IN THE MATTER Submission on SmartGrowth Strategy 2023-2073

STATEMENT OF EVIDENCE OF PETER MOODIE ON BEHALF OF BELL ROAD LIMITED PARTNERSHIP

Dated 23 NOVEMBER 2023

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1. QUALIFICATIONS AND EXPERIENCE

1.1 My full name is Peter Donald Moodie.

1.2 I am a Civil Engineer specialising in Land Development and Stormwater Management employed by and a director of Lysaght Consultants Ltd.

1.3 My qualifications are BE (Natural Resources - Hons) from the University of Canterbury (2003). I am a Charted Professional Engineer and Member of Engineering NZ (1017741).

1.4 I have worked in New Zealand (13-years) and Australia (7-years) over the past 20 years within various engineering consultancies, providing design and construction supervision for residential, commercial and industrial developments. I have specialised in the assessment, design and construction of stormwater management solutions.

1.5 My local experience includes leading the consenting, design and construction monitoring of several large developments in the Bay of Plenty and Waikato, including Zariba's Terrace Views, Bluehaven's Wairakei residential area, Classic Development's Kaimai Views, WBOPDC Omokoroa Stormwater Mitigation Large Earth Dam (Pond 21-1), Hamilton Joint Venture's Te Rapa industrial Development (120 ha) and AMPs Bayfair Expansion. I have also worked on large plan change applications including representing the Urban Task Force as an expert witness for TCC's Plan Change 27 – Flooding from Intense Rainfall.

1.6 I have previously worked for GHD Ltd (New Zealand) and Ardill Payne & Partners (Australia).

1.7 My evidence provides a preliminary overview of the earthworks and civil servicing requirements for The Bell Road Limited Partnership (The Partnership) 129 ha land holdings on the south side the Tauranga Eastern Link (TEL), referred to as the Wairakei South Urban Growth Area in this submission (the Site).

1.8 Whilst my investigation has focussed on the Site, I have also given consideration to the inclusion of the adjacent 217 ha Hurst property, which David Hurst has confirmed can be added to the Wairakei South Urban Growth Area to create a total development area of circa 337 ha. This additional area is referred to as the "Hurst Property" in this submission.

2. SCOPE OF MY EVIDENCE

2.1 My evidence addresses the following:

a) Background Summary
b) Flood Modelling
c) Earthworks
d) Stormwater
e) Wastewater
f) Water Supply
g) Conclusion

3. BACKGROUND

3.1 The Site is relatively flat with most of the landform ranging from RL 1.0 to RL 2.0m Moturiki Datum (MD), sloping at its northern boundaries up to the TEL. The Hurst property is similarly low-lying, with ground levels ranging between RL 1.0 to RL 2.0m MD.

3.2 The sites are bordered by flood stop banks located along the Kaituna River and Kopuaroa Canal, with a top of bank of approximately RL 4 m MD.

3.3 The sites are currently utilised for grazing with limited dwellings, farm improvements and infrastructure.

3.4 Bell Road and the Bell Road Drain separate the two properties. The drain is directed under the TEL and levels are controlled by the Bell Road Pump Station operated by Bay of Plenty Regional Council (BOPRC). Both sites are drained by a number of smaller farm drains which enter either the Bell Road Drain or in the case of the Hurst site, into a larger unnamed drain and then pumped by BOPRC into the Kaituna River on the south side of the TEL.

3.5 Both sites are currently accessed off Bell Road, however The Site is bounded to the north by the TEL and is directly connected to the future Papamoa Eastern Interchange (PEI)

3.6 The Site is also accessed by a large stock underpass connecting under the TEL to Bluehaven's Wairakei Residential area to the north.

