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PEGASUS WEST DEVELOPMENT FAST TRACK APPROVAL REFERRAL APPLICATION

ENGINEERING & INFRASTRUCTURE REPORT

Pegasus West Development| Engineering & Infrastructure Report

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Contents

Statement of Qualifications & Experience

Sam Jackman

I am the author of this report. I am a Technical Director of Civix and hold a Bachelor of Engineering from Unitec Institute of Technology, completed in 2002. I am a Chartered Professional Engineer (CPEng) and a member of Engineering New Zealand. My additional professional qualifications and appointments include International Professional Engineer (IntPE(NZ)).

I have more than 25 years' experience in civil engineering for land development projects in New Zealand focusing on both residential and commercial greenfield and brownfield developments from conceptual through to detailed design with an excellent understanding of the regulatory processes involved with consent acquisition. My technical expertise includes due diligence infrastructure assessments and investigations earthworks design and site optimisation, erosion and sediment control design, roading and pavements as well as stormwater, wastewater and water supply design, with an extensive background working on multi-disciplinary projects that require a high level of coordination with sub-consultants to ensure successful project delivery.

I also have substantial experience in construction observation and contract administration during construction works through acting as Engineer on construction contracts.

Rob Mears

I am reviewer and releaser of this report. I am the Engineering and Surveying Manager of Civix and hold a Bachelor of Surveying from the University of Otago, completed in 2014. I am a Licensed Cadastral Surveyor (LCS).

I have more than 12 years of experience across both surveying and civil engineering for land development project in New Zealand focusing on residential developments from conceptual and development strategy through to delivery with a high level of focus on obtaining buildable consents and closing out complex projects. My technical expertise includes detailed site investigations, consenting and regulatory compliance and supervision of land development projects through construction. These projects typically have a multi-disciplinary approach and require a high level of stakeholder engagement to achieve high quality outcomes.

1. Executive Summary

Civix has prepared this Engineering and Infrastructure Report on behalf of Wolfbrook Developments (Pegasus) Ltd to support a referral application under the Fast-track Approvals Act 2024 for the Pegasus West Development at the former Pegasus Golf Course, 8 Mapleham Drive, Pegasus. The proposal seeks to enable a staged, master-planned extension to the Pegasus, Woodend and Ravenswood urban area, comprising up to approximately 1,000 residential allotments/dwellings, a commercial and community node, associated open space, and supporting infrastructure.

The site comprises approximately 77 ha of land formerly used as an 18-hole golf course, including existing fairways, greens, constructed stormwater ponds, road corridors, pedestrian links and established watercourse and wetland environments. The site is generally gently undulating, falling from south-west to north-east, and includes existing residential lots and infrastructure associated with Pegasus Boulevard and adjoining local roads. Its location, existing urban context and proximity to established services make it a logical area for future urban development, subject to appropriate management of environmental, cultural, engineering and servicing matters.

The report identifies that bulk earthworks will be required to form development platforms, roads, reserves and stormwater management areas. These works can be managed through staged construction, progressive stabilisation, appropriate erosion and sediment controls, and a Construction Management Plan. Controls are expected to be designed and implemented in accordance with industry best practice, the ECan Erosion and Sediment Toolbox Guidelines, and relevant Ngāi Tahu subdivision and development principles, including protection of waterways, wetlands, archaeological areas and culturally significant sites.

New roading, access and three waters infrastructure will be required to service the development. The internal road network is expected to connect with existing roads, provide an appropriate road hierarchy, support pedestrian connectivity, and accommodate three waters and utility services within compliant corridors. Wastewater servicing is expected to be most appropriately achieved through a local pressure sewer system discharging to a proposed terminal wastewater pump station, with conveyance to the Woodend Wastewater Treatment Plant. Stormwater management will retain the low-impact design approach used in the wider Pegasus area, with swales, overland flow paths and stormwater management basins providing conveyance, treatment and attenuation. Water supply will be provided through extension and integration with the existing Waimakariri District Council reticulated network and use of the existing water-take bore with a new ancillary water treatment and storage facility, with firefighting provision to be confirmed through detailed design.

Key constraints identified in this assessment include proximity to wetlands, streams and archaeological features, management of sediment discharge during construction, wastewater capacity and staging considerations, potential odour and septicity risks during early wastewater system operation, and confirmation of water supply and wastewater treatment capacity. These matters are considered capable of being addressed through the substantive application and detailed design stages, in consultation with Waimakariri District Council, relevant infrastructure providers and other stakeholders.

Overall, no civil engineering-related matters have been identified that would prevent the development from being appropriately resolved at the substantive Fast-track Approvals Act application stage.

2. Introduction

Civix has been engaged by Wolfbrook Developments (Pegasus) Ltd (Wolfbrook) to provide civil engineering services to support a referral application under the Fast-track Approvals Act 2024 (FTAA) associated with a proposed redevelopment of the former Pegasus Golf Course located at 8 Mapleham Drive, Pegasus. The project is referred to as Pegasus West Development. The scope of this report includes the following:

- Anticipated site-wide earthworks and erosion and sediment control management/mitigation.
- Roading and access.
- Stormwater management including conveyance, treatment and flood management.
- Wastewater conveyance and disposal.
- Water supply.
- Utility services and provisioning.

