

REPORT

13th May, 2009

FAO: Mr. Joe Noonan,

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OUR REF: rt-13.5.09-nlcc-rky-4.09

YOUR REF: (Proposed Incinerator)

RE: Coastal Erosion, Hydrogeology & Flood Risk Assessment

1 Author's Background

Mr. Shane Bennet holds professional membership of the Irish Geological Institute and the title of *Eurogeologist*. He has 26 years of international experience in physical and contaminant hydrogeology and has conducted a number of ground investigations in the Cork Harbour area including the nearby Hickson Pharmachem and SmithKline Beecham facilities.

His academic qualifications and employment are as follows:

- BSc (Geology & Physics, UCD 1983)
- MSc (Geophysics, University of Houston 1985)
- 1 year Geological Survey of Ireland
- 1 year Zenith Exploration (USA) - Seismic Geophysicist
- 5 years Geraghty & Miller (USA) - Groundwater Consultant
- 6 years KT Cullen (IRL) - Consultant Hydrogeologist
- 13 years SM Bennet & Co Ltd (IRL, UK, USA, FR, ZW) - Hydrogeological & Environmental Engineers.

2 Sources

This summary report is principally based on the following sources:

- an examination of the relevant submissions in relation to the application;
- a review of the local geology and hydrogeology;
- specific discussions with Dr. S. McCarron & Prof. J. Sweeney, NUI Maynooth;
- site and coastline inspection;
- a review of a number of published papers and websites containing information relating to coastal erosion in these islands. The websites for the Coastal Resources Centre, the Marine Institute and NUIC were of particular relevance.

The following bibliography is available in hard copy upon request for this hearing:

- I. *Devoy Robert JN 7/2001, Extract from Project STORMINESS for AGU;*
- II. *Devoy Robert JN c.2000, Encyclopaedia of Ireland, Coastal & Marine Themes, Pub. by Gill & Macmillan, Dublin;*
- III. *Devoy, Robert JN NUIC, Holocene & Longer Term Sea Level Changes & their Implications for Irish Sea Coasts, IQUA 2000 Symposium Proceedings;*
- IV. *Devoy Robert JN 6/2000 UCC, Synthesis and Upscaling of Sea-level Rise Vulnerability & Assessment (SURVAS) Implications of Sea-level Rise for Ireland;*
- V. *Correspondence from Prof John Sweeney to NLCC, NUI Maynooth, 1/2009.*

3 Geology

The EIS §14.4.1.1 states that the site is underlain by Lr. Carboniferous marine interbedded grey/brown sandstone, siltstone and mudstone referred to as the Cuskinny formation of the Kinsale group. I acknowledge that the EIS appears to be in agreement with the GSI's interpretation as illustrated in Sheet 25 and described in the Ringaskiddy Golden Rock sequence on p.48 of the Geology of South Cork.

4 Hydrogeology

The interpretation of the local hydrogeology in the EIS may be summarised by the statement in §14.6.3: *'Groundwater Protect Zone in the area of the site is classed as Lm and LI/E, indicating that the site is a 'locally important aquifer of extreme vulnerability'*. It is also stated that the GSI records indicate that the aquifer is not used locally for supply purposes and that there are no source protection zones in the area. Although the aquifer description in §14.6.3 somewhat contradicts that of §14.6.2, I can find no reason to dispute the hydrogeological interpretation as presented in the EIS.

5 Vulnerability

Although the vulnerability appears to have been correctly interpreted in EIS §14.6.3, I wish to comment on the implications made in the response to the CHASE submission under Item 7.2 in the Statement of Evidence of Ms. Lyden on Soils & Geology, Hydrology & Hydrogeology. The last sentences of both paragraphs are of concern to me. In the first paragraph it appears to be implied that artificial site protection or containment measures could be used to influence or modify the site vulnerability rating or implications thereof. This implication must be considered suspect. The site vulnerability rating as published by the GSI relates to the protection afforded to groundwater by the naturally-occurring overburden and cannot be modified by manmade enhancement, containment or protection measures.

In the latter paragraph it is stated that the extreme vulnerability rating is of no relevance to the proposed development since containment measures are being incorporated. I regard this statement as aspirational. I will demonstrate by example. Filling stations and petroleum fuel depots have long been recognised as polluters of groundwater and soil through spillage or leakage. The most up-to-date facilities for the majors such as EXXON MOBIL therefore use the best containment design and materials available with the benefit of long term experience. Yet such facilities are still being shown to give rise to inadvertent discharges of fuels to ground within a short timeframe. For this reason wherever such materials are being handled practical experience requires planners to assume that there will inevitably be leaks and spills. Such was Titanic's legacy to her engineers.

6 Overburden Geology

The overburden was examined along the beach exposure and appears to consist of a thick upper layer of unsorted glacial till containing angular boulders overlying a thinner layer of laminated till containing imbricated shale layers. The till matrix consists of a fine sand and is observed to collapse under conditions of super-saturation. A number of such collapse features can be seen further along the coastal exposure. The till appears extremely susceptible to weathering/erosion and its nature would appear to support the coastal erosion rates quoted.

By observation the bedrock surface beneath the site's southern boundary appears marginally below the high tide mark at the beach with an overlying overburden thickness of between 1m and 2m which supports the EIS trial pit data.

7 Geomorphology

In §14.2 it is stated that anecdotal evidence suggests that material from the site was used for reclamation and gave rise to the escarpment. The local information that I received suggested that only a small amount of material was drawn from the site for this purpose. I would respectfully suggest that the author of §14.2 reconsider this suggestion since the escarpment feature runs along this coastline beyond Ringaskiddy village and appears far more likely to reflect a former sea level. Such features at 2m above current sea level have been interpreted at other localities such as Courtmacsherry.