3.7 The sites are shown on Figure 1

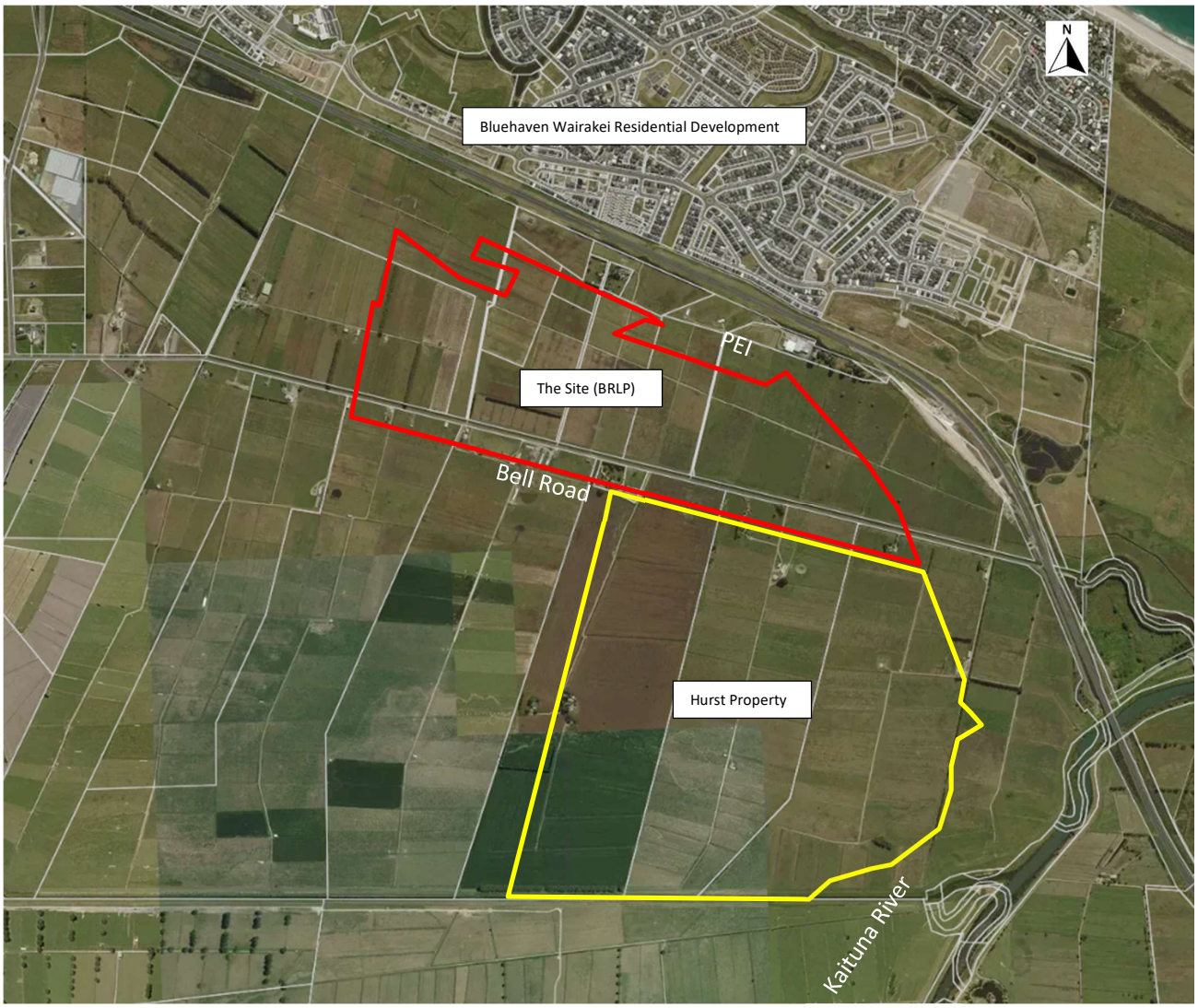

Figure 1: Site Locations, Sourced from GRIPS 15-11-2023

4. FLOOD MODELLING

4.1 The Partnership commissioned DHI Ltd to obtain from BOPRC the flood model utilised in the Bell Road Hydraulic Modelling Update (June 2022), and upgrade this to improve simulation time, identify stability issues and review model setup (mesh and coupling), and to allow a series of base case and development scenarios to be modelled.

