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6/03/2023

47 GOLDING ROAD & 50 PUKEKOHE EAST ROAD, PUKEKOHE

STORMWATER MANAGEMENT PLAN

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Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe | Stormwater Management Plan

Dear Aedifice Development n.1 Ltd,

Thank you for the opportunity for Civix to provide an Stormwater Management Plan for the Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe.

The report and drawings contained in this document show infrastructure details for the Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe.

Please do not hesitate to contact us if you have any questions on this report,

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Additional documents referred in this report are saved under OneDrive link:

https://civixlimited-my.sharepoint.com/:f:/g/personal/joshua_civix_co_nz/Eu0kNlF_PjdMnSFbR0MYCJEBCv-onbPdxF2ad4yyLB94TQ?e=BH3zMt

1. Executive Summary

Civix have been engaged to undertake civil design for the 47 Golding Road & 50 Pukekohe East Road, Pukekohe development. The proposed residential zoning area of 27.23Ha includes new public local roads, private common recreation areas and up to 580 new residential units.

The stormwater management strategy for the site has developed to meet the requirements in the Auckland Unitary Plan, specifically the provisions set out in the following sections:

- Section E1 – Water quality and integrated management
- Section E8 – Stormwater discharge and diversion
- Section E9 – High contaminant generating carparks and high use roads
- Section E10 – Stormwater management area – Flow 1 and Flow 2
- Section E36 – Natural hazards and flooding

Authorisation under Auckland Council's Healthy Waters approved Regionwide Stormwater Network Discharge Consent (NDC) is sought. In accordance with the requirements of Schedule 4 of the NDC, the development is classified as Greenfield.

This report demonstrates that the following outcomes will be achieved:

- No new/additional habitable floor affected by flooding in 1% AEP event will be created and no increase in frequency of existing flooding of buildings will be created.
- No significant increase in risk to the operation and structural integrity of other infrastructure from a 1% AEP event will occur.
- No increase in inundation that affects a building on property in 10% AEP.
- No loss in overland flow path capacity will occur, though overland flow paths will now primarily be directed across the roading network.
- All major capital works projects consider, and where appropriate implement, a green infrastructure option in accordance with the Healthy Waters Green Infrastructure Policy. An assessment against that policy is included, all infrastructure proposed is 'green infrastructure' pursuant to that policy.
- Appropriate erosion protection/mitigation will be provided for any new outfall in accordance with the Stormwater Code of Practice.
- No stormwater is directed to a different receiving environment.

This report also outlines the management approach / key elements of the catchment and provides an assessment, which includes such detail as corresponds with the scale and significance of the effects of the proposal, of how an Integrated Stormwater Management Approach has been adopted in the design and associated stormwater management in accordance with the policies in the AUP Sections E1.3, B7 and B8 (See Annexure 1). This assessment shows how the SMP seeks to:

- Minimise the stormwater related effects of development
- Retain/restore natural hydrology as far as practicable
- Minimise the generation and discharge of contaminants (including gross Stormwater pollutants) and stormwater flows at source
- Minimise temperature related effects
- Enhance freshwater systems including streams and riparian margins
- Minimise the location of engineered structures in streams
- Protect the values of Significant Ecological Areas as identified in the Auckland Unitary Plan

A summary of the stormwater management strategy for the site is summarised in Table 1 below.