Given the application is associated with the referral phase of the fast-track process, engineering design has not been undertaken but an overarching strategy for site development and effects mitigation has been developed so as to inform future engineering design process.

3. Existing Site Description

The Pegasus West Development is located between Pegasus and Ravenswood and Woodend in North Canterbury. The site previously functioned as the Pegasus Golf Course comprising an 18-hole golfing facility with accompanying clubrooms and café located at 8 Mapleham Drive. The site comprises an area of approximately 77 ha over multiple titles. It is bounded by the Taerutu Gully/ Pegasus township to the east, Main North Road (State Highway 1) to the east and rural property to the north and south. The Ravenswood Key Activity Centre is located immediately to the west of State Highway 1.

Pegasus Boulevard bisects the site in generally a west to east alignment providing connectivity from Main Road North to the Pegasus township. There are a number of existing residential dwellings/lots that surround the former golf course and are accessed via various roads from Pegasus Boulevard including Mapleham Drive, Burntwood Lane, Taerutu Lane, Te Haunui Lane, Mara-Kai Place, Ara-Kia Place and Atkinson Lane. Refer to Figure 1 for further details of the site.

Figure 1. Site Location Plan (Source: WDC GIS)

The site is characterised by grassed fairways and greens associated with the former golf course as well as a series of engineered/constructed stormwater ponds that were installed to provide for both stormwater management of site runoff from the roads and lots and for irrigating the golf course. Along the roadways, grass swales have been used for stormwater treatment and conveyance, which drain into the existing constructed stormwater ponds. The Taerutu wetland and Taerutu Stream are present within the eastern-most portion of the site with an established existing riparian corridor within which fairways have been established. The Taranaki Stream is present within the north-west quadrant of the site, draining northwards to Mapleham Drive where it forms a confluence with the Taerutu Stream. There are existing footpaths through the reserves and golf course that provide pedestrian linkages across the site.

The site is generally gently undulating with some localised steeper areas in the vicinity of the constructed stormwater ponds. The general fall of the site is from the south-west to the north-east with an elevation range from approximately RL 10m to RL 4.5m.

4. Proposed Development

The Project is a master-planned residential development with a neighbourhood scale commercial / community node and associated infrastructure, provided as a contiguous extension to the Pegasus, Woodend and Ravenswood urban area. The approximate 77-hectare site is known as 8 Mapleham Drive, Pegasus.

The Project will include the following:

- Staged subdivision and development to enable up to 1,000 residential allotments / dwellings across a range of residential densities and to cater for a range of typologies;
- Development of a commercial/community node that enables provision of day-to-day needs such as retail, service, healthcare, education, recreation and/or related activities for the community, with specific uses determined through community and market needs;
- Associated three waters infrastructure; including an integrated stormwater management and open space network featuring neighbourhood parks and green links;
- Minor alterations to Pegasus Boulevard to provide for the access requirements of the development including intersection improvements and a new road access;
- Associated earthworks, servicing, landscaping and related works to be implemented in stages;
- Areas of land set aside to recognise and provide for cultural and archaeological values including retention of archaeological site M35/440 (pa site) which is registered as a wahi tapu on the New Zealand Heritage List / Rarangi Korero.

The anticipated development is presented on the Pegasus West Development indicative masterplan.

5. Earthworks

5.1. Earthworks Methodology

Bulk earthworks will be necessary across the designated development areas of the site comprising a cut and fill operation for the formation of lots/building platforms, reserves and roads/access as well as formation of the stormwater management areas. The proposed earthworks are intended to facilitate the following outcomes:

- Forming development platforms that meet the required design standards, including compliant longitudinal gradients for roads and accessways.
- Optimising site grading to achieve an overall balance between cut and fill volumes where practicable.
- Establishing finished surface levels that enable stormwater to be conveyed toward the designated stormwater management areas.
- Setting lot levels to achieve the required freeboard above the anticipated flood levels while ensuring no impacts on adjacent existing lots.

Following earthworks, civil construction works including roading, stormwater and wastewater drainage and utility services installation will be undertaken, which will result in land disturbance.

Earthworks and civil works will need to be actively managed to ensure potential sediment and erosion environmental effects will be effectively managed and/or mitigated. This management will include staging the construction, progressive stabilisation and employing appropriate erosion and sediment control measures.

In accordance with industry best practice, implementation of erosion and sediment controls will be undertaken during the construction works for the development to ensure any potential adverse effects are mitigated. Erosion and sediment controls would be undertaken in accordance with the ECan Erosion and Sediment Toolbox Guidelines.

In addition, all earthworks shall consider the Ngai Tahu Subdivision and Development Guidelines, which includes the following:

- 3.1: Earthworks associated with subdivision and development are subject to the general policy on Earthworks (Section 5.4 Issue P11) and Wāhi tapu me wahi taonga (Section 5.8, Issue CL3), including the specific methods used in high and low risk scenarios for accidental finds and damage to sites of significance.
- 3.2: The area of land cleared and left bare at any time during development should be kept to a minimum to reduce erosion, minimise stormwater run-off and protect waterways from sedimentation.
- 3.3: Earthworks should not modify or damage beds and margins of waterways, except where such activity is for the purpose of naturalisation or enhancement.
- 3.4: Excess soil from sites should be used as much as possible on site, as opposed to moving it off site. Excess soil can be used to create relief in reserves or buffer zones.