4.2 Whilst modelling is ongoing, DHI have provided results for the existing/pre-development scenario (Base Case), and a Post Development without Mitigation option which assumed raising of The Site above flood levels. The key modelling outcomes being the provision of a predevelopment 1% Annual Exceedance Probability (AEP) flood level (often referred to as the 100-yr event) and, quantifying the displacement effects caused by infilling of the flood plain.

4.3 The Kaituna River levels have been integrated into the model as well as the effects of the Bell Rd and Wairakei pumpstations.

4.4 The model utilised BOPRC's 1% AEP, 24-hour nested storm with climate change adjustment to the year 2130 (3.68 C°) for pre and post development analysis.

4.5 Modelling confirmed flood levels range from RL 2.53 m to RL 2.84m MD for The Site, and RL RL 2.50 m MD for Hurst Property.

4.6 Flood displacement caused by infilling of The Site is approximately 150mm increase to the south of the site, and 20mm – 100mm increase to the west of The Site as shown in Figure 2. Note that flood displacement shown on The Subject site itself shall be ignored as it merely indicates surface flow on the raised landform is more elevated than the pre-development scenario, as would be expected.

4.7 The evidence of Ben O'Loughlin identifies a current tsunami modelling level of RL 2.00 m to RL 4.00 m MD for the sites (from east to west).

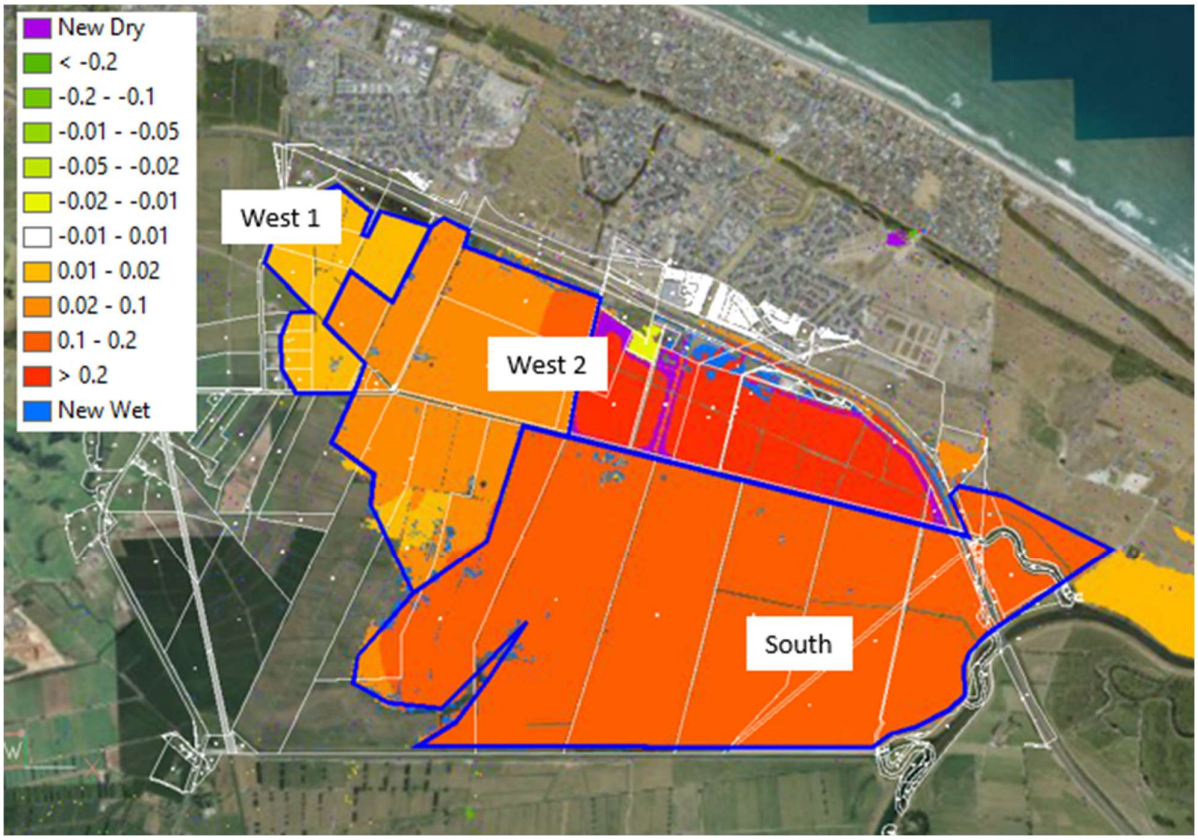

Figure 2: Post Development Flood Displacement Due to Infilling of The Site, Sourced DHI Results 16/10/23

