Tonkin+Taylor

Job No: 1018900
14 October 2021

Selwyn District Council
2 Norman Kirk Drive
Rolleston
7614

Attention: Jocelyn Lewes

Dear Jocelyn

**Private Plan Change 69 - Stormwater, flood management and some ground water and civil construction aspects**

## 1 Introduction

Selwyn District Council (SDC) has engaged Tonkin and Taylor Ltd. (T+T) to review certain aspects of information provided in support of Selwyn District Plan proposed Private Plan Change 69 (PC69). PC69 proposes urban development of approximately 190 ha adjacent to the present south extent of Lincoln town.

The T+T scope of work comprises preparation of a letter report setting out our expert opinion, based on information provided to us, as to the suitability of the land for urban development given the underlying ground water levels and potential surface flooding at design level events. Our letter sets out to what extent we agree or disagree with the Applicant's reporting and findings, including:

i As regards to our scope of work, whether we consider the land is suitable for urban development having regard to the matters set out in section 106 of the Resource Management Act 1991.

ii The anticipated feasibility and challenges arising from the nature of anticipated civil construction works required prior to this land being made suitable for urban development.

iii Whether we consider there to be impediments to the development of this land given the water table and/or flood risk.

Tim Morris (T+T) attended a site walkover of the PC69 area on 14 October 2021 together with Bruce Van Duyn (Carter Group), Tim McLeod (Inovo Projects) and Nick Boyes (for Selwyn District Council). Based on discussions at the time of the site visit we understand that the applicant has progressed a number of the information gaps/uncertainties discussed in this assessment, albeit we have not been provided documents to review this further work, and our report relies on the reports outlined at Section 2 following.

## 2 Source information

Our letter has been informed by aspects of the following documents provided to us by, SDC (the Reports):



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i The Infrastructure Report prepared by Inovo Projects (Issue 3, 28 October, 2020) https://www.selwyn.govt.nz/__data/assets/pdf_file/0012/400161/Appendix-A-Infrastructure-Assessment.pdf including the Storm Water Concept Design Report prepared by E2 Environmental (the Infrastructure Report). The Infrastructure Report states that it was prepared by Tim McLeod.

ii Aspects of the Geotechnical Assessment Report prepared by Coffey (28 January 2021) addressing ground water, primarily Section 6.2 https://www.selwyn.govt.nz/__data/assets/pdf_file/0013/400162/Appendix-B-Geotechnical-Assessment.pdf (The Coffey Report).

iii The updated Private Plan Change documentation itself: https://www.selwyn.govt.nz/__data/assets/pdf_file/0020/400169/Plan-Change-request-application-Rolleston-Industrial-Developments.pdf

iv The "*Outline Development Plan (ODP) – Lincoln South*" (April 2021) (the ODP) as per Attachment 4 of the Private Plan Change request (Amended application 7 April 2021) https://www.selwyn.govt.nz/property-And-building/planning/strategies-and-plans/selwyn-district-plan/plan-changes/plan-change-69,-rezone-186-hectares-of-rural-outer-plains-to-living-x,-living-z-and-business-1-zones,-lincoln.

v SDC memo "Technical issues/difficulties experienced with subdivision neighbouring proposed Plan Change 69" received on 12 October 2021.

## 3 Surface water flooding

The Infrastructure Report includes estimates of the depth of flooding at the site resulting from a 0.2% or 1 in 200-year annual exceedance probability flood event. The Infrastructure Report authors have taken data from the Canterbury Maps website (the Infrastructure Report states the source of the data to be "*Selwyn District Council, 2019, Selwyn's flooding and coastal hazards, retrieved October 12, 2020 from https://apps.canterburymaps.govt.nz/SelwynNaturalHazards map information*"). These data indicate flood depth estimates of 1 – 1.5 m at the south-eastern end of the site, approximately where the applicant has indicatively suggested green space and/or stormwater infrastructure may be located. At other locations no flooding during the event assessed is illustrated. It is difficult to reconcile the estimated flood depths to the ODP figures with any certainty. It is also noted that earthworks appears to be proposed in some areas in the ODP, and that this is unaccounted for in the referenced modelling and could be expected to have some effect on flooding.

The Infrastructure Report contains references to proposed building platform freeboard above flood level, for example the Infrastructure Report states the following:

- "*Any dwelling on land located in Living X (*understood to the eastern end of the development*) zone in Lincoln South shall have a minimum freeboard height of 400mm above the 0.5% Annual Exceedance Probability Flood Event"*
- "*maintaining appropriate (*undefined*) freeboard above the 0.5% AEP flood event for building floor levels. Where suitable, there may be filling of ground levels to above the 0.5% AEP flood level to provide platforms for development*"

We consider that the model results presented in the Infrastructure Report will depend on factors such as:

- The Lake Ellesmere water level throughout the event (given the low-lying nature of the site relative to sea/lake level).
- The extent of weed growth in channels downstream of the site as we understand flood passage is impacted by constriction of the channel at times of high weed growth.

