BIOCAT 5

TERRA FIRMA (WALES) LTD.

Consulting Geotechnical and Geo-Environmental Engineers
Site Investigation Contractors

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Our Ref: GL/8515/10369
Gwyn Lake

Your Ref:

Contact:

RECEIVED 18 JUN 2003

17th June 2003

Biocatalysts Limited
Treforest Industrial Estate
Pontypridd
CF37 5UD

For the attn. of Stuart West

Dear Sir

UNIT 1, CEFN COED, NANTGARW, GEO-TECHNICAL AND GEO-ENVIRONMENTAL CONSULTANCY

We enclose for your attention our letter report critique of the Earth Science Partnerships Report No 2742c.721 referring to the proposed purchase site.

One copy of this letter report has been sent directly to Mr Geoff de Pass of Lambert Smith Hampton.

Also enclosed for your attention is our invoice No. 10369 for the above works.

We would be grateful if you could certify the invoice and arrange for payment to be made as soon as possible. Any cheques should be made payable to Terra Firma (Wales) Limited.

We trust that the above is to your satisfaction, however, if you have any queries or require any further information please do not hesitate to contact us.

Yours faithfully
for: Terra Firma (Wales) Ltd

Dr Gwyn C Lake

Enc.

cc. Mr Geoff de Pass, Lambert Smith Hampton

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16th June 2003

Biocatalysts Limited
Treforest Industrial Estate
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CF14 5DR

For the attn. of Mr Stuart West.

Dear Sir

UNIT 1, CEFN COED, NANTGARW-BIOCATALYSTS LIMITED

We confirm that we have reviewed the Earth Science Partnership (ESP) Report No. 2742c.721 dated May 2003 and report the following:

A Geo-environmental Report incorporating past site investigation and chemical data together with supplementary trial pitting, boreholes and chemical testing that includes the above site was prepared by ESP. On the basis of this information they draw conclusions as to the level of risk from past mining and contamination together with foundation recommendations for the proposed structures and other relevant geo-technical considerations.

Based on this report we would comment as follows:

1.0 Mining Considerations

No recorded shallow underground mining has taken place either beneath or within influencing distance of the site. However, the two main shafts of the Former Nantgarw Colliery are located close to the proposed location of the proposed Unit 1. It is unclear as to whether any of these shafts lies within the land that Biocatalysts Limited is proposing to buy.

The two shafts were infilled and capped following closure of the colliery in the 1980's. Conversations with Mr Gwyn Williams, formally of Robert West Consulting, WTC Consulting and now Bar Consult would suggest that the infilling of the shafts was carried out in a semi controlled manner and that the shaft caps were not designed and constructed to today's design standards. The findings of the ESP investigation tend to confirm this, in that the shaft infill material contained masonry, wire, metal, steel cabling, sheet steel, bar steel, timber and plastic.

1.0 Mining Considerations

The ESP report goes on to say that 'Despite the shafts being infilled there is still a risk of sudden and drastic collapse as the shaft may have been filled at an intermediate level on staging or the fill may have 'bridged'.
In Section 6.4.4 of ESP's report they present a theoretical crater development after Bell (1978). In this model it is postulated that a crater of diameter $2Z\tan\theta + D$ where Z = depth of made ground and superficial deposits, $\theta = 90°-\phi$ say 45° and D = diameter of shaft. The thickness of superficial deposits and made ground at the location of the shafts has been shown to be approximately 14m. Therefore, from the centre of the shaft the potential zone of influence is likely to be a circle of diameter 34m.

The ESP report recommends that a programme of investigatory drilling and grouting is undertaken on the shafts and a new cap constructed to current design standards at or neat to existing ground level.

These works are currently being carried out by the main contractor under the supervision of ESP and Bradley Associates, the Civil and Structural Engineers for the project.

It is understood that these works entail the stabilisation of the shaft infill to a depth of 25m by pressure grouting and the construction of a new reinforced concrete cap at approximately 2.0m below the existing ground level.

While this treatment would drastically reduce the chances of any future collapse of the shafts, there is still a small chance that this may occur in the future. ESP presents a design risk assessment and gives this risk as very unlikely or a 1 in 1 million likelihood of a total loss event.

However, the ESP report goes on to state that ' Where the end use has a human interaction the possibility of sudden collapse must be to all intents and purposes removed entirely. The construction of structures over shafts is prohibited and generally speaking also prohibited within the likely zone of influence regardless of the degree of shaft treatment.'