5. EARTHWORKS

5.1 I prepared a preliminary earthworks assessment for The Site utilising LIDAR ground levels and building a 3D terrain model in the 12D software package. Proposed levels were increased sufficiently to ensure the following parameters were maintained;

- Flood freeboard of 0.5m minimum per BOPRC/TCC/WBOPDC guidelines
- Landform surface grades of 0.5% minimum
- Average preload settlement allowance of 1.5m per EnGeo recommendations
- Average earthquake and creep settlement allowance of 0.3m per EnGeo recommendations
- Stormwater detention storage of 120,000 m^3 and displacement mitigation storage of 1,000,000 m^3 allowance as discussed in Section 6.

5.2 The results confirmed the site will require a minimum ground level of RL 3.95 m MD at the edges of SMAs, generally grading up to RL 5.20m MD to maintain 0.5% surface flow (Secondary flows). There are small areas of the site that will be higher, particularly where tying into existing levels that are higher than RL 5.2m MD. These levels do not however allow for earthquake settlement allowance of 0.3m, hence actual levels constructed on the Site could increase to a range of RL 4.25m MD to RL 5.50m MD.

5.3 Earthworks volumes analysis for the Site using the 12D software to compare pre and post development ground levels indicates approximately 3,000,000 m^3 of fill material will be required to meet minimum design levels. This would be increased by a further 1,800,000 m^3 to achieve preload settlement and earthquake settlement levels, amounting to a total insitu fill volume of 4,800,000 m^3.

5.4 The analysis indicates that 40% of the Site would be occupied by a stormwater management areas (SMAs) to create sufficient storage to offset displacement, provide detention mitigation and provision of stormwater treatment (wetlands). Further details are provided in Section 6.

5.5 For the purposes of preparing a master plan, it was assumed that the Hurst Property will require a SMA occupying 50% of the land area as it is likely to displace a greater volume of flood water due to it being lower lying.

5.6 Master planning analysis indicates a total developable area (excluding SMAs) for both sites of 153 ha (43% of total area).

5.7 As noted in Ben O'Loughlin's evidence, ground strength conditions are likely to deteriorate as one progresses south, requiring greater levels of preload and placement of structural fill. As such, the master plan has been developed to maximise development on the more elevated and better ground conditions on the Site, and locating the SMAs on the lower lying, poorer ground areas, particularly on the Hurst Property. This results in a SMA of 27 ha (21%) on The Site, and a second SMA of 130 ha (61%) on the Hurst Property.

