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# Memorandum

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| To | **David Schwartfeger (Kiwi Properties)** | From | **Jeanette Tucker** |
| Copy | **Emma McDonald (Pragmatix)** | Reference | **510611-000-MEM-CC-0003 rev5** |
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| Subject | **Kiwi Property Drury Centre Precinct Project: Stormwater Management/Design Responses** | | |

## 1 Introduction

This memorandum has been prepared in response to the stormwater comments from Auckland Council and Auckland Transport provided to the Panel in relation to the Drury Centre Precinct Project (the "Project") submitted by Kiwi Property Holdings No.2 Limited. Following review of the comments received from Auckland Council (AC) and Auckland Transport (AT), there are several key themes and issues shared by both parties in respect of the proposed stormwater design for the Project. Accordingly, this memorandum addresses comments on the stormwater topic for this Project from both AC and AT based on the key issues/themes identified below.

These issues have been collated and categorised below to allow a concise response. Refer to the following sections for commentary on these points.

### 1.1 Non-compliance with AC Network Discharge Consent (NDC) and the proposed Drury Central Stormwater Management Plan (SMP)

The proposed stormwater management devices for the Project have been designed in accordance with GD01, as stated within Section 5.3 of the Drury Central Stage 1 Resource Consent Report and demonstrated in the appended calculations in the report Appendix B. As such, the consent design is deemed to provide stormwater infrastructure in accordance with the NDC.

The design is also in general accordance with the proposed Stormwater management Plan (SMP) for Drury East prepared by Tonkin and Taylor in relation to PC 48 and 49 which are directly related to this Project as explained in the planning responses by B&A. However, we understand that there is an unresolved issue regarding the level of water quality treatment of impervious areas within superlots that is preventing the proposed SMP from being adopted by Healthy Waters. Whichever way this matter is resolved, it is unlikely to change the proposed stormwater design for this Project as the proposed SW management solution will be contained within the superlots as the responsibility of the private property owner. Development on the superlots will required a separate resource consent in the future and stormwater quality requirements can be assessed at that future stage, along with SMAF 1 hydrological mitigation.

### 1.2 Retention and infiltration

It has been highlighted through on-site physical infiltration testing that infiltration of stormwater to ground is unlikely to achieve the required minimum rate of 2 mm/hr as expected in GD01. Pockets of favourable ground conditions may be uncovered on site during detailed design and construction, however at this stage based on the physical testing undertaken to date it is considered that infiltration will not be feasible across the site.

We confirm that it is proposed that the retention volume is incorporated into the detention volume. However, it is noted that private lots could provide retention through reuse.

Review of preliminary sizing calculations for communal and distributed bioretention devices confirms that the detention volumes provided are enough to incorporate both the minimum retention and detention volumes. Further refinement of device sizing will be carried out at detailed design.

## 1.3 Location of stormwater trunk mains and manhole lids

Concerns have been raised with the proposed stormwater network location being below the carriageway which would result in manhole lids in the pavement surface / trafficable areas. A key theme from the comments received has been a strong preference for less infrastructure within the road corridor to minimise maintenance and durability liability for asset owners.

In the areas where the stormwater mains have been located below the carriageway, this has been for the purposes of efficiency and minimisation of infrastructure. Locating stormwater mains within the carriageway achieves the following benefits:

- Reduces road crossings from catchpits and clashes with roadside raingardens
- Reduces road crossings from private lot laterals (where applicable)
- Eliminates the potential for parallel networks on both sides of the carriageway
- Reduces manhole sizing with incoming pipes on opposite walls

Most of the stormwater manholes are located outside of the carriageway including Creek Road where it is anticipated that there will be a larger number of traffic movements when this road connects to through the future stages to the north. The position of all manholes will be reviewed and optimised further at the detailed design stage.

Further optimising of the stormwater reticulation network will occur during the detailed design phase and necessary EPA process.

