HEZ WIPS Management Development Mine Subsidence Investigation

December, 2007

WIPS Management

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Contents

List of tables

List of figures

List of appendices

1. Introduction

HEZ (Hunter Economic Zone) is approximately 900 Ha in size and is located south of the villages of Pelaw Main, Kurri Kurri and Weston within the Cessnock Local Government Area.

The HEZ has been extensively undermined and falls within the Tomalpin Mine Subsidence District. The depth of cover to the mine workings ranges from less than 10m to the north to over 200m to the south of the site. Up to three coal seams, Greta, Homeville Top and Homeville Bottom seams have been mined by primary extraction. In some areas secondary extraction of tops coal and pillars was also carried out. The site was last mined during the 1960's and 1970's.

At the request of WIPS Management, Parsons Brinckerhoff (PB) has carried out a desk top study to assess mine subsidence impacts at the proposed WIPS Management industrial development site located off HEZ Drive. The location of the site is shown on Figure 1. The proposed development is underlain by Hebburn No.1 Colliery workings.

Development of the site will involve construction of four large work/storage sheds, a dispatch building with an office, an above ground storage tank area, an in-ground tank, as well access roads and car/truck parking areas.

2. Sources of information

Information relating to previous mining and mine subsidence at the site was obtained from the following sources:

- Mine Subsidence Board (MSB)
- Aerial photographs from Department of Infrastructure Planning and Natural Resources (DIPNR), and
- The DPI were consulted by PB in 2002 to obtain records of the collieries, seams worked and record tracings (RT) for the HEZ site. Photocopies and scanned images were obtained of the record tracings held at the DPI Head Office.

  The RTs relevant to the site are listed in Table 2.1

Table 2:1 Record tracings obtained from the DPI

Seam	Record tracings
Greta	RT 215
Homeville Top	RT 229
Homeville Bottom	RT 214

- "A History of the Greta Coal Measures (1861 to 1998)" CDROM. Newcastle Regional Museum, 1998.

3. Site description

3.1 Surface description

The site is located within gently undulating terrain north of Mount Tomalpin. The northern end of the site forms a broad ridge which slopes away to the north at approximately 3-4^{o} and to the south at 4-6^{o}. Drainage occurs generally via overland flow to the north and south. Two broad gullies at the south end of the site drain towards Swamp Creek to the east at approximately 2-3^{o} and are each fed by culverts under HEZ drive. No surface water was observed at the site; however boggy ground was present at the outlet of the southern most culvert.

At the time of the investigation, the site was mostly vegetated by semi open forest. The north western corner of the site (approximately 2.3Ha) was cleared and used for materials stockpiling associated with HEZ construction works. Stockpiles of topsoil, mulch and general rubble/spoil were observed. The approximate height and extent of these areas is shown on Figure 2.

The north-eastern side of HEZ drive adjacent to the site was generally in fill with embankments up to 3m high along the low lying gully areas. A cutting was noted at the northern end of the site up to 1m deep. The embankments generally sloped at 28^{o} to 32^{o} and were not vegetated. Drainage swales and sediment control fences were also located along HEZ Drive and the stockpile area. The fences were mostly observed to be full or overflowing at the time of investigation. Some rill erosion was observed along the cut/fill batters of HEZ Drive. Major rilling was present on the topsoil stockpiles to the north. Limited bank erosion was also observed within the larger (southern) gully. No rock outcrop was observed at the site.

No mine subsidence surface features were observed.

3.2 Subsurface description

Reference to the 1:250 000 Singleton Soil Landscape Sheet indicates that soils at the site are generally of the Neath Soil Landscape. Subsurface investigation indicates that soils at the site are generally hard residual silty clays and gravely clays overlying weathered siltstone and sandstone. Alluvial sandy silt and silty sand soils were encountered in and near the gully on the south part of the site. Minor fill was observed across the cleared area up to a typical depth of 0.3m to 0.5m.

Reference to the 1:100 000 Newcastle Coalfield Regional Geology Sheet indicates that the site is located on the east limb of the Lochinvar Anticline and is underlain by the Greta Coal Measures.

The Greta, Homeville Top and Homeville Bottom Seams have been worked at the site by underground coal mining methods at the Hebburn No.1 Colliery. The Greta Coal measures CDROM indicates that the coal seams mined at the site crop out to the north of the area proposed for development, and dip to the SSW at approximately 3^{o}.

Record Tracings for the Hebburn No.1 Colliery indicate that the Greta Seam is approximately 4.7m in thickness and deteriorates to the east. The Greta Coal Measures CDROM and Record Tracings for the Hebburn No.1 Colliery indicate that the Greta Seam

was worked to a height 6ft to 7ft (1.8m to 2.0m) during first workings. Areas that have undergone full extraction are assumed to be worked to the full height of seam.