5.8 Boffa Miskell's preliminary master plan is provided in Figure 3.

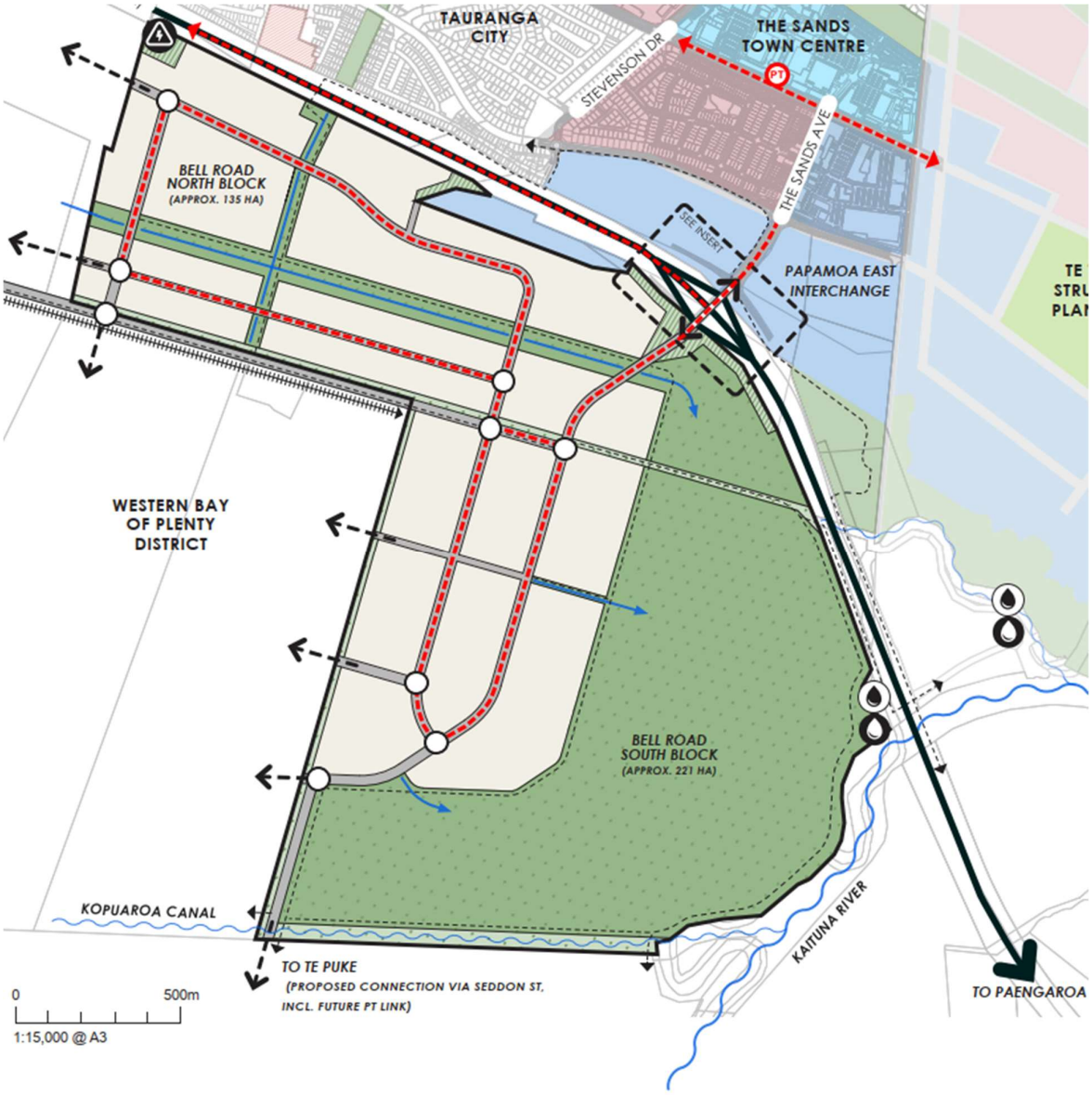

Figure 3: Preliminary Master Plan, Source: Boffa Miskel

6. STORMWATER

6.1 The BOPRC Stormwater Management Guidelines for the Bay of Plenty Region recommend a wetland treatment area of 2% of the contributing catchment. The total developable land for both sites based on the assumptions and calculations presented in Section 5 is 153 ha, equating to a wetland area of 3.1 ha. This is significantly smaller than the proposed SMA total of 157 ha, and could easily be located within these areas. Wetlands would likely be excavated below existing ground levels to utilise the shallow groundwater to provide permanent water levels.

6.2 Measurement of flood displacement areas and depths discussed in Section 4 indicate infilling of the Site will displace approximately 1,000,000 m^3 of existing flood storage.

6.3 It is proposed to construct impounded SMAs (stop banks) that allow culverted gravity inflow but not outflow from the Bell Rd drain/flood plain (e.g. flood flap control). A series of pumps in the would also pump water over the top of the stop banks, raising the water in the SMAs above that occurring in the drain and flood plain. Backflow prevention would stop the water flowing back into the flood plain, allowing additional storage above the flood plain level. A total displacement storage depth of 2m has been adopted in the preliminary calculations, which is between 0.16 m and 0.47 m higher than the existing flood plain level. Further analysis of land acquisition vs imported fill cost will allow the optimum SMA depth vs SMA area to be determined.

