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Review of Hydrogeological Assessment - Proposed Geelong Resource Recovery Facility

The Golden Plains Shire Council (Council) required that a Hydrogeological Assessment (HA) be carried out to support a Planning Permit Application for a new waste management facility to be located approximately 13 km west of the Geelong City Centre - the proposed Geelong Resource Recovery Facility (GRRF). The Hydrogeological Assessment was prepared by SMEC in August 2015

Council engaged AECOM Australia Pty Ltd to undertake a review of the HA and we proposed to address these specific questions:

- Is the assessment consistent with legislative requirements and EPA guidelines?
- Does the proposal provide sufficient information to support a planning permit application?
- Are the proposed components of the hydrogeological risk assessment adequately defined?
- Does the assessment provide an impact assessment of the proposed waste management facility?

1.0 Scope

The assessment will incorporate the following components:

- Overview of EPA Hydrogeological Assessment (HA) Guidelines (EPA Pub 668, Sep 2006)
- Summary of the contents of the HA report
- Assessment of adherence to the Guidelines
- Conclusions – Does the Hydrogeological Assessment meet Council requirements?

2.0 EPA Hydrogeological Assessment Guidelines and Planning Requirements

The EPA HA Guidelines were published in September 2006 and remain as the guidance document for conducting hydrogeological assessments for any existing or proposed development that may impact groundwater quality. The HA Guidelines provide a framework to determine whether there is any:

a) existing groundwater contamination and resulting risk to beneficial uses of groundwater, and,

b) potential risk to groundwater quality and beneficial uses of groundwater.

The Guidelines indicate that the HA requires a staged approach that includes:

- desk top study to build a conceptual hydrogeological model of groundwater flow, quality and contamination
- initial assessment of health and environmental risk
- field investigation and testing to improve the conceptual model

- reassessment of risk if necessary
- reporting of results and potential risks at site.

From a planning perspective, the site is located in a Farming Zone and one of the planning decision guidelines that needs to be considered is the impact on saline groundwater. General amenity impacts and ability for the land to sustain agriculture future use also needs to be considered. The HA report should provide this technical assessment to inform the planning application. It needs to provide an assessment of impact, and if there are no significant impacts provide the evidence. The report should also provide mitigation measures that should be transferred over into the EMP for the site.

The report should consider beneficial users of the groundwater, their location and modelled impacts as a result of the landfill. Otherwise it is very difficult for the Council to make an informed decision which considers impacts.

3.0 Contents of the SMEC HA Report

The HA includes the following components:

1. A review of the relevant legislative requirements.
2. An overview of the site, including a description of the geological and hydrogeological; conditions, climate, and other biophysical elements.
3. A description of the relevant hydrogeological data acquired during the study and the field investigations conducted.
4. Description of the conceptual hydrogeological model
5. Groundwater contamination assessment.
6. Conclusions and recommendations.

This format follows the standard proposed in the Hydrogeological Assessment Guidelines.

4.0 Review of Hydrogeological Assessment

The review has been conducted against the approach which is summarised in Appendix A of the EPA HA guidelines.

4.1 Introduction

4.1.1 HA Recommendation

The Introduction is to contain the purpose of the document, any background information and the scope of the hydrogeological assessment.

4.1.2 Content

The objective is stated as being to collate all information for a Site Conceptual Model to assess site suitability for the proposed development of the landfill, resource recovery and transfer station, greenwaste processing and composting operation, community information centre and associated infrastructure and administration building.

Legislative requirements are described in the report – EP Act 1970, Groundwaters of Victoria SEPP, Waste Management Policy and BPEM. The HA lists the legislative requirements for siting of landfills, resource recovery centres and composting facilities (facility not to be located in an area of potable water quality, waste to be placed at least 2m above water table, preferred siting where underlain by a layer of attenuating soils, site to be not 100m of an recently active fault zone and geotechnically stable).

4.1.3 Discussion

Although the HA indicates it has been undertaken to support a planning permit application for the new waste management facility, there is no description of the waste management facility. Furthermore, the site location plan (Figures 1-1 and 1-2) make no reference to the propose landfill site – just the extraction area boundary.