Based on the ECan Guidelines, the possible measures for erosion and sediment control that will also ensure alignment with the Ngai Tahu Subdivision and Development Guidelines are shown in Table 1.

Table 1: Erosion & Sediment Control Measures

Erosion & Sediment Control Measures	Comments
Cleanwater / Dirtywater Diversions	Cleanwater diversions (CWDs) are used to direct any surface water flow away from the earthworks areas. This can be accommodated within the existing roadway swales or construction bunds that divert upslope clean water runoff. Dirtywater diversions (DWDs) typically comprise either bunds or excavated shallow channels to collect surface water runoff within the earthworks area to the sediment control devices (such as sediment retention ponds or decanting earth bunds).
Stabilised Construction Entrance	Stabilised construction entrances are installed as the primary access point into working areas. These ensure that sediment is not inadvertently transported offsite into the adjacent primary stormwater network.
Sediment Retention Ponds	Sediment retention ponds (SRPs) are used as the primary treatment device for the removal of sediment prior to discharge and are implemented where working areas are >3,000 m^2 for an area up to 5 hectares in size. All SRPs will be sized based on the anticipated earthworks area to provide effective treatment of runoff prior to discharge. Where applicable, flocculation of SRPs will be used to provide a higher level of sediment removal.
Decanting Earth Bunds	Similar to SRPs, decanting earth bunds (DEBs) are used as the primary treatment device for the removal of sediment prior to discharge and are implemented where working areas are <3,000 m2 and in particular where runoff cannot be diverted to a SRP. Where applicable, flocculation of DEBs will be used to provide a higher level of sediment removal.
Cleanwater Pumping	Where existing stormwater ponds are removed to facilitate the earthworks, cleanwater can be pumped to a stabilised outfall for disposal.
Silt Fences	Silt fences / super silt fences can be used around stockpiles and below the main sediment control devices such as SRPs and DEBs. They can also be used around high-risk areas such as existing ponds, natural wetlands and streams to control sediment migration from the working areas/zones.
Site Stabilisation	Progressive site stabilisation is typically implemented following completion of earthworks. This can include a range of methods including placement of granular materials over completed roadway subgrades or re-topsoiling in conjunction with grass seeding over completed earthworks areas.

Works undertaken in accordance with the Guidelines will act to minimise and/or mitigate any adverse environmental effects of sediment discharge during the works through appropriate use and design of erosion and sediment control techniques and measures.

In addition to the implementation of erosion and sediment controls, a Construction Management Plan will be developed for the site works. This will include the following:

- Key contacts and responsibilities (Contractor/Consultant/Council) and key stakeholders including Iwi.
- Health & safety implementation and management (within overall site-specific site safety plan).
- Delineation and protection of archaeological sites within the project area and protocols for accidental discovery.
- Environmental management including but not limited to ecological protection and pre-works measures, erosion and sediment control implementation, inspection and maintenance as well as procedures for the refuelling of plant and equipment and spill management procedures.
- Site operation including proposed hours of work and an outline construction programme, location of site infrastructure including site offices, site amenities, equipment and unloading and storage areas.
- Assessing weather forecasts and in particular planning for severe inclement weather and methods to safeguard the site prior to significant rainfall.
- Traffic management and ensuring continued access for the public during the works activities.

6. Roading and Access

6.1. Roading Overview

Pegasus Boulevard bisects the site in generally a west to east alignment providing connectivity from Main North Road (SH1) to the Pegasus township. There are a number of existing residential dwellings/lots that surround the former golf course and are accessed via various roads from Pegasus Boulevard including Mapleham Drive, Burntwood Lane, Taerutu Lane, Te Haunui Lane, Mara-Kai Place and Atkinson Lane.

As per the indicative masterplan, new roadways are proposed within the development areas to provide access to the lots and will generally connect to the existing roads within the site via new intersections. The future roading network is anticipated to be designed to provide a clear hierarchy of roading typologies i.e. local vs collector roads, consistent with WDC Engineering Code requirements. The proposed road corridor widths, carriageway widths, footpath and pedestrian connectivity provisions, and hierarchy are expected to be consistent with the intent of WDC urban residential standards. The design will be undertaken to support future connectivity, integration with adjacent development, and to provide sufficient corridor width to accommodate three waters infrastructure and utility services within compliant service corridors. Furthermore, the road network layout will be designed to achieve appropriate intersection spacing and ensuring that road geometry supports safe vehicle movements, including service and emergency vehicles.

Private accessways (including JOALs/ROWs) will be used to service small clusters of lots where direct road frontage is not available. These can be designed in accordance with WDC requirements for the number of lots served.

Vehicle crossing locations will be identified at substantive FTAA stage to coordinate street tree placement, on-street parking provision, and sight distance requirements. If vehicle crossings are unable to comply with separation or width standards at the time of land use, this will require separate resource consent approval at that stage. A separate Integrated Transport Assessment will demonstrate that the design outcomes remain safe and functional, particularly given the low operating speeds anticipated within the subdivision. Access from Local Roads is also prioritized where practicable to reduce potential conflicts along the Collector Road.