Table 1 Stormwater Management Summary

Requirement	Design response
Water Quality	Litter traps, raingardens and wet ponds are proposed to treat runoff from public roads, while storm filters are proposed for private COAL's. Stormwater treatment devises will be designed and constructed in accordance with GD01.
SMAF1 - Retention (5 mm) and reuse on site	Roof water for all dwellings will be collected via tanks and used for non-potable purposes. No retention is recommended for Roads due to stability issues.
SMAF1 – Detention (95th percentile)	Detention for the site is provided via Detention Ponds that meets the NDC objectives. This solution has been chosen as it is the SMAF 1 specified outcome, which is the most restrictive outcome and will achieve equivalent hydrology (infiltration, runoff volume, peak flow) to pre-development (grasses state) levels for the dwellings.
Stream hydrology	No direct discharge to stream is considered. Stormwater discharge into the stream only occurs once the runoff is treated within raingardens and ponds. See sections 6.2.2
Assets – General	Assets proposed for the development follow Auckland Council Stormwater Code of Practice Guidelines. Device selection has considered the life cycle costs of the assets and are assessed as the Best Practicable Option for the site.
Primary Drainage Network	The underground drainage network will be sized for 10% AEP design storm. The design ensures that there is sufficient capacity within the pipe network downstream of the connection point to cater for the stormwater runoff associated with the development in a 10% AEP event including incorporating flows from contributing catchments at maximum probable development with expected mitigation for upstream areas. See section 6.2.3
Flood Hazard Management	TuFlow modelling has been carried out on the development and found that the design of the development safely conveys flows through the site. The modelling also found minor increases in flood levels downstream in the 1% AEP event from the development if no mitigation is included in the design. To mitigate this, 1% AEP attenuation is provided in the form of detention ponds to maintain runoff levels on the site at existing levels. The modelling of the 10% AEP for the site showed a reduction in flood levels downstream.
Buildings 1% AEP event	No buildings are within the 1% AEP and floor levels have been set to provide the required freeboard for habitable dwellings. See section 6.2.4

2. Existing Site Description

The subject site is located to the southeast of Pukekohe township and bound by Pukekohe East Road to the north, Golding Road to the west and future urban zoning to the east and south. Refer to figure 1 below.

Figure 1 – Golding-Pukekohe East Location

The subject site encompasses the following properties:

Address	Legal Description	Site Area	Ownership
47 Golding Road, Pukekohe	Lot 1 DP 392968	9.04 ha	Applicant
50 Pukekohe East Road, Pukekohe	Pt Allot 15 Parish Pukekohe District	18.19 ha	Applicant

Refer to Appendix C – Title Record

The properties cover a combined area of approximately 27.23 hectares and are henceforth referred to as 'the site'. Under the Auckland Unitary Plan, the site is zoned 'Future Urban Zone'.

Vegetation across the site comprises grass across all the paddocks, a shelterbelt of large trees near the south-eastern corner and riparian vegetation such as trees and bushes along the permanent stream that passes through the site.

The development is generally considered as greenfield in nature due to the limited presence of any civil infrastructure within the site capable of supporting the proposed development. Consequently, the required infrastructure will have to be extended from existing services within the road frontages along the site boundaries and new infrastructure constructed.

2.1. Topography

The topography of the site is generally a steep contour falling to the centre of the site, before flowing west. Refer Figure 2 – Site Topography.

The topography generally slopes down at inclinations less than 18° toward a west draining gully which runs through the approximate centre of the site and exits the site through the western boundary. There are five areas where the ground slopes are steep (approximately 25°) and a smaller area around the south-west of the site where the ground is moderately steep (approximately 16°). These areas are identified on Figure 2 below.

Figure 2 – Site Topography

2.2. Stormwater Catchment

The site is located within Whangapouri Creek stormwater catchment discharging into the Pahurehure Inlet of the Manukau Harbour. Refer to figure 3 below.