The waste management facility has the potential to impact groundwater quality, but the HA appears to be just a siting document. Although the document indicates how the site meets BPEM criteria for siting the proposed operation, potential impacts of the operation are not considered. Key questions for the landfill that are not addressed include the types and volumes of waste, the engineering concept design – will there be a side liner and base liner, what are the predicted leachate flow rates? Compliance with the BPEM is implied but there is no design or impact assessment to support that the groundwater will be protected.

Similar questions arise concerning the greenwaste composting operation – particularly the base design – and the proposed wastewater disposal requirements for staff at the centre.

4.2 Site Overview

4.2.1 HA Recommendation

The Site Overview is to provide a description of the site, its physical setting, the history of development, the content of previous studies and a summary.

4.2.2 Content

Description of site locality and features are provided and climate, topography, existing bore users and site history are provided.

Section 2 – Site Overview contains a description of the physical characteristics of the site, including climate, topography, drainage, vegetation and land use.

4.2.3 Discussion

The site is a greenfield site so the HA provides information to support the siting of a proposed new development, however there is no description of the proposed landfill or resource recovery facilities.

Section 2.5 indicates that landfill, leachate, oil and fuel spills and composting have the potential to contaminate groundwater and it is expected that descriptions of how this might occur and the design measures to mitigate such impacts would be described in subsequent sections.

The site location plans are not well-labelled. Figure 1-2 shows that the red line is the extent of the extraction area and the yellow line is Works Authority boundary, but there is no reference to landfill.

4.3 Methodology and Results

4.3.1 HA Recommendation

The HA requires two components – a desk study, identifying data sources, assessing data quality and providing a summary of data. The second component is the field study which supplies results and analysis of data.

4.3.2 Content

The Desk Study is presented in Section 3.1. The section indicates the data sources, including BOM, GSV, Visualising Victoria's Groundwater, State GDB, quarry borelogs and regional topographic data from VicMap.

The assessment of data quality indicates problems with bore survey information. The Data Summary section confirms the drilling information provides sufficient regional geological information but the major data gap is the lack of site specific groundwater data. The monitoring bores used in the analysis were former quarry exploration bores and water supply bores. There are no construction details for these bores, no indication of screened interval (or if open hole), no survey information and no record of monitoring.

The objective of the field study is to provide sufficient site specific data to assess the site's suitability for development of the GRRF.

The analysis used four existing water supply bores (windmills) and four converted exploration bores. Groundwater samples were collected and analysed for field parameters and submitted for lab analysis.

4.3.3 Discussion

The approach to the desk study is generally consistent with the HA methodology, although there is an issue again related to labelling of the figures - map (Fig 3-1) does not show the location of the South Mill bore, which was dry at depth of 12.3m. The fact that it is dry is information in itself that informs the hydrogeological assessment, particularly contouring of groundwater levels.

The field study involved accessing existing boreholes for groundwater data on the site, with borehole elevations being derived from survey maps. Since the bores are not constructed as observation bores with isolated screen intervals, there is doubt about the aquifer interval sampled and whether the samples could be contaminated by surface water inflow.

For a landfill of this scale, the EPA would require drilling and sampling of appropriately constructed observation bores. This would be necessary for the Works Approval application, which we understand has not yet been submitted.

While it is recognised that a Planning Permit may not require this levels of detail, the two processes (planning and works approval) are often prepared in parallel. Reliable hydrogeological data is also necessary to inform the development of the conceptual hydrogeological model.

4.4 Conceptual Hydrogeological Model

4.4.1 HA Recommendation

The HA recommends the following components:

- Setting
- Geology / aquifers
- Groundwater flow systems
- Groundwater chemistry
- Protected beneficial uses
- Ground water resource utilisation
- Summary

4.4.2 Content

This section provides a description of the regional geological and hydrogeological characteristics.

4.4.3 Discussion

The geological map (Fig 4-1) does not show the site location and the legend is illegible.