Key constraints and mitigation of potential adverse effects associated with traffic impacts are considered in the separate traffic report.

7. Wastewater Servicing

7.1. Existing Wastewater Servicing

Existing residential lots as well as the former golf course clubhouse within the subject area are serviced via STEP systems (onsite septic tanks) with effluent pumped eastward into the public gravity reticulation, connecting at Kaitiritiri Ridge and feeding along Greenway. The area west of SH1 is serviced by a wastewater pump station (Kesteven Place WWPS) with a rising main within Pegasus Boulevard, Infinity Drive and Gladstone Road. Wastewater ultimately discharges into the Woodend Wastewater Treatment Plant (WWTP) located on Gladstone Road.

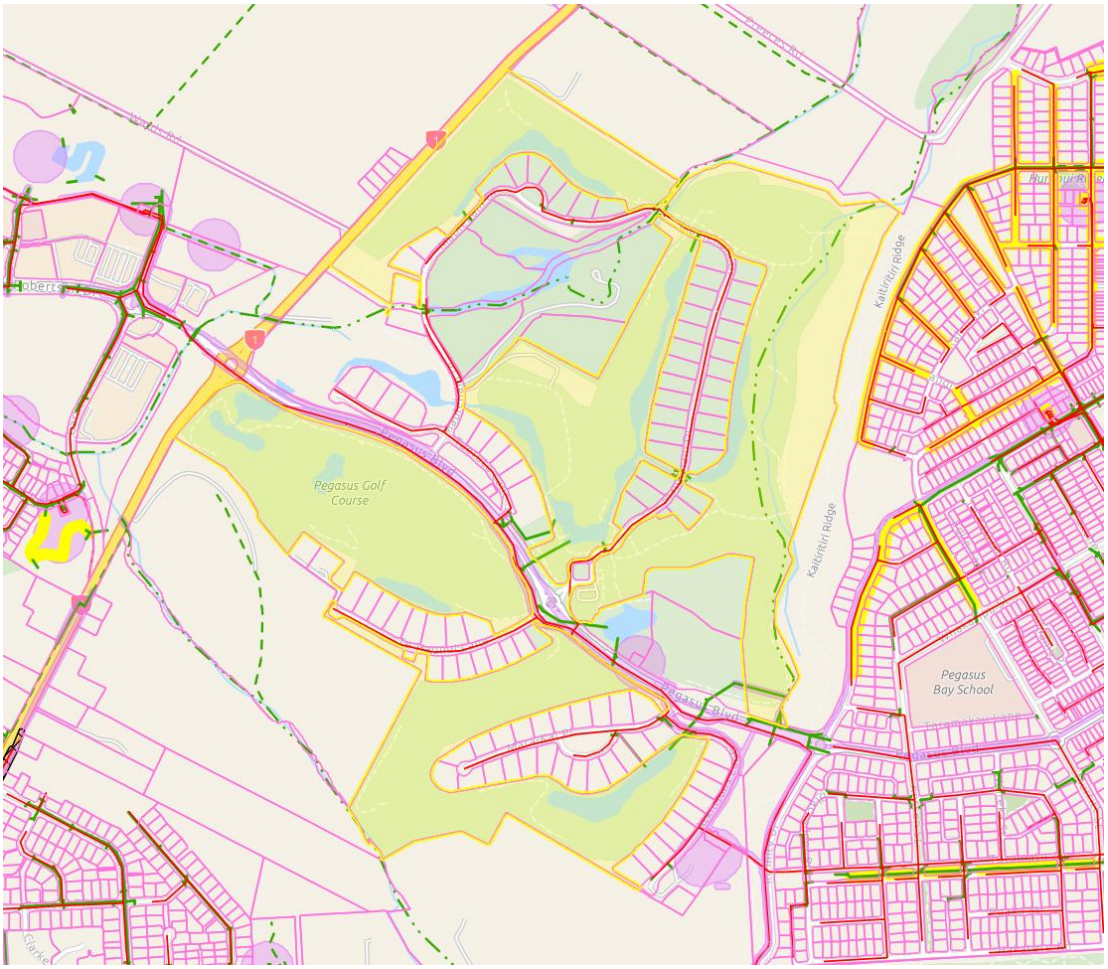

Figure 2. Existing Public Wastewater Network (Source: WDC GIS)

7.2. Wastewater Servicing

Future wastewater design will be undertaken in accordance with WDC criteria as outlined in the Engineering Code of Practice which will ensure that all infrastructure created and to be vested as public is and will remain fit for the intended life of the asset.

In addition, all waste treatment and disposal shall consider the Ngai Tahu Subdivision and Development Guidelines, which includes the following:

- 5.1 Developments should implement measures to reduce the volume of waste created within the development, including but not limited incentives or requirements for:

(i) Low water use appliances and low flush toilets;

(i) Grey water recycling; and

(ii) Recycling and composting opportunities (e.g. supporting zero waste principles).

- 5.2 Where a development is proposed for an area with existing wastewater infrastructure, the infrastructure must be proven to be able to accommodate the increased population prior to the granting of the subdivision consent.
- 5.3 New rural residential or lifestyle block developments should connect to a reticulated sewage network it available.
- 5.4 Where new wastewater infrastructure is required for a development:

  (i) The preference is for community reticulated systems with local treatment and land based discharge rather than individual septic tanks; and

  (ii) Where individual septic tanks are used, the preference is a wastewater treatment system rather than septic tanks.