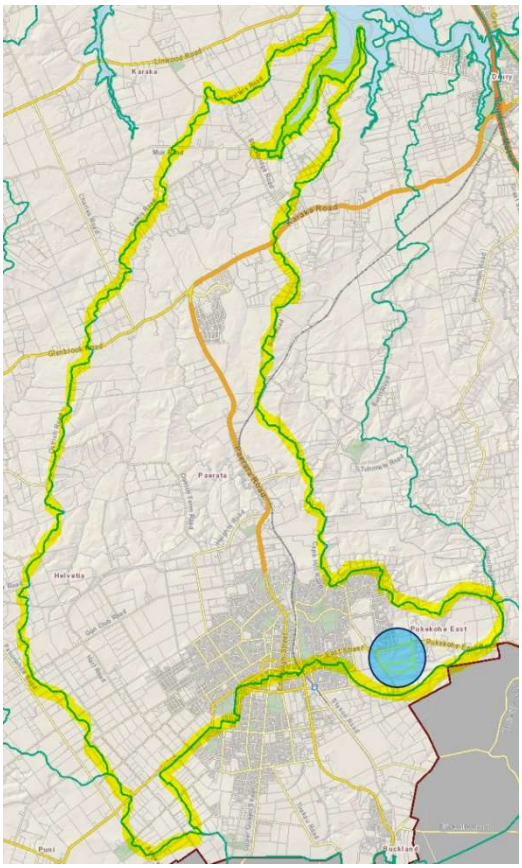

Figure 3 – Whangapouri Creek Catchment

The earthworks have been modelled in such a way that the existing drainage pattern to the Whangapouri Creek Stormwater Catchment will be maintained with the development post construction. This is to ensure the net cut & fill balance within the site is kept minimum, and to provide better connectivity for the roads & other infrastructure.

2.3. Geotechnical

Auckland Council provided two sources of soil information, GNS soil map which is the current Soils layer within the Auckland Council GIS database, and the Landcare S-Map from a specific study that was conducted for the Hingaia catchment and surrounding areas.

According to the Auckland Council GIS Soils layer, the geology of the catchment is mostly comprised of Pukekohe volcanic soils and alluvial soils, 58% and 42% respectively. The southern areas of the catchment are mostly volcanic soils, covering almost all of the Pukekohe North Subcatchment, and the majority of the Wesley Subcatchment mostly in the southern and western areas. The northern areas of the Whangapouri Creek catchment are alluvial soils. There is also a small pocket of alluvial soils located in the Pukekohe East volcanic crater, within the Pukekohe North Subcatchment. Technical Publication (TP) 108 rainfall-runoff guidelines (Table 3-2 – Hydrological Soil Classifications for prevalent Auckland Soils) classify volcanic soils as Group A and alluvial soils as Group B.

Based on the Landcare S-Map, much of the catchment is classified as HSG C soil with HSG D soils around the streams. There are also pockets of HSG A soils within the catchment and also along the eastern boundary of the Pukekohe North Subcatchment.

TP108 describes the SCS hydrological groups as:

- Group A – Low runoff potential and high infiltration rates;
- Group B – Moderate infiltration rates;
- Group C – high runoff potential and low infiltration rates.

Geotechnical Desktop study assessment of the site has been carried out by Soil & Rock. Refer to Appendix D - Geotechnical Assessment Report. Based on the Geotechnical assessment for the site we have utilised a permeable curve number of 50 for the development, as a compromise between class A and class B soils. For areas upstream of the site we have used a permeable curve number of 39 to represent Class A soils.

2.4. Existing Drainage Features and Stormwater Infrastructure

Based on Auckland Council Geomaps, there is no Public Stormwater assets existing within the site. However, there is an existing network on the northern side of Pukekohe East Road that utilises road drainage along Pukekohe East Road.

Any existing private pipes located within the site will need to be removed/re-laid to better suit the new finished ground levels.

2.5. Receiving environment

The stormwater from the site exits via the western boundary across Golding Road and travels through a gully along neighbouring parcels before heading towards an open watercourse running along the eastern side of Willowgrange Place. This open watercourse flows into Whangapouri Creek via permanent streams & culverts and eventually into the Pahurehure Inlet of the Manukau Harbour.

The Pahurehure Inlet is located on the south-eastern side of the Manukau Harbour. The Pahurehure inlet is the receiving environments for the Franklin area which has a long history of cultivation and livestock farming (Meijer, et al., 2006). There is a long-standing issue of elevated nitrate concentrations in surface and groundwater bodies in the Franklin area, associated with intensive horticultural production (Meijer,et al., 2016).

