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Preliminary Engineering Assessment for Development of 11 Greenacres Drive, Kawakawa

The following is a due diligence assessment to determine the extent of existing and potential new infrastructure available to service a new development at 11 Greenacres Drive. This assessment is based off Council GIS alignments of existing services, which are indicative only. Site specific investigations will be required prior to commencing detailed design.

Existing Site Description

The subject site consists of two existing properties herein referred to as 11 Greenacres Drive (Sec 22 & Sec 25 SBRS of Kawakawa). The site is roughly rectangular in shape with approximate area of 93,400m^2. The site is located on the southern edge of the small Northland township of Kawakawa, just south of the Bay of Islands Hospital between Greenacres Dr and NZ State Highway 1 which form the western and eastern boundaries respectively.

Existing on site is a single standalone dwelling, as well as a separate building, carpark and sealed access roads which are part of the hospital complex. The remainder of the site is densely vegetated. The immediate neighbourhood consists predominantly of standalone dwellings on larger plots of land

Figure 1: Site Boundary Outlined in Yellow

The topography of the site is undulating. A northerly tending ridge divides the site into two notable catchments with slopes falling westerly toward Greenacres Drive and easterly toward NZ State Highway 1, either side of the ridge. The western slopes have a gentler gradient, slopes to the east are more variable, starting of gentle and becoming more incised/steeper. Figure 2 below highlights notable aspects of the site topography.

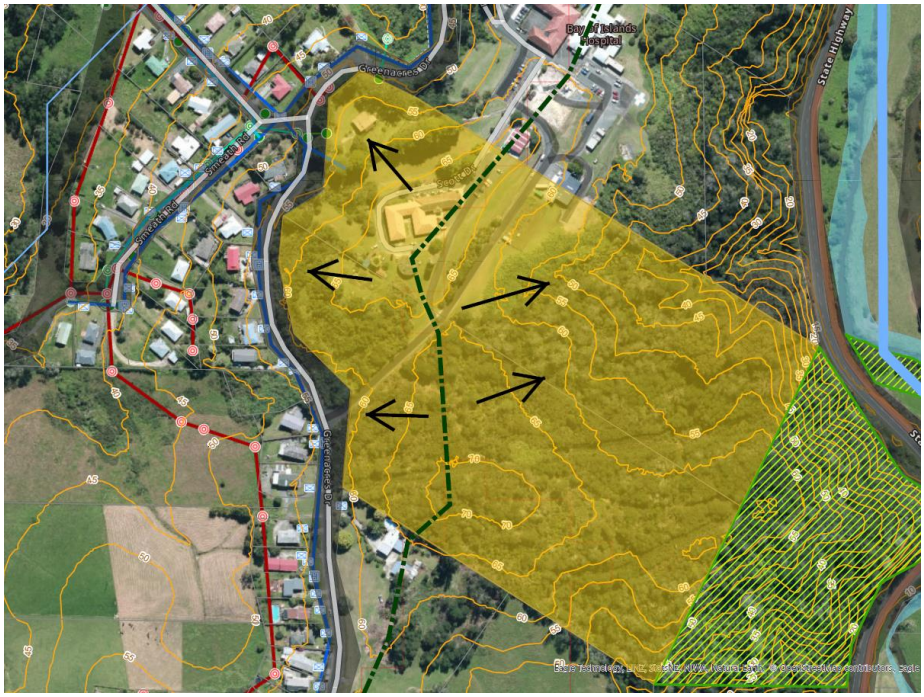

Figure 2 Site topography. Northerly tending ridge shown with slope arrows for prevailing slope either side of the ridge. The green hatched area sandwiched between NZ State Highway 1 and the Site is a conservation zone.

Proposal

The Te Mataroa development involves provision of 182 dwellings including Iwi homes, a wellness centre, and aged care apartment buildings. The relevant civil engineering services required to support the development are discussed in subsequent sections of the memo. The concept design is shown below in figure 3.

