

Appendix Three – Servicing Report



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AUSTRALAND HOLDINGS LIMITED

EAST BALDIVIS HOLDINGS, BALDIVIS RD, BALDIVIS

ENGINEERING SERVICES REPORT

1. General

Australand Holdings is planning to develop the above properties, which are owned by associated companies. The development will produce some 913 residential lots ranging from 150 square metres to 663 square metres in area. The average lot size is around 375 square metres.

This report covers proposals for earthworks, retaining walls, roads, drainage, groundwater, water supply, power supply, gas, telecommunications and sewerage as required for current urban development standards for some 913 lots - as shown on the Development Planning Strategies plan.

2. Executive Summary

The land the subject of this report is located some 1.5km North of Safety Bay Road on the Eastern side of Baldivis Road, opposite Ingram Road, and extends from Baldivis Road on the western boundary to the Kwinana Freeway on the eastern boundary. The land has scattered residual mature trees after part being used as grazing and farming land for many years. The basic land form is low lying land with some low hillocks of free draining Bassendean Sands underlain in parts by Guildford Formation silts on the western low area, and in the south east corner by some clayey material.

The Environmental Geology map of the Geological Survey of Western Australia classifies this site as generally deep Bassendean Sands and being suitable for urbanization. Preliminary geotechnical investigations have revealed that some remedial works and filling will be required for the silty/ clayey areas to make them suitable for urbanization.

The land can be connected to all services, either by extension from neighboring subdivision developments abutting the site on its western boundary, or by extension along Baldivis Road.

The Water Corporation has given advice that the land can be serviced with water supply from their Baldivis system with some upgrading of water mains, and that some 200 lots can be connected to the existing sewer pump station located on the north west corner of the site on Baldivis Road, pending final approval to the link into the East Rockingham Waste Water Treatment Plant (ERWWTP), which is due for completion in 2015.

All stormwater discharging from the development will be conveyed to an outfall under the Kwinana Freeway. There is an unregistered Water Corporation Main Drain running

through the land from north to south which currently connects to this culvert. Runoff from minor rain events will be retained on site by soakage in swales in line with current best practice as outlined in the “Liveable Neighbourhoods” policy. The average AAMGL is at RL 3.7m AHD along the drainage line, rising to RL 4.2 m AHD in the centre of the site, thence falling to RL 4.0 m AHD at the eastern boundary. The 1 in 100 year flood level of the Peel Main Drain and the Serpentine River affecting this land is at RL 5.6m AHD. Fill to lots will be placed to 500mm above this level in accordance with the flood level fill guidelines.

Access to the site is by way of future roadways off Baldivis Road, plus future connecting roads to the developments abutting the land on the north and the south.

3. Site

The land is situated on the east side of Baldivis Road, opposite Ingram Road, between Baldivis Road and the Kwinana Freeway, some 1.5 km north of Safety Bay Road in the Baldivis District of the City of Rockingham. The land occupies an area of approximately 60 ha.

The land is generally low lying with a slight central sand ridge at RL 7m AHD running roughly north – south through the centre of the site. The low area between this ridge and Baldivis Road is a swale at RL 4m AHD containing the silty soils, and the Water Corporation’s unregistered Main Drain. Baldivis Road is at approximately RL 6.5m AHD and the Kwinana Freeway is constructed at approximately RL 6m AHD.

The geology of the land is described by the Environmental Geology Map of the Geological Survey of WA, as being the most part “S8, Bassendean Sands”, with M4 silt in the western low area. This Bassendean Sand soil type is described as suitable for urbanization. The M4 area is subject to problems with flooding and is cohesive.

The site has previously been used for general farming and grazing, and is parkland cleared, with houses and sheds located in the centre. Each site is connected to telephone and power.

Baldivis Road, abutting the land along the western boundary is constructed as good standard rural road with bitumen seal without any formal drainage.

4. Development Proposal

It is proposed to develop the land as a 913 lot residential subdivision, with all normal services, with links to abutting developments (existing and proposed) for sewer, water, power, roads, gas and phone services, with all drainage to be treated on site prior to outflow, using best management practices. Two road connections are planned to Baldivis Road.

The development will entail substantial earthworks to provide level, free draining building blocks, filled to 500mm above the 1 in 100 year flood level, ie to a minimum of RL 6.1mAHD for lots.

Drainage will be effected by a combination of site soakage and detention of road stormwater into compensating basins, with the swale compensating basins accommodating the larger event storms, and overflowing into the unregistered Main

Drain, eventually discharging off site at pre-development flow rates to the culvert under the Kwinana Freeway.

The existing Baldivis Road will be upgraded to a boulevard standard to match existing upgraded portions as required by the City of Rockingham, with a roundabout planned for the main entry opposite Ingram Road.