The Homeville Top Seam underlies the Greta Seam and the two are separated by a 100ft (30m) thick bed of conglomerate. The Homeville Top Seam varies in thickness from 5ft to 10ft (1.5m to 3.0m) and thins toward the west. The Homeville Bottom Seam averages between 5ft to 6ft (1.5m to 1.8m) in thickness and is separated from the upper split by 20ft (6.0m) of sandstone and conglomerate. The Homeville Bottom seam also thins to the west.

4. Mining impacts

Reference to record tracings and mine plans provided by the MSB and DPI indicate that:

- the site is not underlain by Greta Seam workings
- The site is underlain by Homeville Top Seam workings. The depth to the top of the Homeville Top Seam is greater than 150m and the seam has undergone full extraction, and
- the site is not underlain by Homeville Bottom Seam workings.

Figure 2 shows the outline of the mine workings for each seam in relation to the site as well as depth of cover isopachs (contours) for the Homeville Top Seam.

The Homeville Top Seam workings have undergone full extraction in this area. Workings that have been fully extracted are expected to have already collapsed and are therefore unlikely to present a significant mine subsidence constraint for future industrial development. Additionally, the depth of cover to the mine workings for the Homeville Top seam is greater than 150m. Therefore mine subsidence is unlikely to have a significant impact on development of the site as a production facility and warehouse.

5. Mine Subsidence Board guidelines

The MSB have been contacted regarding development on this area of the HEZ site and made the following comments:

The property is located within a proclaimed Mine Subsidence District. The board has adopted the following surface development guidelines and will consider applications for:

- Single storey, steel framed improvements clad with steel, or tilt up slab construction, with single storey masonry amenities and office blocks, designed in accordance with the relevant codes and standards. These improvements are limited to a maximum length of 50m and a maximum height of 12m.
- Other types will be considered on their individual merits. These improvements may require engineering design to cater for specific mine subsidence parameters. Details of these requirements may be obtained from the Board's technical staff.

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6. Conclusion

Based on the review of MSB and DPI plans and guidelines, it is concluded that the Homeville Top Seam workings which underlie the proposed WIPS Management site are unlikely to have a significant impact on the development due to:

- the depth of the workings being greater than 150m, and
- the full extraction and anticipated collapsed condition of the workings (therefore further subsidence is unlikely).

7. Limitations

It should be noted that the observations and recommendations detailed within this report are based on a limited information and assessment. Should conditions vary significantly from those described, or the scope of development works be changed, additional geotechnical advice should be sought. This report should be read in conjunction with the appended Limitations of Geotechnical Investigations.