Figure 3: Proposed Development Concept Design

Earthworks

Earthworks will be required within the subject site for trimming and shaping the existing topography to form the following:

- The road network with adjacent pedestrian footpaths/berm and car parking.
- Building platforms for the terraced houses and apartment blocks

Due to the topography of the site, it is likely retaining walls will be required to create level platforms and suitable gradients across the site. Notably, the Stage 2 aged care facility will likely require extensive earthworks/ retaining as it is situated on steep terrain with an approximately 20m level difference between the highest and lowest points. A change in orientation of this facility may be considered to avoid the steep drop off. Figure 4 below provides additional details. A detailed geotechnical investigation will be required to assess the ability of the underlying ground conditions to support the development and note any remediation measures required. Notably, the investigation should assess stability of the steeper slopes in the eastern areas.

Figure 4 Alternate orientation for Stage 2 aged care facility indicated in red

Flooding

Several overland flow paths (OLFP) are located across the extent of the site. The OLFP flow in a westerly and easterly direction either side of the central ridge. The overland flow paths outlet to Greenacres Dr on the western site boundary and through what appears to be a culvert under State Highway 1 to the east. The culvert is not shown on GIS, however review of contours and street imagery indicate its presence. OLFP within the site can be modified to suit the development layout however the existing discharge point will need to be maintained. Figure 5 below provides details of the existing OLFP within the site.

The development site is situated at a high point within the catchment and is therefore unlikely to be inundated by flooding. Further assessment of the OLFP will be required at detailed design stage.

Figure 5 OLFP through the site as per Council GIS. OLFP shown by green lines

Access

Access to the development is proposed via a network of internal roads extending from the existing through-road between the Bay of Islands Hospital and Greenacres Drive (Hospital Road). Hospital Road and the intersection with Greenacres Drive are proposed to be upgraded, providing pedestrian connectivity through the site and associated safety features. The road upgrades and transportation requirements are discussed in detail in the Traffic Impact Assessment undertaken by Traffic Planning Consultants LTD.

Stormwater

The site is divided into two drainage catchments by a central ridge. The western catchment flows toward Greenacres Dr and the eastern towards State Highway 1. Options for these catchments have been assessed below.

There are several potential stormwater connection points which can be further investigated for detailed design:

1. There is a 225mmØ stormwater pipe from an existing catchpit located on the western site boundary across Greenacres drive, circled in figures 6 & 7 below. A new public manhole could be installed on this pipe with an extension network laid up into the development. Based on initial assessment of the contours this network should be deep enough to service the western catchment and parts of the eastern via gravity discharge. The remainder of the eastern catchment could be serviced by constructing a new network and outfall discharging flow towards an apparent culvert under the state highway (figure 8 below). Notable constraint with this option is the small diameter of the connection point in Greenacres Drive as it is located at the head of the existing network, thus not easily upgraded without extensive works. Additionally, details of the culvert are unknown at this stage and would require additional investigation.