- Climate change assumptions – one figure appended to the Infrastructure Report refers to the 2081-2100 RCP8.5 climate change scenario, but this figure is not included in the main body of the report, and at this point it is not clear if this scenario is consistently referred to.
- The duration of a particular flood event compared to what was modelled.
- Construction work associated with the development. For example, impervious surfaces to increase runoff and earthworks to alter ground levels - both excavation to store stormwater and filling to form building platforms and/or otherwise make areas of the site suitable for development.
- The flood depth estimates are District wide. There may be uncertainties applying the data to a specific site e.g. matters related to storm duration and/or precision of topographical information (including proposed earthworks) and/or local features such as culverts and the like.

Given the preceding, we have not sighted a reliance statement confirming that the model results that the Infrastructure Report relies on are suitable for the purpose intended by those that prepared the model. We suggest that this matter is clarified.

The Infrastructure Report also states the following:

- "*Flood modelling for the 0.2% AEP indicates flooding of the Arariri/LII River floodplain next to the Arariri/LII River to a maximum level of approximately RL 4m (New Zealand Vertical Datum 2016). Parts of the site above RL 4m are not subject to inundation and can be safety developed. Areas of the site below the RL 4m contour line can potentially be developed as larger residential lots subject to setting minimum building platform levels and allowing part of these lots to flood in extreme events.*"

The 4 m contour is not indicated on the provided figures included in the Infrastructure Report. It is not possible, based on documents provided to T+T, to understand the significance of this matter e.g. how much of the site is, or is not, above the 4 m contour (proposed or existing). The ODP does not provide the information necessary to resolve these matters.

The ODP indicates stormwater treatment areas are near the L11 River. It is important that stormwater infrastructure, such as treatment ponds are appropriately located so as their effectiveness is not impaired by flooding up to appropriate threshold events (e.g. volumes are not double counted). We have not signed information to verify how this has been resolved.

## 4 Some submitter concerns

There are a large number of PC69 submissions. We have observed that a number of submitters have raised issues relating to the following topics that we consider in this assessment as relates to the suitability of the site for urban development:

- Springs and/or ground water.
- Flooding.

## 5 Groundwater

Springs are evidence of a high groundwater level. Based on information outlined in the Infrastructure Report, the ODP, discussions with SDC staff, the 14 October site visit, and information provided by PC69 submitters, we understand that the land encompassed by PC69 includes various locations where springs/ground water emerge at the ground surface.

The Infrastructure Report states the following:

- "*Baseflow in Springs Creek, Lincoln Main Drain, and Collins Drain is dominated by groundwater discharges from artesian springs.*"
- "*The highest measured depth to groundwater in shallow wells near the site varies between 0.2 and 0.42 m below ground level.*"
- *"There are a number of artesian springs and associated land drains located across the site that will be incorporated into the overall development plan."*
- *"The groundwater table level will influence the depth of stormwater management systems, particularly on the lower lying land on the eastern portion of the site where groundwater levels are influenced by the water level in the Ararira/LII River."*

In relation to a groundwater level for liquefaction analysis, the Coffey Report states that:

- "*we have used a groundwater level of 1.0mbgl for the eastern portion and 2.0m to 2.5mbgl for the western portion of the site. This can be refined later.*"

Generally, we infer that the springs illustrated on the ODP appear to be located in areas shown as either proposed Reserve Location and/or set aside for Stormwater Management (noting some are not but we understand from site discussions that the ODP is indicative and it is the applicants' intent to include these other springs within either proposed Reserve Locations and/or areas set aside for Stormwater Management. Groundwater levels change over time. It is not clear if the locations on the ODP align with low, average or high ground water levels. Some springs may only emerge in particular wet years and disappear in dry years.

A high groundwater level can introduce difficulties and complexity during construction and can influence the strength and durability of various infrastructure assets over their lifetime.

It is our view that the design and construction activities will be influenced by the site ground water conditions. Excessive ground water levels may result in localised inundation and problems for infrastructure and dwellings if subdivision design and/or construction is not appropriate.

While we acknowledge that in principle, ground water issues may be addressed by appropriate design and construction, the information provided to us thus far does not necessarily indicate specific details of how groundwater issues will be addressed to enable development. Appropriate design performance is likely to require things like:

- Appropriate siting of dwellings, reserves and stormwater management infrastructure.
- Appropriate cut and fill activities. Filling may not necessarily mitigate all issues with a high ground water level e.g. changes in hydraulic gradient may cause springs to relocate.
- Suitable drainage.
- Necessary design standards/specifications to achieve infrastructure that is durable long term. For example, pavement depth and construction materials, and stormwater/wastewater chamber uplift resistance.