Preliminary consultation with WDC has confirmed that there is capacity in the Woodend WWTP for the current projected 50-year growth (as per the District Plan) with some upgrades required. As the development is not within the 50-year growth plan, it is expected that additional capacity will need to be added to the Woodend WWTP alongside those planned works. WDC have further indicated that is expected there will be scope to upgrade the Woodend WWTP, however the additional loading may trigger the need to replace and upgrade some aspects such as the inlet works. Through substantive and detailed design, coordination will be undertaken with WDC to confirm the upgrades needed, the costs associated with these works, and the timing of these, to ensure both this development and the others planned in the network are serviced.

Possible options for servicing of the Pegasus West Development are outlined in the following sections.

7.2.1. Option 1 – Gravity Network

Due to the disparate nature of the development, to service the respective areas via gravity reticulation, a number of wastewater pump stations connected to a terminal wastewater pump station would be required. This option is therefore not considered practical from a long-term asset ownership and operation perspective.

7.2.2. Option 2 – Local Pressure Sewer (LPS)

Areas of Pegasus are already serviced via local pressure sewer (LPS) systems, with the on-lot infrastructure (pump chamber, pump, control panel and pipework to the boundary) privately owned. Due to the disparate nature of the subject development site(s) and relatively flat topography, a LPS system is considered a logical solution. The LPS system would then pump to a new public centralised terminal WWPS within the development area, which would then pump via rising main to the Woodend WWTP.

Design assumptions on construction techniques allowed for in the design include trench batter for open trenched pipes, drill rig setbacks for directionally drilled lines and trench shields where required. The system is designed to be constructed from the bottom up to allow all inverts to be confirmed prior to upstream assets being constructed.

The key elements in designing and developing a LPS system are:

- Minimising pipe lengths and retention times as well as maximising velocities within the reticulation whilst not exceeding desired pump heads and limiting high residence times leading to odour and septicity issues.
- Ensuring that stormwater does not enter the foul system, as stated in the Building Code. This includes ensuring that gully traps are built to the standard identified in G13 of the building code or NZS4404 and pressure sewer chamber covers are finished above ground levels (covers are vented and allow storm water to enter the chamber if they become submerged).
- Staged restarts after power failure (last numeral of address times 10 minutes after power restored).

It is noted that properties serviced via existing STEP systems would be retained, however these may be redirected into the terminal WWPS within the development area. This will be assessed further at substantive application stage.

7.3. Terminal Wastewater Pump Station and Rising Main

A proposed terminal wastewater pump station (WWPS) could be located in the general location of the former golf clubhouse at 8 Mapleham Drive. The WWPS would collect flows from the discrete areas of the development service via pressure sewers and then pump the wastewater to the Woodend WWTP via a new circa 2km long rising main. Whilst the pressure sewer pumps can theoretically convey flows all the way to the treatment plant, the use of a terminal WWPS and rising main is considered a better option, reducing household pump heads and ensuring that sufficient velocities are achieved in the rising main. Refer Figure 3 for details.