## 1.4 Site specific stormwater management plan and proposed consent conditions

The comments provided by Trent Sunich (4sight Consulting Ltd for AC) suggest a requirement to provide a site-specific stormwater management plan (SMP) (proposed condition 14A). This is not supported by Kiwi. A comprehensive SMP has already been prepared by Tonkin and Taylor for Drury East which covers the PC 48 and 49 area, the project area too as a result. It is considered that this SMP for Drury East (which includes this site location) is sufficiently detailed alongside the proposed precinct provisions as part PC 48 to manage stormwater effects arising from the Project. A site-specific stormwater management plan will largely be repetition of the approach outlined in the Drury Central Stormwater Management Plan and is considered unnecessary duplicative. Site specific details and commentary can be sufficiently provided within the design reporting that is carried out to support the Project and further documented within the deliverables at the detailed design stage.

Trent Sunich (4sight Consulting Ltd for AC) has also proposed some consent conditions to address the stormwater management requirements and responsibilities of title holders. From our perspective, the key issue with the recommended conditions is the allowance for treatment and detention of runoff from the proposed super lots and the potential of treating or detaining within downstream communal bioretention devices. The main issue with the recommended conditions is it will not be practical for the anticipated future development in these super lots (most likely to be residential) to provide individual

detention/retention due to space constraints. It is anticipated that accessways for any terraced housing that might be developed would limit the ability to provide roadside devices greater than 20m$^2$.

The proposed conditions for the project already propose condition requiring hydrological mitigation in accordance with SMAF 1 and consistent with the SMP. It should be noted that full water quality treatment of impervious surfaces to GD01 standards for single private lots is not proposed as part of the SMP. Applying a risk-based approach to water quality treatment, it is considered that significant levels of contaminants are not expected from private superlots. However, to allow capture of coarse sediments and spills, a catchpit with a grate, sump and submerged outlet should be used to drain impervious surfaces.

Once the decision for PC 48 is released and the associated precinct provisions which pertain to stormwater management are confirmed, together with provisional approval of the Drury East SMP, it is considered that the approach to stormwater management will be confirmed in this framework and any future development on the superlots will need to be in accordance with this.

## 1.5 Selection of Best Practical Option and layout of bioretention devices

Due consideration to the type and layout of stormwater management devices has been carried out in accordance with guidance documentation (GD01, GD04, AT TDM) and as set out and discussed within the proposed SMP. The proposed SMP delivers a toolbox for application by the developer to achieve the planned stormwater management outcomes. The device options summarised within the toolbox clarify the range of methods considered to date which can be used to achieve the performance standards, while maintaining the flexibility for design development. Various device options were considered during the development of the stormwater design for the Project - refer to Table 1 for the general assessment and Table 2 for the selection of the Best Practical Option (BPO) below.

It is noted that the general preference of GD01 for greenfield sites is for “stormwater to be managed as close to source as possible” as stated in section B1.8. It is clear in the proposed design that this preference has been applied with roadside raingardens used where possible and communal ‘end-of-pipe’ bioretention devices only used when this cannot be practically achieved – namely adjacent to super lots that will introduce clashes with accessways (for envisaged terraced housing). Whilst this introduces many relatively small devices (at least >20m$^2$) it is understood that this will provide the best water quality outcome and follows the overall philosophies of the integrated stormwater management approach promoted in Auckland Council guidance documentation and the Auckland Unitary Plan.

The sizing, location and details of bioretention devices are intended to be further optimised through the detailed design process and necessary EPA approval stage.

