JAC Land

For Woodhouse Pastoral Company

Outer Eynesbury Hydroponics Precinct Project

Hydrology and Hydrogeological Assessment

June 2014

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1. Introduction

1.1 Purpose

GHD Pty Ltd (GHD) was engaged by JAC Land on behalf of Woodhouse Pastoral Company Pty Ltd to undertake a hydrological and hydrogeological assessment of the site of a proposed Hydroponics Precinct Project (The Project) near to the township of Eynesbury, Victoria. The assessment will investigate whether the proposed works of The Project may have a significant effect on the surface water and groundwater environments. Furthermore, GHD will evaluate the impact of construction and operation of The Project and make recommendations to mitigate this impact where appropriate. The results of this assessment will accompany an existing Referral prepared by JAC Land for a decision on the need for assessment under the *Environmental Effects Act* (1978).

1.2 Description of proposed works & study area

Woodhouse Pastoral Company Pty Ltd is seeking to establish a hydroponics precinct on a project site of 457 ha south of Eynesbury. The site's southern boundary is defined by the Ballan Road, and lies west of Mount Mary Road. The site is shown in Figure 1, page 2.

Preliminary information provided to GHD indicates that 14 greenhouses and various ancillary components, including access roads, recycled-water treatment tanks, administration offices, and utilities (e.g. gas, mains water, sewer, electricity and telecommunications) are proposed as part of the works of the Project.

A provisional masterplan of the works is provided by JAC Land and is attached in Appendix A, page A-1. It is understood by GHD that the footprint of the proposed works is yet to be finalised at the time of reporting.