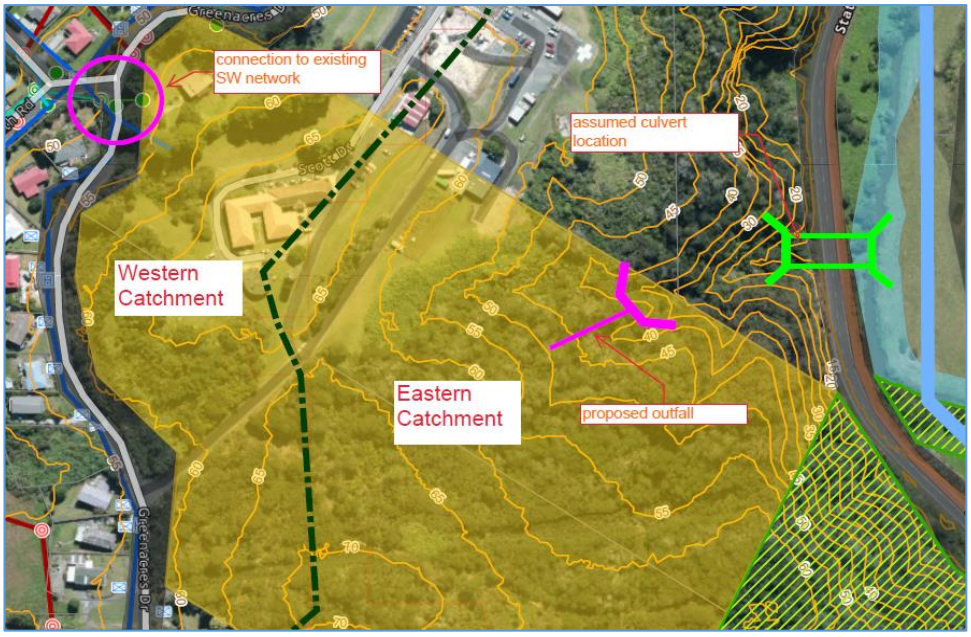

Figure 7: Stormwater Drainage Concept

Figure 6: Existing Catchpit Locations on Greenacres Drive shown on Google Street View

Figure 8 Culvert under State Highway 1 shown on Google Street View

2. There is also an existing 300mmØ stormwater pipe further north of option 1. An existing catchpit is located on the northwestern corner of the site running across Greenacres Drive, shown in figures 9 & 10 below. A new public manhole could be installed on this pipe with a network extension laid into the development from the roadway. Unlike the first option, this pipe can be more easily upgraded if undersized to serve the development. The connection should be deep enough to service the western catchment and parts of the eastern via gravity discharge, with the balance draining toward a new outfall.

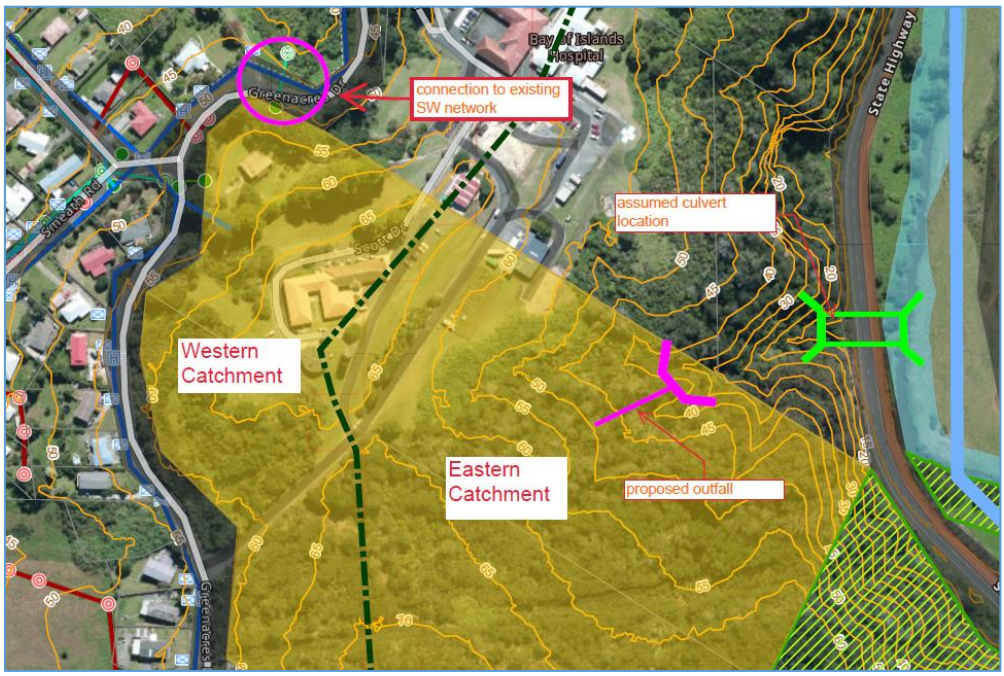

Figure 9: Stormwater Drainage Concept

Figure 10: Existing Catchpit Location on Greenacres Drive shown on Google Street View

3. An additional option for stormwater servicing is connection through the neighbouring properties on Greenacres drive, from the existing network at the end of Smeath Road (location circled in figure 11 &12). While this will require neighbour approval, a network extension from this point will be able to service the lower areas of the development without the need for a new outfall. Constraints with this option include requirement to obtain multiple approvals from private parties to cross their property with new SW services, and deep excavations of SW pipes crossing the ridge within the site.