**Table 1: Assessment of stormwater management options**

| Option | Advantages | Disadvantages | Site specific considerations |
|---|---|---|---|
| **Soakage basin**<br>**Rapid Infiltration Chambers** | Provides enhanced aesthetic value and can be integrated into overall landscape design<br>Provides some temporary detention<br>Low capital costs | Requires machinery access for maintenance (mowing, pruning of vegetation, tiling and soil removal)<br>Requires maintenance removal of sediments and pre-treatment to prolong life of systems<br>Not suitable in areas where there is a low infiltration rate or /and high ground water table<br>Infiltration devices generally not suitable for volume control (detention) or managing flows from large storms | Not considered suitable to the site due to low permeability of the in-situ soils.<br>Additional devices would be required to provide water quality treatment and stormwater detention. |
| **Dry ponds (detention basins) and wet ponds** | Provides amenity and enhanced aesthetic value<br>Can be integrated into overall landscape design<br>Provides some temporary detention<br>Low capital costs | Requires high level of infiltration or/ and filter bed (dry pond)<br>Additional measures such as impermeable liners and subsoil drainage required for areas with high groundwater (dry pond)<br>Temporary and permanent standing water can be a potential Health and Safety risk<br>Does not provide retention or water quality benefits<br>Wet ponds have additional maintenance requirements | Dry ponds not considered suitable due to the low permeability of the in-situ soils.<br>Additional devices would also be required to provide the water quality treatment and stormwater retention for both wet and dry ponds.<br>Can be Health and Safety risk in urban environments. |
| **Swale** | Provides amenity and enhanced aesthetic value<br>Integrated into overall landscape design<br>Provides some temporary detention<br>Low capital and maintenance costs<br>Vegetated swale would potential alignment with mana whenua values | Requires subsoil drainage<br>Secondary treatment is still required<br>Provides no retention or detention | Suitable to provide stormwater conveyance.<br>Additional devices would be required to provide retention and detention.<br>Not suitable for suburban residential environments. Significantly increases road reserve. |

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| **Tree pits** | Provides amenity and enhanced aesthetic value<br>Can be integrated into overall landscape design<br>Can be integrated into smaller areas | Requires maintenance of filtration beds<br>Not feasible in areas with high ground water table or/and soils with low infiltration rates | Can only service small sized areas. Suitable therefore for restricted locations but not for larger scale treatment purposes.<br>Cannot provide detention / retention required for SMAF 1. |
| **Raingardens/ Bioretention** | Provides amenity and enhanced aesthetic value<br>Integrated into overall landscape design<br>High level of treatment<br>Potential alignment with mana whenua values<br>Provides retention and detention | Additional measures such as impermeable liners and subsoil drainage required for areas with high groundwater<br>Requires some maintenance of filter medium and subsoil drainage<br>Requires larger vegetated areas<br>High capital costs | Considered suitable to provide both retention and detention while providing additional amenity value.<br>Can be located to remove pollutants as close to source as possible.<br>Provides high level of treatment.<br>Achieves quality and quantity requirements in single device.<br>Suitable and efficient as attenuation is not required for the site. |
| **Constructed wetland** | Adds ecological value to site and biodiversity<br>High level of secondary treatment<br>Can provide some temporary detention with freeboard allowance<br>Moderate capital costs<br>Potential alignment with mana whenua values<br>Provides amenity and enhanced aesthetic value<br>Integrated into overall landscape design | Requires pre-treatment and doesn't allow for retention<br>Unable to be located within areas of steep topography<br>Potential Health and Safety hazard in urban environment with public access<br>Requires high level of continual maintenance (moderate to high maintenance costs)<br>Attenuation not required as part of the SMP<br>Affected by temperature fluctuations and ground water table, ie permanent water level can drop significantly when there is insufficient recharge | Not considered suitable due to steep topography in downstream edge of the development area, would be extremely challenging to construct and maintain<br>Requires long term maintenance<br>Health and Safety risk can be high in populated, urban environments<br>May require supplementary water supply if insufficient base flow due to low permeability soils or fluctuating water table<br>Does not provide at source treatment as preferred in GD01 and GD04.<br>Requires additional and larger pipe reticulation to drain site to communal location. |
| **Proprietary stormwater treatment devices** | Integrated easily into existing stormwater infrastructure<br>Easily maintained<br>Not dependant on infiltration through soil or filter medium<br>High level of primary treatment<br>Moderate capital costs | Requires sufficient driving head to operate<br>No additional aesthetic value added, or natural amenity/biodiversity benefits<br>No detention provided<br>Can be expensive to maintain | Suitable for use in areas where a land-based system is not feasible or practical<br>Does not provide the same amenity value as other options |