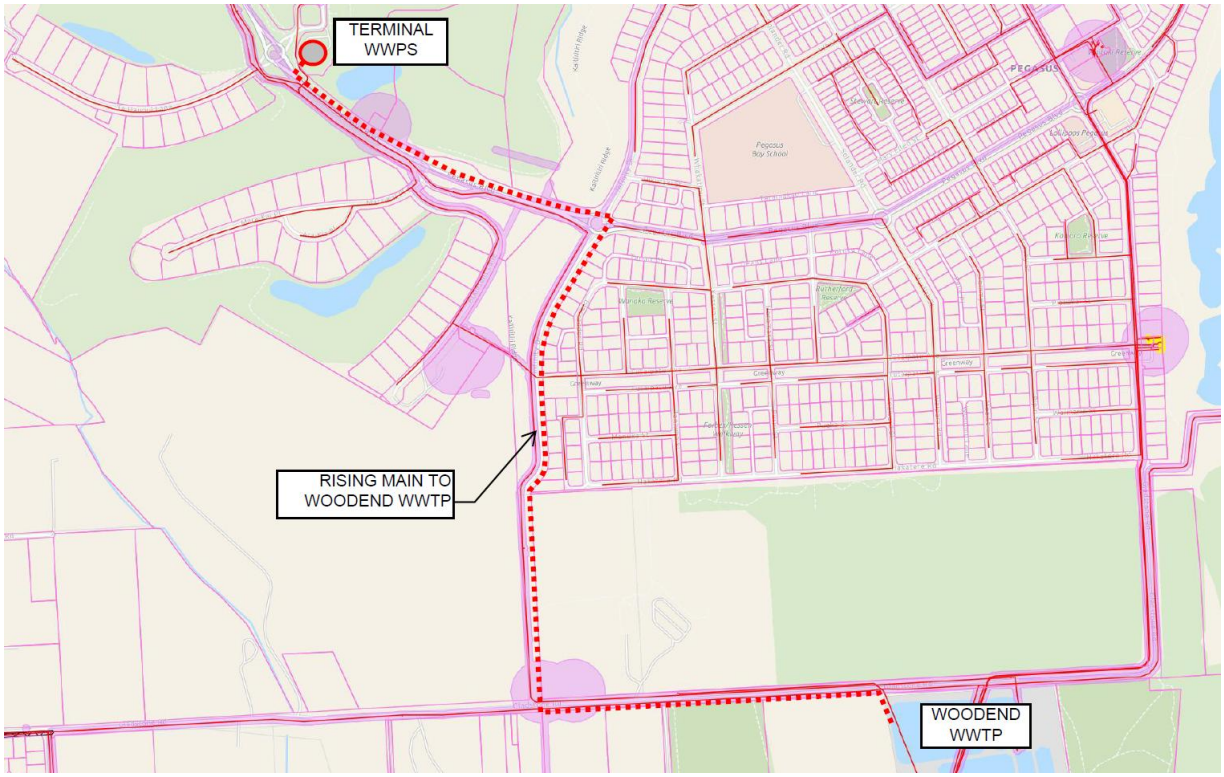

Figure 3. Terminal Wastewater Pump Station and Rising Main Sketch Plan (Source: WDC GIS)

Treatment facilities would be required at the terminal wastewater pump station location, for odour, and potentially for septicity.

Given the initial low flows arising from the development, so as to manage septicity issues and ensuring adequate velocities in the rising main, the option of discharging the Kesteven Place WWPS into the proposed terminal WWPS (which would then pump back into the existing DN280 rising main) could be considered. This would allow velocities to be maintained and retention times minimised to mitigate the risk from septicity.

Once there were sufficient flows from the development, a new rising main from the terminal WWPS could then be constructed to the Woodend WWTP. The option to maintain Kesteven Pl WWPS discharging into the terminal pump station could be reviewed at this time, with the option maintained, or reverted back to pumping directly to the WWTP via the existing rising main.

It is also recommended that consideration be given to the development staging. Ideally each area would be developed from closest to the pump station to furthest, with each area predominately built out before the subsequent development area commenced. This minimises the time that a pressure sewer system is operating with a smaller percentage of the ultimate properties connected. When a small percentage of houses are connected, experienced velocities are low and retention time high, leading to potential odour and septicity issues.

8. Stormwater Management

8.1. Existing Stormwater Servicing

Existing residential lots as well as the former golf course clubhouse within the subject area drain stormwater runoff to roadside swales as part of the low-impact design solution that provides for primary flow conveyance and water quality treatment. In general, there is limited piped infrastructure within the subject area, other than swale outlets which drain to the existing constructed stormwater ponds within the former golf course, pipes draining some of the properties to the ponds or in locations where road culverts have been installed to drain the ponds to existing watercourses. Refer to Figure 4.

Figure 4. Existing Public Stormwater Network (Source: WDC GIS)

The existing constructed stormwater ponds are understood to have provided source water for irrigation of the former golf course, which are shallow (in the order of approximately 1m deep). It is likely that the ponds also provide some flood storage based on overland flow and the nature of the current landform which may drain towards the ponds.

8.2. Future Stormwater Servicing

Future stormwater design will be undertaken in accordance with WDC criteria as outlined in the Engineering Code of Practice which will ensure that all infrastructure created and to be vested as public is and will remain fit for the intended life of the asset. They key design requirements will be to convey the 10% AEP (1 in 10 year) storm event, with exceedance flows from larger rainfall events for the 1% AEP (1 in 100 year) storm events conveyed via defined overland flow paths.

In addition, stormwater management shall consider the Ngai Tahu Subdivision and Development Guidelines, which includes the following:

- 2.1: All new developments must have on-site solutions to stormwater management (i.e. zero stormwater discharge off site), based on a multi-tiered approach to stormwater management that utilises the natural ability of Papatüänuku to filter and cleanse stormwater and avoids the discharge of contaminated stormwater to water [refer to Section 5.4, Policy P6.1].
- 2.2 Stormwater swales, wetlands and retention basins are appropriate land based stormwater management options. These must be planted with native species (not left as grass) that are appropriate to the specific use, recognising the ability of particular species to absorb water and filter waste.
- 2.3: Stormwater management systems can be designed to provide for multiple uses. For example, stormwater management infrastructure as part of an open space network can provide amenity values, recreation, habitat for species that were once present on the site, and customary use.
- 2.4: Appropriate and effective measures must be identified and implemented to manage stormwater runoff during the construction phase, given the high sediment loads that stormwater may carry as a result of vegetation clearance and bare land.
- 2.5: Councils should require the upgrade and integration of existing stormwater discharges as part of stormwater management on land rezoned for development.
- 2.6: Developers should strive to enhance existing water quality standards in the catchment downstream of developments, through improved stormwater management.

A stormwater management plan and flood assessment has been prepared by Flowstate Consulting LP for the Pegasus West Development. While not detailed in this report, the key aspects for stormwater management as explained by Flowstate includes the following:

- As per existing, roadside swales to receive and convey runoff from the lots as well as roads. This will provide a water quality treatment function as well as some infiltration.
- The roadways will also function as the secondary flow path system and will direct runoff to stormwater management basins situated within the development.
- Stormwater management basins will be used to attenuate post-development runoff volumes and peak flow rates to pre-development conditions. It is anticipated that some of the existing stormwater ponds will be retained and/or reconfigured to accommodate the required storage volumes. In other locations, new stormwater ponds will be constructed to accommodate the required storage volumes.