## 6 Construction activities

Comment on the general construction challenges at sites with shallow depth to groundwater (i.e. high groundwater levels) was requested by SDC. High groundwater levels pose additional challenges for civil construction activities when compared to sites with deeper ground water levels, from both technical and construction cost perspectives. Potential example issues include:

- A need to cut to waste instead of cut to fill, potentially requiring disposal of excavated material and/or the importation of fill and/or conditioning of fill.
- More complicated sequencing / methodologies.

- A requirement for de-watering e.g. for services and/or pavement construction.
- Requirements for deeper pavement depth than may be necessary to achieve design requirements e.g. due to unavoidable construction damage to the pavement subgrade.
- Complicated erosion and sediment controls (e.g. treatment of water).
- Flexible resource consent conditions that can accommodate management of appropriate water volumes.
- Longer timeframes.

These challenges may be addressed by appropriate consent conditions, budgets, construction timing and methodologies.

We understand that the high groundwater table has provided construction stage challenges at the adjacent Te Whariki development. This further highlight the relevance of considering high groundwater levels as part of assessing PC69.

## 7 Section 106 of the Resource Management Act

Comment on a Section 106 assessment on the potential for material damage arising from erosion and inundation was requested.

In its present from and based on the documents provided to us, we consider that aspects of the site appear to be subject to inundation and potentially erosion. We have not been provided sufficient information to make a meaningful assessment of these issues. Uncertainties and/or present information gaps include:

- Proposed ground levels (including cutting and filling).
- Estimated critical flood levels given the proposed arrangement.
- Estimated groundwater conditions (e.g. water levels including estimated level fluctuation).
- Proposed lot locations and/or building platform areas (latter relevant for larger lower lying lots).

However, we understand that a Section 106 assessment is necessary to support an application for subdivision consent and that the present application is for a plan change, and therefore a Section 106 assessment is not required at this stage (but will be necessary at the subdivision consent stage).

## 8 Conclusions

Based on our review of the supplied information, we conclude as follows:

i We consider that some areas within the site are likely suitable for urban development given the issues we have considered. We also consider that aspects of the land encompassed within the PC69 area are not suitable for urban development in its present form having regard to the potential for inundation. Inundation is one of the matters set out in Section 106 of the Resource Management Act 1991. We note following in relation to this comment:
   - We have not sighted a subdivision general arrangement plan illustrating proposed site levels, proposed cut and fill arrangements and proposed locations of residential lots and related infrastructure (e.g. roads/secondary flow paths, stormwater treatment and/or attenuation infrastructure).
   - That some areas that we consider unsuitable for development may be able to be made suitable for development by appropriate earthworks.
   - The Infrastructure Report notes that some less suitable areas may be utilised for stormwater management.

- We were verbally advised at the time of the site visit that some unsuitable areas are intended as green space.

Further information regarding the nature of the proposal is necessary to provide further comment.

ii High groundwater levels require consideration in subdivision design.

iii An assessment of inundation, as outlined at Section 106 of the RMA is not possible at this time given the information provided to T+T (noting that the general comments at i. above to not comprise a Section 106 assessment).

iv The anticipated civil construction works required prior to this land being made suitable for urban development are, from an engineering perspective likely to be technically feasible. High groundwater levels will complicate construction and impact on cost, both from the perspective of temporary works as well as permanent infrastructure.

v If design work is to be progressed further, it is important that an appropriate stormwater model taking proper account of the critical event and proposed finished ground levels is developed to confirm areas of the site to be developed. We suggest that this work informs an application for subdivision consent if it is not required to inform the PC69 application.

## 9 Applicability

The sole purpose of this report and the associated services performed by Tonkin & Taylor Limited (T+T) is to undertake a limited review of, and comment on, the reports listed at Section 2 of this letter (the Reports) prepared by Inovo, E2 Environmental and Coffey (the Principal Consultants) in accordance with the scope of services set out in the Contract between SDC and T+T. That scope of services, as described in this letter, was developed with SDC. No calculations have been checked by T+T as this is outside the scope of the agreed service.

T+T's review was a form of peer review, undertaken on a level-of-effort basis, to provide comment to assist SDC in its decision making in relation to Private Plan Change 69 (PC69). The responsibility for the Reports remains fully with the Principal Consultants and T+T's review does not constitute a means by which that responsibility can be passed on to T+T.

This letter has been prepared on behalf of, and for the exclusive use of SDC, and is subject to, and issued in accordance with, the provisions of the contract between T+T and SDC. T+T accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

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