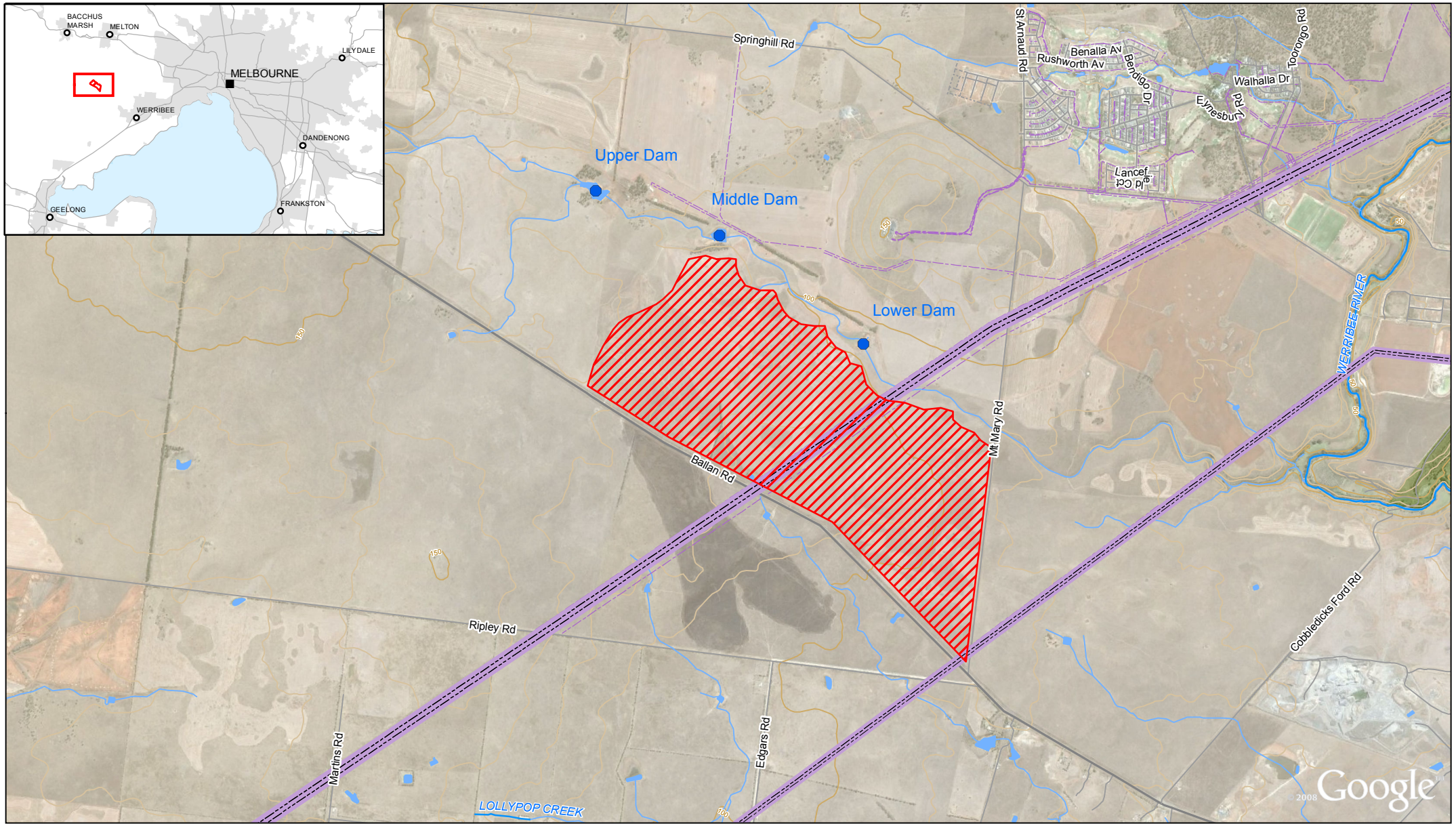
1.3 Scope of works

This report includes the following specific technical information:

- Description of the existing conditions
  - Results of a site inspection
  - Hydrologic catchment
  - Significant nearby waterways
  - Geology and groundwater environment
- Discussions of the potential impacts of the proposed works
- Conclusions
- Recommendations to mitigate any potential impacts

Note the focus of this hydrology and hydrogeological assessment is both the Project Area itself and also the downstream receiving waters (Werribee River) of the study area.

This report should be read in conjunction with the limitations documented in Section 10.



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

- Project Area
- Other Parks
- Water Area
- River
- Stream
- Drain/Channel/Other
- Arterial
- Collector
- Proposed
- Minor Contours (10m AHD)
- Major Contours (50m AHD)
- transmission line 500KV
- transmission line 220KV
- transmission line <66kV
- Dam Locations

Woodhouse Pastoral Company
Eynesbury Precinct Hydrology Assessment

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Site Locality Plan

Figure 1

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180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE Vicmap (Jan 2014), Google Eath Pro (Image captured 13/02/2013) Created by:jlloyd

2. Assessment method

2.1 Technical investigations

The method applied to describe the existing conditions was based on a desktop review of available literature relating to surface water, groundwater and hydrogeology.

To complete the overall picture of existing conditions, the following tasks were undertaken. These tasks then formed inputs into the impact assessment which is described later in this report.

- Review published and unpublished reports pertaining to the area in the immediate proximity of the site.
- Describe the existing relationship and interactions between surface water, groundwater, land use, geology and climatic conditions to provide a summary of the pre-works environment.
- Identify relevant legislation and policy in relation to protected beneficial uses of groundwater and surface water.
- Identify the location of users/receptors of the surface and groundwater systems such as bore owners and streams.

2.2 Assumptions

This investigation has relied on a number of data sources which have assumed to be up to date:

- Published geological and hydrogeological mapping.
- State Groundwater Management System (Victorian Data Warehouse).
- Index of Stream Conditions Victoria (Victorian Data Warehouse).
- Government produced literature including zones, overlays, meteorological and topographical data.

These data sources have been referenced, where relevant, throughout the report and a complete list of references is provided in Section 11 at the end of this report.