Key constraints and mitigation of potential adverse effects associated with traffic impacts are considered in the separate stormwater report.

9. Water Supply

9.1. Existing Water Supply Servicing

Existing residential lots as well as the former golf course clubhouse within the subject area are serviced for water supply via the existing WDC reticulated water supply network comprising watermains varying in size from 150NB to 250NB and 50NB ridermains. Fire hydrants are located along the existing roadways for firefighting supply.

Water is supplied to the local network via the Pegasus water treatment plant (WTP) located at 15 Atkinsons Lane, which receives and treats water from a number of well extraction sites in the surrounding area.

It is noted that an existing water permit CRC181927 was granted by the Canterbury Regional Council (ECan) to the former golf course, which permits groundwater take via a bore for community supply (to be former clubhouse) and irrigation. The approved volume comprises 2,798 m^3/day for irrigation and 60 m^3/day for community supply, a total permitted water take of 2,858 m^3/day.

8.2. Future Water Supply Servicing

Future water supply design will be undertaken in accordance with WDC criteria as outlined in the Engineering Code of Practice which will ensure that all infrastructure created and to be vested as public is and will remain fit for the intended life of the asset. In addition, all water supply and use shall be undertaken in accordance with the Ngai Tahu Subdivision and Development Guidelines, which includes the following:

- 4.1 New developments should incorporate measures to minimise pressure on existing water resources, community water supplies and infrastructure, including incentives or requirements for:

  (i) low water use appliances and low flush toilets; (ii) grey water recycling; and (iii) rainwater collection.

- 4.2 Where residential land development is proposed for an area with existing community water supply or infrastructure, the existing supply or infrastructure must be proven to be able to accommodate the increased population prior to the granting of subdivision consent.
- 4.3 Developments must recognise, and work to, existing limits on water supply. For example, where water supply is an issue, all new dwellings should be required to install rainwater collection systems.

Preliminary consultation with WDC has confirmed that the existing water supply network has neither source nor treatment capacity to service the development through the existing public WDC network. As per WDC's advice to the adjacent Gressons Road ODP area, similarly for the Pegasus West Development an additional supply source and treatment plant will be required, which will need to be integrated with the existing supply for redundancy and resilience purposes.

Based on WDC residential water-demand allowances, the estimated demands are as follows:

- Total average-day demand: 909 m^3/day
- Total peak-day demand: 1,438 m^3/day
- Peak-hour demand: 94 L/s

Given that the existing permit allows for a water take of up to 2,858 m^3/day, it is expected that the onsite bore will be available to supply the estimated peak-day demand of 1,438 m^3/day for the Pegasus West Development (being less than the consented volume) with a new treatment and storage facility installed as required. This will be investigated through the substantive design to determine the most suitable location of the facility.

A possible variation to the water-take consent may also be required due to the change in use to a majority of community supply rather than for irrigation supply, however this isn't expected to be an issue.

Servicing of the site will require extension and integration with the existing reticulated water supply network. Internal reticulation within the future development is anticipated to comprise potable water mains ranging between 100NB and 150NB. Each lot would be provided with an individual metered water connection installed in accordance with WDC standards.

9.2. Firefighting

Firefighting requirements for the site shall be based on Standards New Zealand New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ 4509:2008 Section 4.4 Tables 1&2. It is expected that FW2 classification will apply to the development for residential landholdings. For commercial landholdings, this will be subject to specific fire design in determination of the applicable classification.

10. Utility Services

10.1. Existing

Existing power and telecommunications infrastructure is in place within the site and currently services the residential properties as well as former golf course clubhouse. It is expected that the existing infrastructure will be retained.

10.2. Proposed

For power servicing, based on preliminary advice from MainPower, from a transmission and zone substation perspective they do not currently anticipate any material power supply capacity constraints once their planned Coldstream Zone Substation project has been completed. They have further indicated that based on the proposed development, reinforcement within the local distribution network will support the additional demand, which is to be expected.

Similarly for telecommunications servicing, it is expected reinforcement within the local distribution network will be required to support the additional demand.

As the development concept is refined and load/demand assumptions understood, coordination with the utility services providers on the infrastructure that may be required to support the proposal will be confirmed.

11. Preliminary Assessment of Effects and Mitigation

Preliminary assessment of effects and mitigation are outlined in Table 2.