Figures

Client: WIPS Management
Project: Proposed Industrial Development
Location: HEZ

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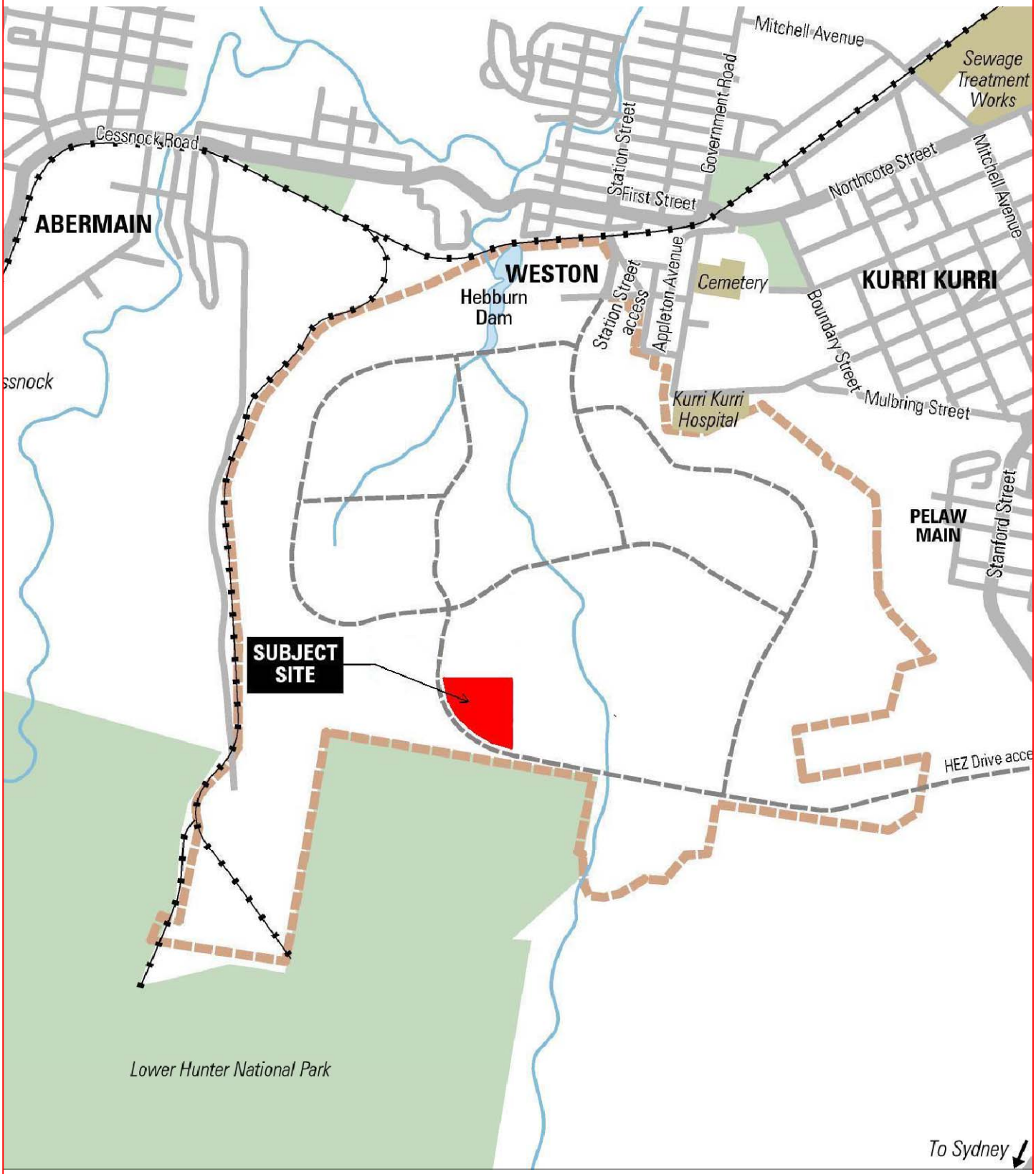

Site Plan
Figure 1

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Client: WIPS Management
Project: Proposed Industrial Development
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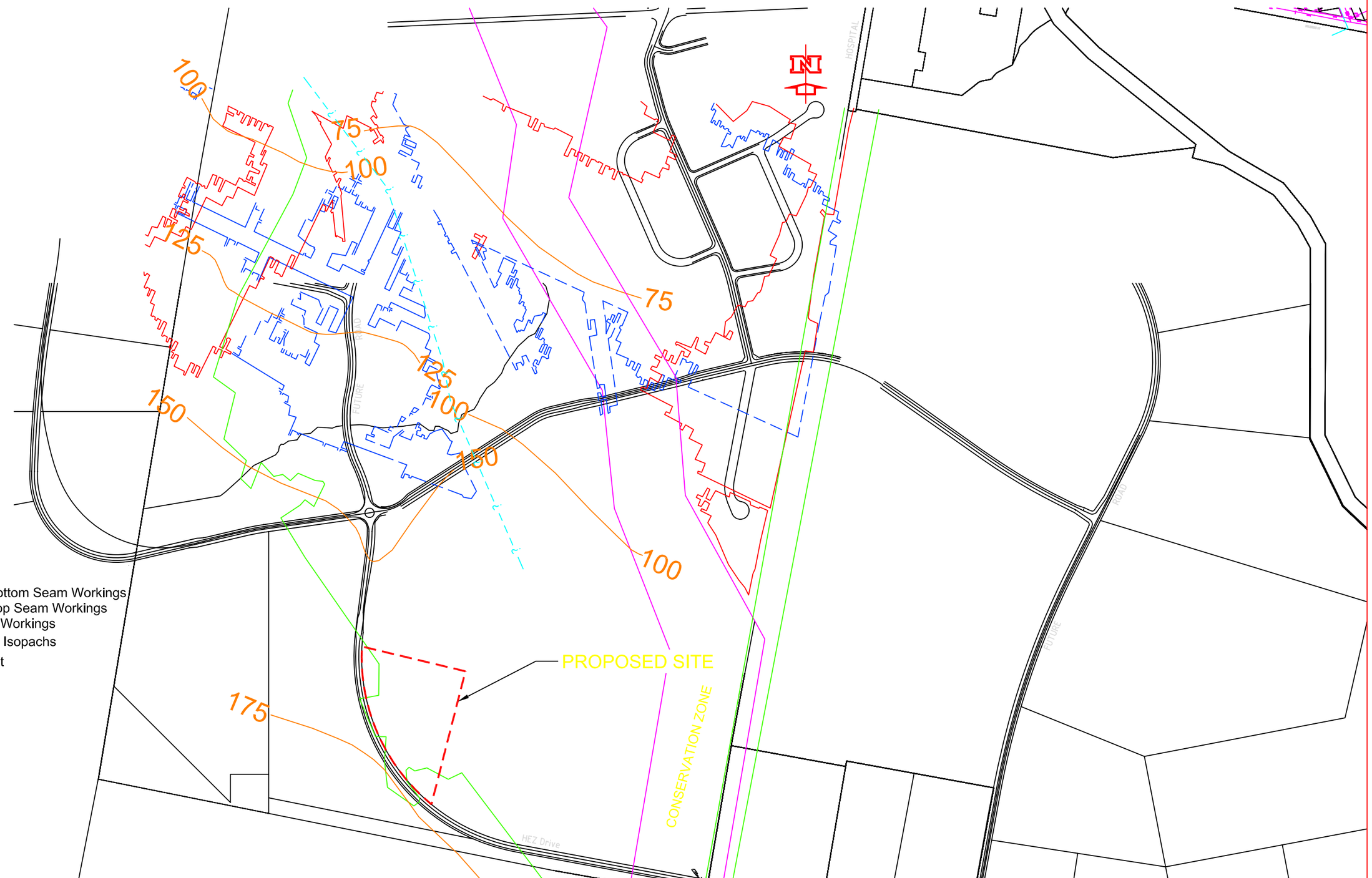
Scale 1: 10,000