3. Legislation and policy

3.1 Relevant legislation

This section provides an overview of the key legislation and policy documents which form the regulatory framework for surface water and groundwater.

The framework for the management of surface water and groundwater in Victoria is established primarily through the:

- *Water Act 1989*
- *Environment Protection Act 1970*

In the context of groundwater, the Water Act principally deals with the sustainable, efficient and equitable management and allocation of the resource. It also provides a means for the protection and enhancement of all elements of the terrestrial phase of the water cycle.

The Environment Protection Act empowers the Environment Protection Authority Victoria (EPA Victoria) to implement regulations, maintain State Environment Protection Policies (SEPPs) and protect the environment from pollution and the management of wastes. The Act regulates the discharge or emission of waste to water, land or air by a system of Works Approvals and licences. It has the objectives of preventing and managing pollution and environmental damage, and the setting of environmental quality goals and programs.

A number of subordinate legislation and guidelines exist which further expand on the general tenets of the Water Act and the Environmental Protection Act. SEPPs set out Victorian Government policies that control and reduce environmental pollution and have been formulated for discharges to atmosphere, water, land and noise emissions. These policies protect the environment and human activities ("beneficial uses") from pollution caused by waste discharges and noise and are subordinate documents to the Environment Protection Act.

3.2 Maintenance of water quality

3.2.1 Surface water

The State Environment Protection Policy (*Waters of Victoria*) aims to provide a coordinated approach for the protection and, where necessary, rehabilitation of the health of Victoria's water environments.

As required by the *Environment Protection Act 1970*, the SEPP *WoV* identifies the beneficial uses and values of the water environment that the community and government wish to protect. The SEPP *WoV* also contains objectives that describe the conditions required to protect the identified beneficial uses of the receiving water bodies. Detailed information is documented for each Catchment Management Authority (CMA) region and Melbourne Water on the following:

- The beneficial uses of water environments.
- The SEPP environmental quality objectives that apply at each site.
- The attainment program (identifying responsibilities and strategic actions).

The ephemeral tributary forming the northern boundary of the Project Area discharges to the lower reaches of the Werribee River. This area falls within the Cleared Hills and Coastal Plains segment, as defined in the Victorian Government Gazette (2003).

The target objectives for environmental water quality indicators are shown in Table 1, page 5 below.

Table 1 SEPP WoV – Water Quality Objectives for Rivers and Streams, Cleared Hills and Coastal Plains Segment

Indicator	Quality objective
Water Quality Indicators	
Total phosphorus (µg/L)	≤ 45 (75th percentile)
Total nitrogen (µg/L)	≤ 600 (75th percentile)
Dissolved oxygen, % saturation	25th percentile ≥ 85; maximum 110
Turbidity (NTU)	≤ 10 (75th percentile)
Electrical conductivity (µS/cm)	≤1500 (75th percentile)
pH	25th percentile ≥ 6.5; 75th percentile ≤ 8.3

Source: Victorian Government 2003

Biological, flow, sediment quality and habitat indicators are also defined for water environments and are detailed in print and also online (see EPA 2014).

Waterways both directly and indirectly affected by the proposed works of the Project would need to be considered under the SEPP *WoV*. SEPP *WoV* identifies "beneficial uses" of waterways and establishes environmental quality objectives at levels that would ensure the protection of these uses.

The beneficial uses of water environments include:

- Aquatic plants and animals
- Water suitable for aquaculture and edible seafood
- Water-based recreation
- Water suitable for human consumption
- Cultural and spiritual values
- Water suitable for industry and shipping
- Water suitable for agriculture

The SEPP (*Waters of Victoria)* legislation outlines that these beneficial uses need to be protected from potential impacts to the water environment resulting from construction and operation of the Project.