8 Ordnance Data

Whilst all site levels are currently surveyed to the Malin Head Ordnance Datum, I recommend that a comparison with the spring high tide level for Cork Harbour at the southern site exposure is the relevant comparison in this case. A topographic map showing land surface elevation above the local spring tide level would illustrate the areas at risk of flooding more clearly. Against this the predicted values for the storm surge and sea level rise can be superimposed. For reference purposes the spring tide maximum at Cobh is listed at 4.2m CD (Cork Harbour 2008 Tide Tables).

9 Predicted Sea Level Rise

Professor John Sweeney (*Correspondence from Prof John Sweeney to NLCC, NUI Maynooth, 1/2009*) states that the 2007 Intergovernmental Panel on Climate Change projected a range for sea level rise of 0.26m to 0.59m. However he suggests that this range is insufficiently pessimistic in that the most recent evidence including projected carbon emissions and data on the Greenland Ice Sheet retreat indicates that a rise in sea level of 1m by 2090 is conceivable. In §14.9 the EIS satisfactorily allows for a 1m sea level rise in their calculations of the proposed design platform level for the waste transfer station.

10 Storm Surge

Professor Sweeney (*Correspondence from Prof John Sweeney to NLCC, NUI Maynooth, 1/2009*) quotes *Oxford 1989* as predicting a surge of 2.5m to 3m for the 1 in 100 year storm under current climatic conditions. At this location it is reported that flooding is experienced during low pressure storms with the wind from the SE. The allowance of 3m for the 1 in 200 year storm surge made in §14.9 the EIS appears moderately inadequate when compared with Oxford's 1 in 100 year figures. It should also be noted that a freeboard allowance of 1m above maximum predicted flood levels is recommended for finished floor elevation for building construction. A 0.5 m allowance has been made in EIS §14.9 for the proposed elevation of the Waste Transfer Station.

11 Maximum Flood Assessment

Combining a 1m sea level rise with the 3m surge for the 1 in 100 year storm (Oxford 1989) would suggest a 4m flood level. The visible high tide mark as observed on Gobby Beach on 13/5/09 was approximately 0.5m below the level of the public car park. Using the conservative assumption that the 4.2m CD Spring Tide level is commensurate with the visible high tide level, a 4m increase over and above that level would appear to have catastrophic consequences for this site.

Anecdotal evidence provided by locals and supported by photography demonstrates clearly that significant flooding does occur both on this site and along the access road. It was reported to the author in April 2008 that the first residence north of the site was boarded up due to repeated flooding.

12 Coastal Erosion

An extrapolation of the historic rates of coastal erosion has been quoted in the EIS §14.8 as 55m in 100 years along the southern margin with an unexplained acceleration in the latter 50 years. This correlates with the 0.2m-0.5m average/year quoted (*Devoy Robert JN 6/2000 UCC, Synthesis & Upscaling of Sea-level Rise Vulnerability & Assessment (SURVAS) Implications of Sea-level Rise for Ireland*). However values of 1m to 2m per year were also quoted currently for the southern and eastern coasts and this may better reflect the acceleration in the past 50 years on this section of coast. I would respectfully advise that, bearing in mind the easily erodible nature of the sandy till and the apparent absence of bedrock above the high tide level, this particular stretch of coastline must be considered amongst the most vulnerable in Ireland. The coastal erosion map of Ireland (*Devoy Robert JN c.2000, Encyclopaedia of Ireland, Coastal & Marine Themes, Pub. by Gill & Macmillan, Dublin*) identifies this particular section of coastline.

The cut and fill process that is proposed to create the finished land surface levels purports to use the natural till available on site. As is evident along the coastal section, this fill is easily eroded and is prone to collapse under conditions of super saturation. It appears from the EIS that the incinerator is to be constructed on such material without rock piling. Without sea defences coastal erosion would be expected eventually to undermine such a structure.

13 Mitigation Measures

It has been stated in the EIS §14.14.3 that mitigation measures are not required in respect of Coastal Recession and Coastal Flooding. The reasoning given is that *significant impact on the coastal retreat processes is not anticipated to result from the construction or operation of the facility*. With regard to this reasoning, a further statement in the EIS §14.14.3 appears confusing: *if coastal protection works are constructed in future, mitigation measures will be*

included if it is determined that these works could have an impact on erosion or accretion along the coastlines to the north and south of the site.

Notwithstanding the flood assessment findings, this approach ignores the predicted coastal retreat of 55m per 100years which is expected to significantly undermine the proposed footprint of the incinerator building and eventually overtake the entire site. No development can choose to ignore or dismiss the natural perils inherent in a site merely because they are not caused by the construction works themselves.

14 Environmental Impact

With the benefit of having seen the actual impact as opposed to the aspirational impact arising from developments of this nature, I regard the conclusion in Section 14 that “*there will be no negative environmental impact*” as being naive and unrealistic. At the very least the statement could be altered to read truthfully that “*there will be no intended negative environmental impact*”. I bring this to the reader’s attention because I challenge anyone to find an EIS commissioned by the proposer that finds any significant negative environmental impact. Inherent in this observation is the suggestion that the EIS requirement element of the current planning process needs revision. A twin track approach employing the devil’s advocate approach merits consideration.

Authored by Mr. Shane Bennet on behalf of S.M. Bennet & Co. Ltd. End of Document