Based on the above we feel that Unit 1 should be constructed at least 17m from the centre of the shafts in order to remove all risk of the unit being affected by any future collapse.

In addition, if it is found that either or both of the shafts lie within the boundaries of the land purchased by Biocatalysts Limited, then it is recommended that the shafts remain in the ownership of the developer so that any future expense incurred as a result of problems with the shafts will not become the responsibility of Biocatalysts Limited.

It should also be noted that when constructing the 'pit head' buildings, it was traditional to raise the ground in order that underground tunnels associated with the shafts could be easily constructed. Evidence of such a tunnel was encountered in ESP's investigation of the shafts where a 8.0×4.0m side chamber was encountered at 1.5m. It is, therefore, essential that the proposed earthworks envisaged for the site find and treat any such tunnels.

As far as we are aware there have been no monitoring for methane gas emissions from the shafts. However, the grouting of the shaft infill to below rock head should reduce the risk of methane emissions considerably. This together with the recommended gas preventative measures given in ESP's report should be acceptable.

2.0 Geo-technical Considerations

The foundation recommendations given in ESP's report for unit 1 was either to construct a raft foundation on a minimum of 1.5m of excavated and recompacted materials, or alternatively to use piled foundations.

The report goes on to state that 'ground bearing floor slabs on re-compacted fill materials are likely to be acceptable depending upon the applied loadings and settlement tolerances.'

Either of the above solutions are acceptable provided that the building is constructed outside the zone of influence of the two shafts as previously described.

From conversations with Mr John Campbell of ESP it is understood that due to the amount of large obstructions in the ground the chosen foundation option is to excavate approximately 2.0m of materials, remove all obstructions, re-compact the materials and construct a semi raft type foundation floor slab on the improved ground.

For such a solution all deleterious materials/foundations should be removed and the remaining materials compacted in layers to a specification such as the Specification for Highway Works. The materials should be compacted close to their optimum moisture content (95% or higher) and be capable of delivering a total settlement not greater than 20mm with angular distortions caused as a result of differential settlements of less than 1:750 for the envisaged design loads.

All the excavation and re-compaction works should be supervised and certified by a suitably qualified engineer. A certification report should be prepared that should include all on site acceptability testing.

On the basis of the in-situ gas monitoring undertaken to date the methane protection measures recommended in ESP's report should be included in the development.

3.0 Environmental Considerations

The chemical testing undertaken by the various consultants have indicated generally low levels of the substances tested for. However, there have been consistently elevated results with respect to Polyaromatic Hydrocarbons (PAH).

ESP have analysed these results together with the results of the testing undertaken by themselves and conducted a Qualitative Tier 1 Risk Assessment. This assessment has concluded that following the capping of the site by buildings, hardcover and 300mm of inert topsoil in landscaped areas that there should be no risk to site end users for a commercial development and that a Tier 2 risk assessment is not required at this stage. We agree with this assessment, however, the local planning authority may insist on a minimum of 600mm of inert materials be placed in landscaped areas.

With regard to the aquatic environment it should be noted that the Environment Agency is likely to be contacted as part of the planning consultation process. Due to the proximity of the River Taff to the development they may require a Tier 2 assessment to be carried out to ensure that the contamination beneath the site is not a potential pollutant of the aquatic environment.

The combustibility results provide by ESP show that there is a potential for combustion of the made ground over the site. This confirms the previous findings of Wimpey Environmental where 'hot spots' were investigated.

ESP concluded that excavation and re-compaction of the ground as described in Section 2.0 will significantly reduce the risk of future combustion. We also agree with this assessment.

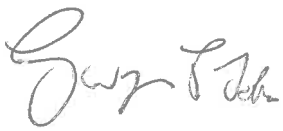
3.0 Environmental Considerations (Continued)

We would also recommend that during the earthworks that all potentially combustible materials are removed and replaced with inert granular materials.

With regard to Japanese Knotweed the recommendations given in ESP's report should be strictly adhered to.

We trust that the above is to your satisfaction, however, should you have any queries or require any further information please do not hesitate to contact us. In the meantime we await your further instructions.

Yours sincerely
For: Terra Firma (Wales) Limited



Dr Gwyn C Lake

cc Mr Geoff de Pass, Lambert Smith Hampton