Healthy Waterway Strategy (Melbourne Water)

Melbourne Water's *Healthy Waterway Strategy* outlines the strategy for management and investment in local waterways to improve environmental values, considering all stakeholders such as community groups and commercial customers. The Project Area falls within the Healthy Waterway Strategy's "Werribee and Little River Lowlands Catchment" and specifically the Lower Werribee reach. A number of objectives have been identified for this catchment within the Lower Werribee River management unit, including:

" stabilise the platypus population, increase the proportion and number of native fish, improve the diversity and abundance of streamside and wetland birds, maintain vegetation to a high quality and improve amenity." (MWC 2013, *Chapter 5.1 p108*)

Managing environmental flows, undertaking weed control and revegetating degraded riparian or streamside zones among other objectives, are part of Melbourne Water's 20 year strategic priorities for the Lower Werribee catchment.

3.2.2 Groundwater

Under the Environment Protection Act, and on the recommendation of the EPA Victoria, the Victorian Government enacted the State Environment Protection Policy (SEPP) (*Groundwaters of Victoria*). This policy aims to maintain and, where possible, improve groundwater quality to protect beneficial uses. Groundwater with higher concentrations of salinity (measured as mg/L TDS) is deemed to have fewer beneficial uses.

SEPP (*Groundwaters of Victoria*) forms the primary guide to determining existing impacts and the risk of impacts to groundwater quality. The policy is based on a number of principles which include:

- Groundwater is an undervalued resource and all Victorians have a shared responsibility for its protection.
- Protection of groundwater (and aquifers) is fundamental to the protection of connected surface waters.
- Groundwater (and aquifers) should be protected to the greatest extent practicable from serious or irreversible damage arising from human activity.
- Intergovernmental agreement on the Environment (IGAE) principles are applicable (e.g. polluter pays, intergenerational equity and the precautionary principle).

The policy provides that groundwater is categorised into segments, with each segment having particular identified uses. The segments and their beneficial uses are summarised in Table 2, page 6.

Table 2 Protected beneficial uses and groundwater segments

Beneficial use	Segment (mg/L TDS)				
	A1	A2	B	C	D
	0–500	501–1,000	1,001–3,501	3,501–13,000	>13,000
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water					
Desirable	✓				
Acceptable		✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks and gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (e.g. swimming / bathing)	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

Note: TDS – Total Dissolved Solids (mg/L). Source EPA 1997

EPA Victoria may determine these beneficial uses do not apply to groundwater where:

- There is insufficient yield.
- The background level of a water quality indicator other than TDS precludes a beneficial use.
- The soil characteristics preclude a beneficial use.
- A Groundwater Quality Restricted Use Zone (GQRUZ) has been declared.

SEPP (*Groundwaters of Victoria*) requires that occupational health and safety, odour and amenity also be considered, due to the fact that vapours sourced from impacted groundwater may present a potential risk to workers, and that odours or discolouration may result in degradation of overall beneficial use.

4. Site inspection

4.1 Inspection details

A site inspection was undertaken on 17 February 2014. The objective of the site inspection was to gain an appreciation of the hydrological and hydrogeological settings. To achieve this, a GHD hydrologist and hydrogeologist undertook a site walkover, accompanied in part by the Property Manager.

A photographic record, showing key observations from the site inspection has been attached as Appendix B, page B-1.

The site is currently used for broad acre cropping, and livestock grazing (cattle) which was noted during the site inspection. The site visit occurred in February in summer and as such ground conditions were dry. Other than the existing unnamed waterway, no other natural features such as springs or defined natural channels were observed. For the most part the main drainage line is a broad floodplain, anywhere between 10 m to 100 m wide.

4.2 Hydrology

The site inspection confirmed the presence of a number of dams on the property, all containing water. Three on-line dams (sitting in the middle of the main drainage line) were identified at the following locations:

- 282,075 mE and 5,811,622 mN
- 282,887 mE, and 5,812,733 mN
- 281,823 mE and 5,813,416 mN

These dams are referred to as the Upper, Middle and Lower Dam. Refer to Figure 7, page 31 for locations.