5. Earthworks & Retaining Walls

Each lot will be finished level as required for clearance to the 1 in 100 year flood level. This level exceeds the normal requirement of 1.2m above the AAMGL, which in this case ranges between RL3.7m AHD to RL4.2 m AHD in the centre of the site, and falling to RL 4.0m AHD along the eastern boundary, which would require a minimum fill level ranging between RL4.9 and RL5.4m AHD. In comparison, the estimated minimum fill level for the 1 in 100 year flood for the afflux for the Peel Main Drain/ Serpentine River is RL 6.1mAHD, which governs the final development level requirements.

Minimum retaining walls will be required due to the level nature of the filled land at the development stage. Any walls will be subject to Council building approval. There is an earthworks embargo for all Classification 4 (To DEC Dust Control Guidelines) development sites during the months of November and March, hence unless significant dust control measures to reduce the site classification to facilitate earthworks over this period.

Earthworks on site will entail removal of all unsuitable soils to clean base and importing of fill with clean free drainage sand to meet the designated levels.

The existing drainage channel across the site will be piped and rerouted along roadways, very close to its current location.

It is proposed to negotiate with neighboring land owners to allow boundary fill to spill onto such land so that coordination of filled lot and road levels can be made. Roads and lot levels at boundaries will be set to suit the flood determined levels.

6. Roads

All roads will be constructed to City of Rockingham standards. The main north – south road will connect to future development north and south allowing access to the recreation area planned for the North-West corner of the site adjacent to Baldivis Road.

It is envisaged that as part of the development, Baldivis Road will be upgraded to urban standard; being the current boulevard style which will include; including reconstruction as required, plus kerbing, sheeting, drainage and underground services as required for the development.

A roundabout is proposed for the main entry intersection with Ingram road.

7. Drainage

This site being east of Baldivis Road, is contained within the policy area called the “Mundijong Drainage District” which is a rural drainage strategy controlled by the Water Corporation. Now that the land is proposing to be developed as urban, the area will revert to the control of the City of Rockingham.

The site is still located within the catchment of the Water Corporation controlled Peel Main Drain and the Corporation has provided advice on the maximum flow rates that can be discharged from the site. The Corporation has advised in their letter of 18 September 2007 that the maximum outflows should be 3l/s/ha and 4.5l/s/ha for the 10 year and 100 year flows respectively.

The unregistered Main Drain (Trunk drain) will be rerouted close to its current alignment but beneath roadways as proposed under the current plan. The piped drain will be used to convey upstream existing flows, plus outflows from basins within the development. It will also be laid as a subsoil drain to control the maximum groundwater level to current plotted AAMGL's in a similar fashion to the existing drain. No untreated surface water will be connected to the trunk drain.

Given the 1 in 100 year flood fill requirement for the Peel main Drain of RL6.1mAHD, the vast majority of the site will require at least 1.5m to 2 metres of fill above the natural surface levels and AAMGL. This means that soakwells will operate effectively, meaning that in most cases, lot drainage will be disposed on individual allotments. The proposed development also includes significant areas of lots smaller than 300 square metres. For these very small lots, the proportion of paved area is significantly greater than for lots greater than 300 square metres and the opportunities to provide site soakage is limited due to space and footing setback requirements. As a result soakage plus overflow drainage connections are proposed for the lots smaller than 300 square metres.

The site has been divided into a series of catchments as outlined in attached Drawing PRO221- SK-07. This sets out the drainage catchments as determined by the preliminary road design, and shows diagrammatically the swale locations. Treatment is proposed to consist of a bio retention area to treat the 1 in 1 year 1 hour storm and a sill area to accommodate the larger recurrence interval storms. The base of the bio retention area is proposed to be set approximately 300mm above the controlled groundwater levels (CGL's) to reduce risks of long term standing water over the winter periods. The sill area is proposed to be set a minimum of 0.5m above CGL to ensure that these areas are useable as public open space apart from during storm events.

Outlets to basins will be controlled to limit outflows to predevelopment flow rates with the outflow rates increasing resulting from increasing height of water in the drainage basin.

The basins have been designed to hold the 1 in 100 year storm with the allowable outflow rates as provided by the Water Corporation. In terms of the inter-relationships between the afflux of the Serpentine River and the development flows, it is noted that for the critical storms for surface water flowing from the development to the River, the times are relatively short, with the critical storm durations between 24 and 36 hours. The critical storm duration for this portion of the Peel Main Drain is around the 72 hour storm, meaning that outflow will occur prior to the rise in the level of the Serpentine River, and therefore the storage level of the internal basins will reduce for the critical storm for the Peel Main Drain. Outflow will continue after the level of the Serpentine River has dropped below the outfall pipe. To ensure that back flooding from the Main Drain does not unduly affect the development, it is proposed that the outlet from the development be fitted with a non-return "flap valve" where the development connects to the existing drainage channels.