Table 2: Key Constraints & Mitigation of Potential Adverse Effects

Key Constraints	Comments
EARTHWORKS	
Proximity to natural wetlands and streams/riparian corridors	Delineation of natural wetlands and streams/riparian corridors will be established within the final masterplan which will establish the boundary of the proposed landform including ensuring there is sufficient separation for temporary sediment control measures during earthworks as well as permanent works.
Proximity to archaeological features/areas	Similarly, delineation of archaeological features/areas will be established within the final masterplan which will establish the boundary of the proposed landform/earthworks areas and ensure there is no encroachment into known areas of archaeological and cultural significance unless authorised by an archaeological authority. In particular, this includes the eastern area of the site around the Taeturu Wetland and Taeturu Stream.
Sediment discharge and site management during earthworks	The effects from uncontrolled sediment discharge are widely understood, primarily due to the impact on aquatic receiving environments such as streams and wetlands and effects to both flora and fauna. As outlined in Section 5.1, sediment discharge can be effectively mitigated by implementing erosion and sediment control during earthworks. These controls will be implemented in accordance with industry best practice and will effectively control sediment during earthworks. The devices outlined have been widely used over several decades to ensure sites are adequately managed and the receiving environment safeguarded from sediment discharges. In addition, a construction management plan will be implemented to ensure effective site management during the earthworks and civil works.
Flooding during earthworks/site works	The risk from inclement / severe weather can be adequately managed by regular weather forecast reviews and planning ahead before significant weather events. This can include maintenance or sediment control devices (such as cleaning out or dewatering SRPs/DEBs to increase storage capacity), ensuring there are adequate overflow or bypass measures (such as geotextile reinforced emergency spillways).
Works duration	Increased construction period may raise net sediment yield where earthworks areas are exposed for longer than anticipated. To mitigate, this, the aim will be to maximise productivity to minimise time sites are open. Additionally, earthworks and working areas should be progressively stabilised as soon as practicable once works are progressed.

WASTEWATER	
Woodend WWTP capacity	It is expected that additional capacity will need to be added to the Woodend WWTP alongside already planned expansion works. Through substantive and detailed design, coordination will be undertaken with WDC to confirm the upgrades needed, the costs associated with these works, and the timing of these, to ensure both this development and the others planned in the network and serviced.
Low in-flow during initial stages of development build-out leading to odour and septicity issues	Use a LPS system to minimise pipe lengths and retention times as well as maximising velocities within the reticulation whilst not exceeding desired pump heads and limiting high residence times leading to odour and septicity issues. The LPS system would discharge to a new terminal WWPS. Given the initial low flows arising from the first stages of the Pegasus West Development that drain to the terminal WWPS, so as to manage septicity issues and ensuring adequate velocities in the rising main, the option of discharging the Kesteven Place WWPS into the proposed terminal WWPS (which would then pump back into the existing DN280 rising main) could be considered. This would allow velocities to be maintained and retention times minimised to mitigate the risk from septicity.
WATER SUPPLY	
Water supply treatment plant capacity	WDC have confirmed there is no capacity within the existing public network. Use of the existing consented water-take bore with and associated treatment and storage facility will need to be implemented as part of the development.

It is expected that resolution of potential effects as identified will be addressed through the substantive application and detailed design stages. Overall however, any potential effects are considered to be largely confined to the development site and immediate surrounding area, with no significant adverse effects identified within the wider catchment. Offsite effects, such as on the WWTP and water supply reservoir, can be adequately addressed through engineering design to increase capacity within the network.

12. Conclusions

This assessment has considered the civil engineering aspects including earthworks, erosion and sediment control, 3-waters and utilities servicing relevant to the Pegasus West Development.

Bulk earthworks will be necessary across the designated development areas of the site comprising a cut and fill operation for the formation of lots/building platforms, reserves and roads/access as well as formation of the stormwater management areas. Earthworks and civil works will need to be actively managed to ensure potential sediment and erosion environmental effects will be effectively managed and/or mitigated. This management will include staging the construction, progressive stabilisation and employing appropriate erosion and sediment control measures

New wastewater, stormwater and water supply infrastructure (3-waters) will need to be implemented to service the development. Future 3-waters design will be undertaken in accordance with WDC criteria as outlined in the Engineering Code of Practice which will ensure that all infrastructure created and to be vested as public is and will remain fit for the intended life of the asset.

For power and telecommunications servicing, it is expected reinforcement within the local distribution network will be required to support the additional demand.

It is expected that resolution of potential effects as identified will be addressed through the substantive application and detailed design stages. Overall however, any potential effects are considered to be largely confined to the development site and immediate surrounding area, with no significant adverse effects identified within the wider catchment. Offsite effects, such as on the WWTP and water supply reservoir, can be adequately addressed through engineering design to increase capacity within the network.

On this basis, no civil engineering-related matters have been identified that would prevent the development from being appropriately resolved at the substantive Fast-track Approvals Act application stage.

13. Limitations

This assessment contains the professional opinion of Civix Limited staff relating to this development. Civix Limited staff used their professional judgement and acted in accordance with the standards of care and skill normally exercised by professional engineers providing similar services in similar circumstances. No other express or implied warranty is made as to the professional advice contained in this report.

We have prepared this report in accordance with the brief provided and following our terms of engagement. The information contained in this report has been prepared by Civix Limited for the client Wolfbrook Property Group Developments (Pegasus) Limited, their professional advisers, the Minister for Infrastructure and other invited commenters / participants that are involved in the consideration of a referral application under the Fast-track Approvals Act 2024, and the relevant Local Authorities in relation to the specified project brief described in this report. No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of or reliance on this assessment by any third party.

The assessment is also based on information that has been provided to Civix Limited from other sources or by other parties. The assessment has been prepared strictly on the basis that the information that has been provided is accurate, complete, and adequate. To the extent that should any information be inaccurate, incomplete or inadequate, Civix Limited takes no responsibility or liability whatsoever for any loss or damage that may result from any design and assessment based on information that has been provided to Civix Limited.