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| **Rainwater tanks** | Provides detention and ability to reuse stormwater for other uses<br>Can be integrated to collect runoff from roof catchment areas<br>Potential alignment with mana whenua values | Requires additional infrastructure for inground tanks and sufficient hydraulic grade for above ground tanks<br>No additional aesthetic value added, or natural amenity/biodiversity benefits<br>Requires frequent inspections<br>No water quality benefits<br>Reuse for potable demand requires treatment but suitable for non-potable use | Suitable for non-trafficable hardstand areas and buildings not requiring additional quality treatment<br>Building materials must be inert to eliminate the generation of contaminants<br>Suitable for private lots but not suitable for development wide catchment applications |
| **Pervious pavements** | Provides some amenity/landscape features<br>Potential alignment with mana whenua values<br>Low risk to Health and Safety | Prone to clogging and requires maintenance<br>If the pervious paving fails, the surface will be considered non-compliant | Suitable for hardscape associated with residential, park or other communal areas where runoff is not directly reticulated<br>Additional devices would be required to provide treatment as well as detention / storage<br>Not suitable for traffic areas of high acceleration, deceleration or turning |
| **Living roofs** | Provides some amenity and biodiversity<br>Potential alignment with mana whenua values<br>Provides some advantages to buildings (eg noise insulation and thermal properties)<br>Provides some retention and detention | Higher construction and maintenance costs with certain designs<br>Maintenance and monitoring of plants required | Suitable for roof areas for all buildings within the residential and centre zones<br>Requires consideration to structural support and maintenance access<br>May require supplementary irrigation during Auckland summers if insufficient rainfall to maintain plants |

**Table 2: Selection of BPO with respect to site requirements**

| Option | Required | | Not Required | Comment |
|---|---|---|---|---|
| | **Water Quality Treatment** | **SMAF 1 Detention / Retention** | **Attenuation (10% AEP, 1% AEP)** | |
| Soakage / Infiltration | Not feasible on this site due to ground conditions | | | |
| Dry / wet ponds | ✕ | ✓ | ✓ | Only partially provides requirements – would require additional devices |
| Swales | ✓ | ✕ | ✕ | Only partially provides requirements – would require additional devices |
| Tree pits | ✓ | ✕ | ✕ | Only partially provides requirements – would require additional devices |

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| Raingarden / Bioretention | ✓ | ✓ | ✕ | Meets requirements of the development and can be applied to larger public catchments |
| Wetlands | ✓ | ✓ | ✓ | Provides more than what is required for the development and goes against principles of at-source treatment |
| Proprietary Devices | ✓ | ✕ | ✕ | Only partially provides requirements – would require additional devices |
| Rainwater tanks | ✕ | ✓ | ✕ | Option for quantity management for private lot, clean runoff |
| Pervious Pavement | ✓ | ✓ | ✕ | Option for quality / quantity management for private lot runoff |
| Living Roofs | ✓ | ✓ | ✕ | Option for quality / quantity management for private lot runoff |

Raingardens/Bioretention has been selected as the BPO for public/super lot catchments of the site due to their ability to provide the necessary requirements for the site and their adaptability to be provided at-source and as communal devices where site constraints govern.

The detailed design process will ultimately determine the layout and distribution of bioretention devices with preference in the first instance to provide as close to source as possible in line with Auckland Council guidance.

Developers of superlots will be able to apply various options to achieve water quality and water quantity requirements that are suited to small catchments. As mentioned in section 1.44, in line with the proposed SMP and ongoing discussions with council, the BPO for water quality treatment of private singular lot impervious surfaces has been assessed on a risk basis concluding that the minimum treatment measure shall include a catchpit with a sump and submerged outlet to capture gross pollutants and potential spills.

This approach is considered to be the BPO for private superlot, water quality treatment as it:

- Meets the water quality objectives of the SMP.
- Recognises that there is very little or marginal gain to be had from undertaking treatment using GD01 designed devices where contaminant loading is minimal.
- Aligns the performance requirements to contaminants of concern and risk frequency and integrates with the options included in the stormwater management toolbox in the SMP.
- Provides an economic, achievable and realistic water quality treatment solution that targets the contaminants of concern.

Yours sincerely

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