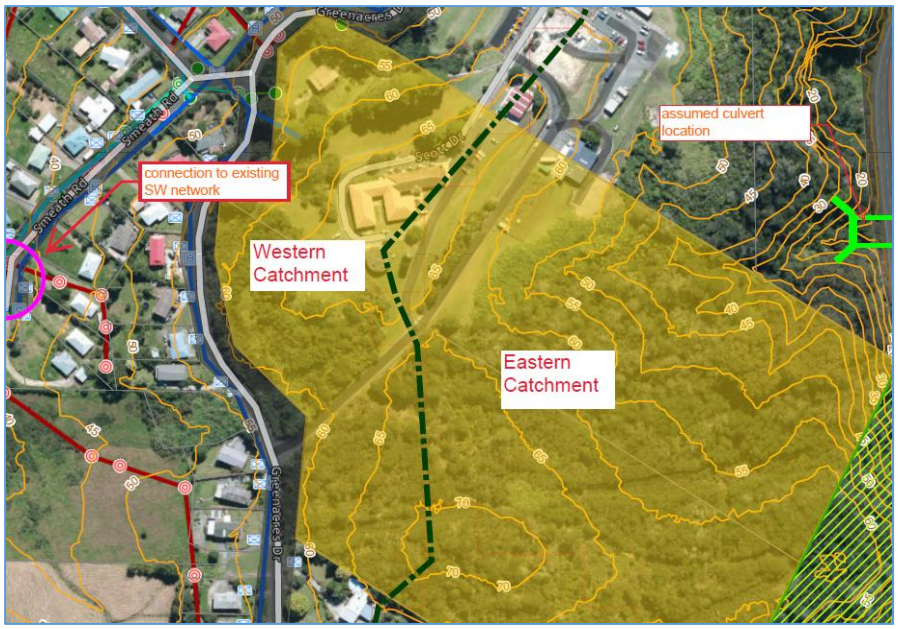

Figure 11: Existing SW Asset Locations on Smeath Road shown on FNDC GIS

Figure 12: Existing SW Asset Locations on Smeath Road shown Google Street View

The proposed development is large in scale and may trigger requirement for stormwater hydrological mitigation and quality treatment, this will need to be further investigated to determine if such devices (tanks, raingardens, swales etc) will need provision. Additionally, if any existing stormwater network downstream of the site does not have any additional capacity, detention tanks may be required to mitigate the effect of the proposed development on the downstream stormwater flow.

Wastewater

There are two potential options for wastewater servicing which can be investigated further with detailed design, and these are summarized in the following points.

1. There are two existing public WW manholes shown in the Greenacres roadway adjacent to the north-western site corner (figs. 13 & 14), which could be utilised for a network extension into the development. It is likely the existing dwelling on 11 Greenacres drive already has a connection into one of these manholes and it is advised to investigate this further to determine the existing alignment within the property. It is unlikely the network would be deep enough to service the entire development, especially the eastern areas. Alternate solutions may be required for these lower lying areas which may include pumping.