For decades the inlet and the harbour basin have been the recipients of sediment and polluted storm water that drains into the harbour. In August 2016, the Manukau Harbour received a D in Auckland Council's Marine Report Card for poor water quality. Hence, it can be considered as a degraded estuarine environment and warrants protection under the objectives and policies of the Auckland Unitary Plan Sections B7.3 and B7.4 including protection from adverse Water Quality Discharges.

Also, noted that Local and regional government, community groups and iwi are all working to improve the water quality and environment in this area. Pahurehure Inlet Esplanade Planting project has been funded to improve the health of the inlet and a healthier Manukau Harbour.

2.6. Existing Hydrological Features

An existing natural wetland is located in roughly the middle of the site adjacent to a permanent stream. A riparian margin & building offset will be established to protect this feature. The development will divert post development overland flow away from the natural wetland to maintain its nature. Other hydrological features include overland flow paths across the site.

2.7. Flooding and Flow Paths

As indicated on Auckland Council Geomaps, an overland flow path with a catchment area of 63ha exits the site on the western side. Flood plains associated with these OLFP are also present. Auckland Council Geomaps website

shows the overland flow paths are running towards Whangapouri Creek through the middle of the site which has several tributaries along its length. Refer to figure 3.

Figure 4 – showing the Overland Flowpaths (OLFP) on the left and Flood plains on the right

2.8. Coastal Inundation

The site is not at risk of Coastal Inundation.

2.9. Biodiversity

A comprehensive Ecological Impact Assessment (EcIA) has been undertaken by Bioresearches for the proposed development, refer to report "PC2 Ecological Impact Assessment: 47 Golding and 50 Pukekohe East Roads". This report details the ecological assessment that was undertaken by Bioresearches to determine the ecological features within the site and the significance of those features. Within this assessment, Bioresearches considers the ecological value of existing terrestrial and freshwater features on site and evaluates how the proposed Private Plan Change (PPC) may impact the value of these features. As necessary, recommendations are provided to aid in the avoidance, minimisation, or remediation of adverse effects that could arise as a result of the rezoning. It was concluded from the EcIA that the proposed zone change to a MHU zone will ensure adequate maintenance and enhancement of ecosystem services, indigenous biodiversity and areas of contiguous indigenous vegetation cover, while accommodating for the appropriate subdivision, use and development of urban land.

Refer to Appendix E - Ecological Assessment.

2.10. Archaeological and Heritage Sites

Archaeological assessment of the site has been carried out as part of the plan change application process. Refer to Appendix F – Archaeological Assessment.

2.11. Contaminated Land

Contaminated Land assessment of the site has been carried out by Soil & Rock Consultants as part of the preliminary site investigation.

Refer to Appendix D - Geotechnical Assessment Report.

3. Development Summary and Planning Context

A review of the relevant stormwater guidelines and policies were carried out to determine the appropriate stormwater and flooding requirements to adopt in the Stormwater Management Plan for this development. The relevant requirements are summarised in Table 2.

Table 2 Regulatory and design requirements

Requirement	Design response
Unitary Plan – SMAF hydrology mitigation	5mm retention tanks with non-potable water reuse for all dwellings Extended Detention Volume for stream protection via Detention Ponds for all paved surfaces.
High Contaminant Generating Areas	Treatment for the site to be provided via litter traps, raingardens, and wet ponds prior to discharging into the natural stream.
Natural Hazards	Flood modelling and assessment. Design of the site to ensure safe access and that floor levels are not at risk of flooding.
Auckland Unitary Plan Precinct	N/A
Existing Catchment Management Plan	N/A
Auckland Council Regionwide Network Discharge Consent	Measures proposed to comply with the NDC