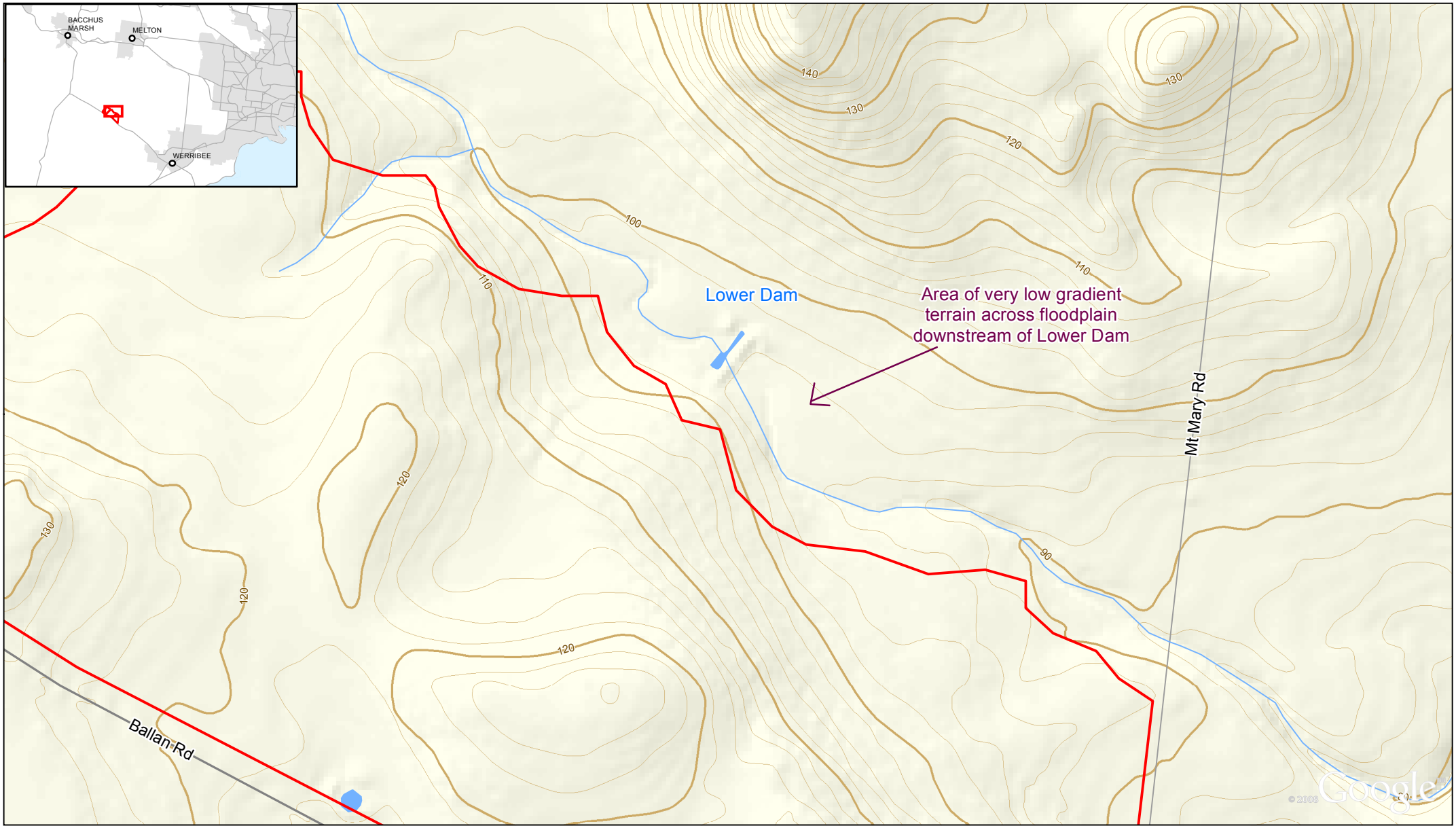
No other significant surface water features within the Project Area were noted. Discussions with the Property Manager confirmed the main drainage line was ephemeral, only flowing after large rainfall events.