Section 4.2 describes the groundwater flow systems. The depth to water table is shown in Fig 4-5 but there is no source quoted for this map and the shading on the map is inconsistent with the field data. In fact the map suggests that the areas adjacent to the alluvial valleys have very deep water tables whereas the basaltic plains have water tables within 2m of surface. The text also indicates the map is inconsistent with field results, so it would be better to explain the differences or exclude it from the report.

The discussion on groundwater salinity indicates that groundwater at the site is between 3,500 and 7,000 mg/L TDS, which classifies it as Segment C. In fact one of the bores (West Mill) has a salinity of 2,100 mg/L (Table3-3) which classifies the water as Segment B. Fig 4-6 is quite stylistic but it also shows the site straddling segments B and C. The source for the Regional Salinity map (Fig 4-6) is not provided.

The local hydrogeology section (4.2.2) indicates groundwater flow is in a southerly direction according to the one round of monitoring conducted. Note there is an error in the contours for Homestead and MB01 bores which should have water table elevations of 58.5 and 54.8m respectively. They are shown as 66 and 68m. The reference to Section 3.2.5 should read 3.2.3.

There is not a description of the proposed GRFF operation – it is not known what type of waste is to be disposed, the relative proportions or the landfill engineering standards. The conceptual model in Figure 4-10 appears to have no engineering design basis – it suggests the landfill will be designed on the base and sides, but this is not referenced in the text.

The Conceptual Model shown in Figure 4-10 is very stylistic and does not show the liner design, the location of sensitive groundwater receptors or bore locations. The section has no vertical or horizontal scale and there is no link to the potential sensitive receptors described in Section 4.4 and whether they may be impacted by the proposed development. If the groundwater classifies as Segment B, then the potential for impact from leachate migration is more significant.

4.5 Groundwater Contamination Assessment

4.5.1 HA Recommendation

The HA recommends the following components:

- Description of contamination
- Impact assessment
- Risk assessment

4.5.2 Content

The guidelines indicate that an impact assessment should be conducted using the risk assessment framework i.e. source-pathway-receptor. In the case of the GRRF the source that has the potential to impact groundwater quality is leachate emanating from the proposed landfill and the composting operation of the resource recovery facility. The Impact Assessment as a minimum requires an assessment of whether each of the protected beneficial uses of groundwater is protected, or precluded by contamination.

In cases where contamination is serious and the risks may cause environmental harm, a more detailed groundwater risk assessment may be required.

4.5.3 Discussion

The Groundwater Contamination Assessment (Section 5 of the HA) provides an assessment of contamination of the site as it is now, not as a consequence of its intended use. The report indicates there are issues with using the older bores from the site (windmills and quarry exploration bores) for development of the hydrogeological conceptual model and as a consequence it proposes cleaning out of the existing bores and drilling of 4 additional bores in the Newer Volcanics. A recommended quarterly monitoring program is proposed. Note that the plan of new bores (Figure 5-1) shows eight new monitoring bore locations.

If the proposed development is approved, the existing bores could not be incorporated into the regular monitoring program because of lack of bore construction information. So the proposed drilling of at least eight new bores would be required and we concur with the proposed locations.

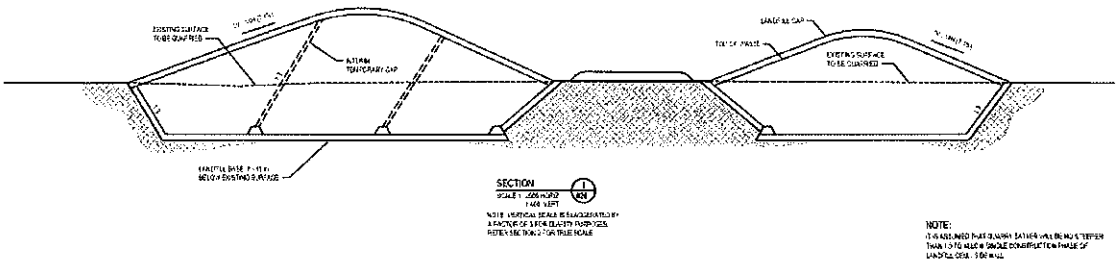
4.6 Conclusions and Recommendations

In Section 6 Conclusions and Recommendations are presented. This section indicates that the objective of the HA is to collate available information to develop a Site Conceptual Model of the geological and hydrogeological framework so that an assessment of the site's suitability for the proposed development may be undertaken. The HA Guidelines however indicate that the HA should be more than that – it is a systematic study of geology, hydrogeology, geochemistry and contamination at a site and an essential component of the HA is the development of a clear conceptual model of the hydrogeology, the contamination and the potential human health and ecological risks.