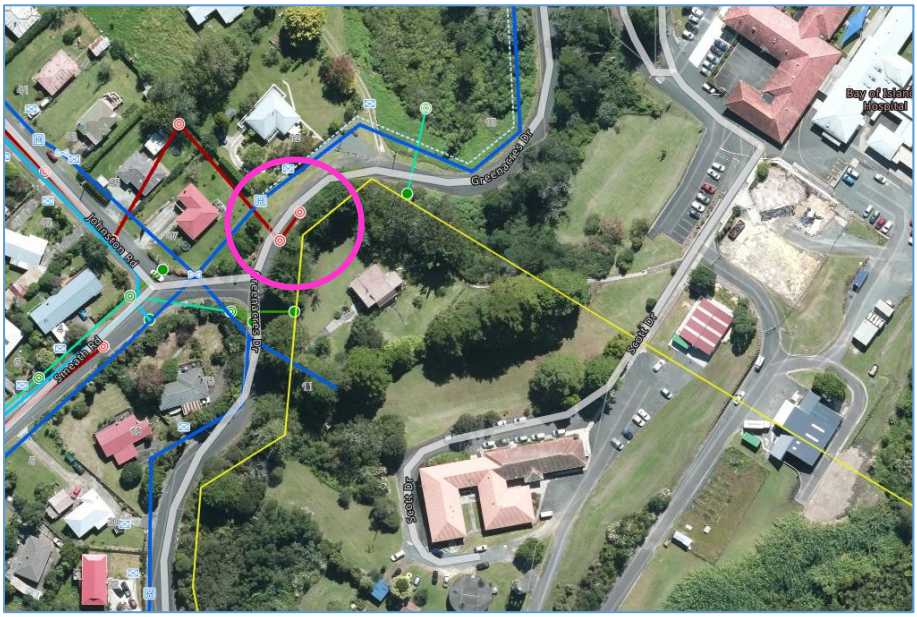

Figure 13 Existing Wastewater Assets on Greenacres Drive shown in FNDC GIS

Figure 14: Existing Wastewater Asset on Greenacres Drive shown on Google Street View

2. A second option for wastewater servicing to the development could be via network extension from the public manhole located on the west boundary of 34 Greenacres Drive, east towards the site (fig. 15). This will require a neighbour approval for connection through 34 Greenacres Drive; however, this option may prove to be more efficient in terms of the network alignment through the site. Pumping or alternate solution likely to still be required for lower lying areas of the site on the eastern side.

Figure 15: Existing WW Manhole Adjacent to 34 Greenacres Road shown in FNDC GIS

Water Supply

Water Supply may be available via the existing 100mmØ AC public watermain in the Greenacres Drive, indicated in Council GIS. A new network branching off Greenacres Drive, with all components of the water supply (potable and fire supply assets) could be extended into the development along the new road corridors. Capacity of the existing network to support the development for potable and fire supply will need to be confirmed through further investigation.

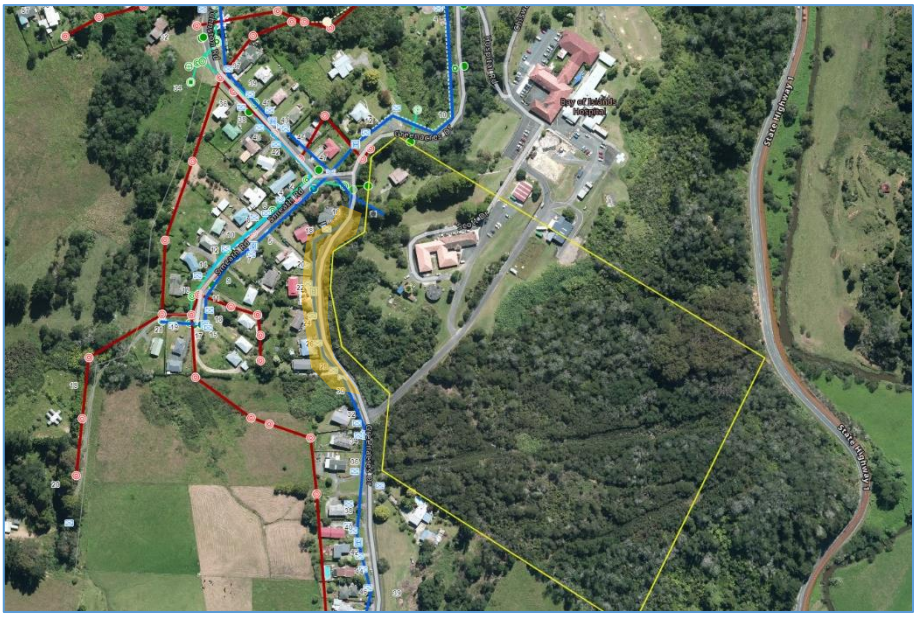

Figure 16: Existing Watermain Location shown in FNDC GIS

Conclusion

11 Greenacres Drive is suitable for development as discussed throughout the above assessment. The key design points are summarized below:

- Access to the development is available via the existing through-road between Greenacres Drive & Hospital Road
- Stormwater servicing may be available via an extension of the existing public network and establishment of a new outfall.
- Wastewater servicing may be available via an extension of the existing public network.
- Water supply may be available from the existing public watermain in Greenacres Dr depending on the result of a hydrant test to confirm potential number of new lots

Should you have any questions in relation to any of the above, please feel free to contact the undersigned on 212608521 or via email lucia@civix.co.nz.

Kind Regards,

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