Erosion around the perimeter of all three dams from stock access was observed.

The drainage line downstream of the upper dam showed signs of erosion in the form of bank slump (Photo 5, Appendix B, page B-4). Finer soils had been washed away leaving gravel in the base of the channel, indicating the velocity of the flow spilling over the overflow weir is significant enough to incise the channel. Approximately 50 m downstream of this erosion the channel disappears leaving a broad floodplain (Photo 6, Appendix B, page B-4).

The flow path downstream of the middle dam remains defined, but the main flow path out of the lower dam was difficult to determine. The lower dam is shown in Figure 2, page 9 and the flow path becomes an undefined channel in the broad floodplain. Visual evidence of the overflow of the lower dam was noted by livestock trampling in moist soil (photo 9, Appendix B, page B-6). Downstream of this trampled area in a south easterly direction, the topography of the floodplain is relatively flat compared to upstream and downstream. During the site visit it was observed that this section of very low gradient floodplain appeared to be a disconnect between the observed trampled “depression” immediately south east of the dam to the next defined length of the unnamed waterway, approximately 250 m downstream.

The area of low gradient across the floodplain downstream of the lower dam is indicated in Figure 2, page 9.



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Project Area
Water Area
Stream
Arterial
Collector
Contour 2 m
Contour 10 m

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Topography of Waterway Downstream of Lower Dam

Figure 2

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180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE Vicmap (Jan 2014), Google Eath Pro (Image captured 13/02/2013) Created by:jlloyd

Downstream (east) of Mount Mary Road the waterway becomes incised until the confluence with the Werribee River (photos 2 and 10, Appendix B, page B-2 and page B-6). The elevated Mount Mary Road roadway and culvert act as a control point for this incision.

The south east corner of the Project Area drains to the unnamed waterway downstream of Mount Mary Road. Ballan Road is a barrier which directed water to the south east corner of the site, and flows would then be carried north along Mount Mary Road and then flow to the unnamed waterway to the east of Mount Mary Road.

Further downstream still, Werribee River at Cobbledick Ford is a complex and highly incised waterway with abundant native and non-native riparian and aquatic vegetation (refer Photo 13, Appendix B, page B-8). A water depth of approximately 0.2 m was observed overtopping the Cobbledick ford crossing during the site visit.

4.3 Hydrogeology

The site walkover confirmed the Newer Volcanic geology. Basalt floaters were noted at the surface in a number of paddocks, particularly in areas where (historical) cropping had not obviously occurred. The higher topographic points, where evidence of cropping was absent were littered with basalt rocks and pyroclastic material, which is somewhat atypical of the basalts of the Western Plains.

Inspection of the slopes of the topographic high points was undertaken for spring activity. Signs of spring activity typically include:

- Water logged ground
- Thriving vegetation/evidence of verdant areas
- Visible water and spring flow
- Scouring

None of the above lines of evidence were noted during the site inspection.

The unnamed drainage line noted in the above hydrologic discussion was inspected east of the Project Area beyond Mount Mary Road. It was noted that east of the boundary, the drainage channel became slightly more incised. In some areas, this was in part due to it being aligned with the edge of a volcanic flow (refer photograph 10 in Appendix B, page B-6). The edge of the flow was located near 284,577 mE and 5,811,820 mN (zone 55).

A windmill (Appendix B, page B-7, photograph 11) was identified off the Mount Mary Road, on the eastern slopes of Green Hill. The windmill had no mill and based on vegetation growth, it had not been in operation for some time. Coordinates of the windmill were collected with a hand held Global Positioning System (GPS) and have been summarised in Table 3, page 10. The bore is also shown in Figure 6, page 20.

Table 3 Windmill location

Bore ID	Easting	Northing
Not Known	284,493	5,812,807