It is in this second part that the HA is deficient - there is no description of the proposed development and the risks it poses to the groundwater environment. The HA deals only with siting criteria but not potential issues associated with leachate migration. The document lacks a conceptual design of the landfill system, an indication of waste types, an assessment of leachate generation rate and predicted impacts on groundwater quality and beneficial use.

There is a significant difference between the other assessment reports that accompany the application as appendices. The other reports present an impact assessment based on the engineering design drawings that are presented in Appendix B and Appendix D.

Appendix B Plans and Elevations shows the staging plan and cell layout, transfer station layout, compost pad and landfill cross section. It also shows a plan of the rehabilitation profile, which is the basis for the Stormwater Management Plan (Appendix G) that incorporates calculations of runoff from the rehabilitated facility.



Appendix D Engineering Concept Report presents the engineering aspects, including the liner profile options consistent with BPEM and the cap profile. The landfill airspace is estimated to be 21.5 Mm^3, which equates to 150 years of airspace at a rate of 100,000 t/year. The compost pad is also described as comprising a 1m thickness of compacted clay.

Impacts of the proposed design on other environmental sectors - air quality (odour), noise and traffic are dealt with in the other appendices, but not groundwater.

5.0 Does the Hydrogeological Assessment Meet Council Requirements?

The Hydrogeological Assessment has been prepared to support a Planning Permit Application for the Geelong Resource Recovery Facility (GRRF) which will include a transfer station and landfill to receive 100,000 tonnes/year of municipal solid waste but there is no detail on the design of the proposed landfill and how impacts of leachate on groundwater will be mitigated. This is a requirement of BPEM for any proposed landfill development. Although it references the BPEM, the HA indicates that BPEM requirements are considered during licensing and approval processes and that the objective of the HA "is to collate available information to develop a Site Conceptual Model of the geological and hydrogeological framework so that an assessment of the site's suitability for the proposed development may be undertaken."

In the description of the hydrogeological conditions of the site and the characterisation of beneficial uses of groundwater the HA generally conforms to the EPA requirements. While there are issues with appropriate labelling of figures and incorrect groundwater contours, these are not considered to be fatal flaws. Our assessment indicates that the site is suitable for proposed landfill development provided appropriate engineering measures are incorporated into the design and that mitigation measures are appropriate.

We note, however, that the Planning Authority also has the responsibility to adopt a best practice environment management and risk management approach which aims to avoid or minimise environmental degradation and hazards. As it stands, the HA does not provide an indication of the elements of the conceptual design that will be incorporated to mitigate leachate impacts on groundwater. Leachate flow rates, liner seepage rates and predicted impacts on groundwater quality are not identified.

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We consider that Council needs to be supplied with sufficient information to be satisfied that the proposed design will not create adverse impacts on beneficial uses of groundwater in the vicinity of the site. In this respect, the HA is considered inadequate because the following components are missing:

1. A description of the landfill design – the number of cells, the filling schedule, the liner system, the cap and cover design and the leachate collection system.
2. The predicted leachate generation rate, derived from HELP or similar approved leachate modelling tool.
3. The leachate generation rate should be assessed under BPEM conditions i.e. average climatic conditions and two consecutive 90th percentile wet years.
4. The leachate disposal design option is to be described. It appears that a leachate pond is to be constructed and that evaporative disposal will be the disposal strategy, but this is not explicitly stated. If evaporation is to be the strategy, then the pond should be sized to sufficient capacity to accommodate two consecutive wet years, as per BPEM requirements.
5. An assessment of impact of leachate migration through the liner on groundwater quality. This could be the result of numerical modelling or estimated on the basis of BPEM design seepage rates i.e. 10 L/Ha/day.

Yours faithfully