Legend

- Homeville Bottom Seam Workings
- Homeville Top Seam Workings
- Greta Seam Workings
- 150 — Cover Depth Isopachs
- ? — Inferred Fault

Hebburn No. 1 Mine Workings
Figure 2

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Appendix A

Limitations of geotechnical investigations

LIMITATIONS OF GEOTECHNICAL SITE INVESTIGATION

Scope of Services

This geotechnical site assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Parsons Brinckerhoff (PB) ("scope of services"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, PB has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, PB has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. PB will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to PB.

Geotechnical Investigation

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared to meet the specific needs of individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor or even some other consulting civil engineer. This report was prepared expressly for the Client and expressly for purposes indicated by the Client or his representative. Use by any other persons for any purpose, or by the Client for a different purpose, might result in problems. The Client should not use this report for other than its intended purpose without seeking additional geotechnical advice.

This Geotechnical Report is Based on Project-specific Factors

This geotechnical engineering report is based on a subsurface investigation which was designed for project-specification factors, including the nature of any development, its size and configuration, the location of any development on the site and its orientation, and the location of access roads and parking areas. Unless further geotechnical advice is obtained this geotechnical engineering report cannot be used:

- when the nature of any proposed development is changed; or
- when the size, configuration location or orientation of any proposed development is modified.

This geotechnical engineering report cannot be applied to an adjacent site.

The Limitations of Site Investigation

In making an assessment of a site from a limited number of boreholes or test pits there is the possibility that variations may occur between test locations. Site exploration identifies specific subsurface conditions only at those points from which samples have been taken. The risk that variations will not be detected can be reduced by increasing the frequency of test locations; however this often does not result in any overall cost savings for the project. The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of the subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration programme, no matter how comprehensive, can reveal all subsurface details and anomalies.

The borehole logs are the subjective interpretation of subsurface conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation, and can not always be definitive. For example, inspection of an excavation or test pit allows a greater area of the subsurface

profile to be inspected than borehole investigation, however, such methods are limited by depth and site disturbance restrictions. In borehole investigation, the actual interface between materials may be more gradual or abrupt than a report indicates.

Subsurface Conditions are Time Dependent

Subsurface conditions may be modified by changing natural forces or man-made influences. A geotechnical engineering report is based on conditions which existed at the time of subsurface exploration.

Construction operations at or adjacent to the site, and natural events such as floods, or groundwater fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept appraised of any such events, and should be consulted to determine if additional tests are necessary.

Avoid Misinterpretation

A geotechnical engineer should be retained to work with other appropriate design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

Bore/Profile Logs Should Not Be Separated from the Engineering Report

Final bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings. To minimise the likelihood of bore/profile log misinterpretation, contractors should be given access to the complete geotechnical engineering report prepared or authorised for their use. Providing the best available information to contractors helps prevent costly construction problems. For further information on this matter reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters. Canberra 1987.

Geotechnical Involvement During Construction

During construction, excavation is frequently undertaken which exposes the actual subsurface conditions. For this reason geotechnical consultants should be retained through the construction stage, to identify variations if they are exposed and to conduct additional tests which may be required and to deal quickly with geotechnical problems if they arise.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and no other party. PB assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of PB or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

PB will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.