6.4 The DRAINS hydraulic software package was utilised to model pre and post development runoff model for The Site assuming 100% pervious predevelopment conditions, and 90% impervious post development conditions. Detention storage was increased in the model until the post development 1% AEP matched the predevelopment 1% AEP discharge rate using TCC's 1% AEP - 2130 - 24-hr nested storm pattern. The model indicates a detention storage rate of approximately 2650 m^3/ha of developable land is required to meet 1% AEP predevelopment rates. A depth of 0.45m was added to the SMA areas to account for detention storage requirements.

6.5 A diagram of the proposed SMA operation including wetland treatment, displacement mitigation and onsite detention is presented in Figure 4

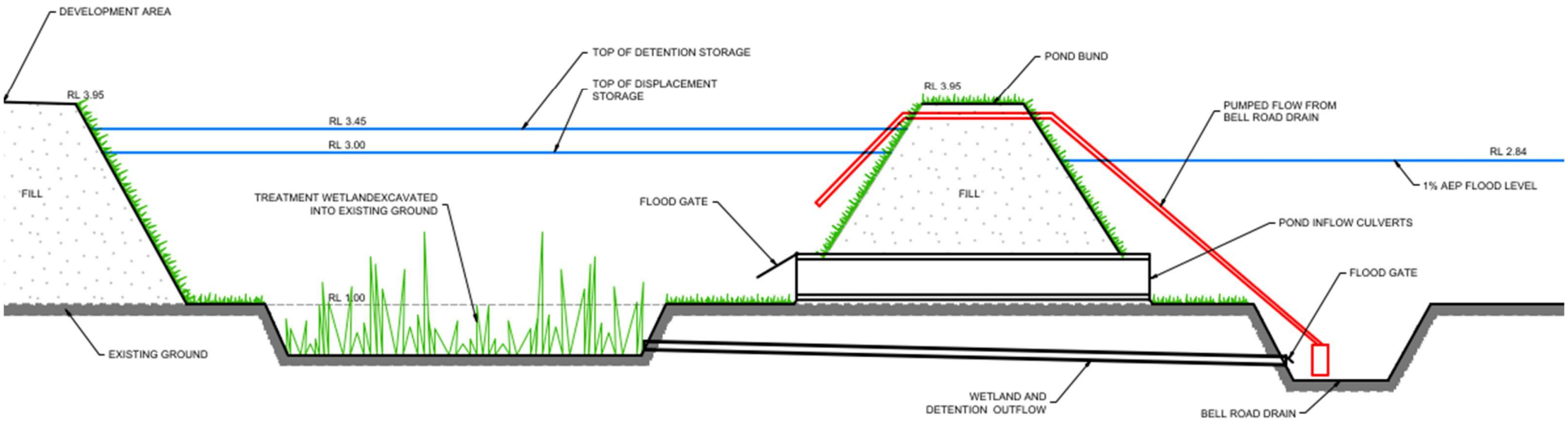

Figure 4: Typical Stormwater Management Area (SMA) Cross Section

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7. WASTEWATER

7.1 The sites are currently not connected to public wastewater reticulation. Potential solutions, subject to further investigation, include:

- Connection via the existing underpass through to TCC's Wairakei network.
- Connection to the Te Puke Wastewater Treatment Plant
- Provision of an onsite treatment and disposal/discharge solution

8. WATER SUPPLY

8.1 Potable water supply could be provided from either a direct connection to the Waiari Water Supply Scheme 600ø PE pipeline immediately to the south of the site sites, or an upgrade main in Bell Road.

9. CONCLUSION

9.1 On the basis of my preliminary assessment, potential solutions exist for urban development of the sites in terms of earthworks, flooding, stormwater, wastewater and water servicing.

9.2 I have reviewed the SmartGrowth Industrial Land Study reports, and in my opinion, many of the issues raised in the short-listing process have potential solutions, and the sites should therefore not be excluded from further investigation or short-listing.