A separate Local Water Management Strategy (LWMS) has been carried out to further detail the size and volumes of the detention areas. Ground water monitoring bores have been established on site, with readings undertaken since September 2009.

The proposed drainage system for the subdivision will also include accommodating drainage flows from Baldivis Road, with swales proposed along Baldivis Road.

An UWMP will be completed as part of the detailed engineering design once the subdivision plan has been approved.

8. Groundwater

The groundwater level at the site has been measured by RPS Consultants from September 2009.

Groundwater levels are controlled by the existing drainage line through the site and the existing freeway drainage and the groundwater levels appear to be a result of the surface water “perching” on the sand/clay interface and grading to the outfall drains along this interface. The resulting site AAMGL is therefore at RL 3.7m AHD along the “Main Drain” corridor, peaking to a high point of around RL 4.2m AHD in the eastern half of the land then dropping as the impact of the Freeway drain occurs to RL4.0m AHD at the Freeway boundary.

The invert of the existing drain through the development grades from RL3.7mAHD at the northern boundary of the land to RL2.8mAHD on the southern boundary. The invert of the existing 1050 diameter culvert under the Freeway is RL2.40mAHD.

9. Power

It appears that sufficient power supply exists in the area to supply the development

- A high and low voltage aerial line is located in Baldivis Road north and south of the site. This line is located on the east verge of Baldivis Road.
- Similarly a high and low voltage aerial line exists on the north verge of Ingram Road.
- Some aerial service power lines run across the site servicing the existing homes.

All aerial lines along Baldivis Road and across the site will be relocated underground in line with current WAPC approval policy at the cost of the developer. The existing aerial service lines inside the lots will be removed as part of the development. Maintenance of power to occupied homes will be a priority during subdivision construction.

All internal power reticulation lines and transformer installations will be constructed at the cost of the developer. Transformer sites will be determined at the detailed subdivision design stage.

10. Water Supply

At present there is no reticulated water supply to the site, although a 300mm main is located opposite the south west corner of the site in Baldivis Road, and a 900mm trunk main is located in Eighty Road and Baldivis Road north of the site. The developer will be required to extend the 300mm main across the Baldivis Road frontage of the site as a

pre-funded item as part of the servicing strategy. This main will eventually connect to a 250mm main at the junction of Baldvis Rd and Fifty Road.

This 250mm reticulation main has recently been constructed along Eighty Road and north along Baldvis Road by developers north of Fifty Road.

The Water Corporation has advised that upgrading of the supply may be required in the future via a pre-funded 500mm trunk main from the Tamworth Reservoir along Eighty Rd to Fifty Rd to Baldvis Road.

11. Sewer

The site is not connected to sewer, but according to Water Corporation preliminary planning, it is contained within two sewer catchments each requiring permanent pumping stations, according to Water Corporation planning. We are of the opinion that, because of the filling requirements, all the subject land can be connected to the one existing pump station, which is known as Baldvis North Pump Station “E”, located adjacent to Baldvis Road immediately north of the northern boundary of the subject land on Baldvis Road. The change in sewer catchment planning will require future discussions with the Corporation.

The permanent Water Corporation Baldvis North sewer pump station “E” station has been constructed on a site adjacent to the north east corner of the site on Baldvis Road, which has a restricted temporary discharge to the Corporation’s Kwinana WWPS No 6 (Bertram Road), some 8 km north of the site, which in turn discharges to the Kwinana WWTP. This station currently serves only existing Urban Zoned land. The permanent discharge for this pump station is to the East Rockingham Waste Water Treatment Plant (ERWWTP).

The Water Corporation has advised that, although there is no accommodation for sewer flows from this proposed development until the East Rockingham Waste Water Treatment Plant (ERWWTP) is operational in 2015, some 200 lots of this development can be accommodated into the existing sewer Pump Station “E”, as the lots are within the permanent sewer catchment for the station. Further development extra to the 200 lots will be conditional on the Corporation receiving clearance for the service “link in” to the ERWWTP. The Corporation expects to receive this approval in the next few months.

Site gravity sewers will be deep due to the level nature of the land in a north – south direction. The sewer connecting to the southern boundary is to accept future discharge from a future pump station, and will be sized appropriately.

Land to the north of the site will connect to a sewer extended within the development to a point in the main north – south road at the northern boundary of the site.

12. Telephone & NBN

Telstra and Opticomm Broadband services exist in the area along the west verge of Baldvis Road, and could be easily extended to service this proposed development. Some upgrading may be required.

The development size will enable NBN to service the development. Under new requirements, the developer is required to install “pipe and pit” for future NBN cable installation, and these will be designed and installed with the development construction.

13. Gas

There is a 160mm high pressure gas main located on the west verge of Baldivis Road across the frontage of the site.

The adjacent “Baldivis Central” and “Spires” development sites are fully connected to the ATCO gas reticulation system and this can be extended through the site.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

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