Table 3 Stormwater Management Summary

Requirement	Design response
Water Quality	Litter traps, raingardens and wet ponds are proposed for runoff from public roads while storm filters are proposed for COALs. Stormwater treatment devices will be designed and constructed in accordance with the GD01.
SMAF1 - Retention (5 mm) and reuse on site	Roof water for all dwellings collected via tanks and used for non-potable purposes. No retention is recommended for Roads due to stability issues. This solution has been chosen as it is the SMAF 1 specified outcome, which is the most restrictive outcome and will achieve equivalent hydrology (infiltration, runoff volume, peak flow) to pre-development (grasses state) levels for the dwellings.
SMAF1 – Detention (95th percentile)	Detention for the site is provided via Detention Ponds that meets the NDC objectives.
Stream hydrology	No direct discharge to stream is considered. Stormwater discharge into stream only occurs once the runoff is treated with litter traps, raingardens and ponds. A slow discharge from the ponds to the stream is carefully designed to achieve neutrality and for stream protection. See sections 6.2.2
Assets – General	Assets proposed for the development follow Auckland Council Stormwater Code of Practice Guidelines. Device selection has taken into account the life cycle costs of the assets and are the Best Practicable Option for the site.
Primary Drainage Network	Underground drainage network sized for 10% AEP design storm. The design ensures that there is sufficient capacity within the pipe network downstream of the connection point to cater for the stormwater runoff associated with the development in a 10% AEP event including incorporating flows from contributing catchments at maximum probable development. See section 6.2.3
Flood Hazard Management	TuFlow modelling has been carried out on the development and found that the design of the development safely conveys flows through the site. The modelling also found minor increases in flood levels downstream from the development if no mitigation is included in the design. To mitigate this, 1% AEP attenuation is provided in the form of drainage ponds to maintain runoff levels on the site at existing levels.

Requirement	Design response
Buildings 1% AEP event	No buildings are within the 1% AEP and floor levels sighted to provide required freeboard for habitable dwellings. See section 6.2.4

4. Mana Whenua Values

Mana whenua values are intrinsic to the design, construction, and management of stormwater devices in the Auckland region. A review has been completed to ensure the stormwater design for the site aligns with Mana whenua values.

Ngāti Te Ata and Ngāti Tamaoho Iwi groups have been engaged to prepare a Cultural Assessment for the proposed PPC.

The stormwater design for the site aligns with mana whenua concerns around the responsibility to ensure that the mauri or life force of water which may be damaged, destroyed, or modified pollution of a stream, river, estuary, catchment or harbour.

A rain tank will be proposed for each of the dwellings to collect the roof water and will be re-used for non-potable purposes. Road water (such as public roads and COALs) will be conveyed to the detention ponds where it will be detained and slowly released into the stream.

The stormwater principles applied to the site are adopted and in compliance with the GD01 and GD04 stormwater guidelines.

Where the outfalls are proposed to the stream, a natural look with rip-rap protection at the discharge point will be provided. All cesspits in roads (public roads & COALs) are proposed with “SW360 litter trap or enviro-pod”. There has been one natural wetland identified in the site and is proposed to be retained and protected in-situ.

Stream degradation has been mitigated using a number of methods. Suitable planting is proposed with the detention pond to add treatment prior to discharge into the stream restores the Mauri of the water through the land-based treatment.

Ngāti Tamaoho are based around the protection, restoration and/or enhancement of the natural environment and environmental health which is reflected through the use of stormwater treatment, retention and detention devices on site.

Overall, the stormwater design aligns with the values of Ngāti Te Ata and Ngāti Tamaoho Iwi groups by utilising reuse tanks within the lots, soakage, drainage reserve land & detention ponds.

5. Proposed Development

5.1. Location and Area

Refer to Section 2 of this report for details of the site.

5.2. Purpose of the Development

The site proposal is to create new public and local roads, several private accessway’s, rear lanes, side lanes, carparking areas and pedestrian walkways to service up to 580 residential units. In addition, a shared use path along the stream is planned and will provide amenity and shared facilities for residents in the area.

The development proposal requires upgrading sections of Golding Road. It also requires the creation of new intersections on Golding Road and Pukekohe East Road. Upgrades/relocation of existing infrastructure will be undertaken where these new roads intersect and along site boundaries as required.

This proposal is to seek subdivision and land use consent for an integrated development within plan change approval application process.

Figure 6 – showing the proposed roading layout of the site (refer to Concept Master Plan for details)

5.3. Site layout and urban form

Refer to the scheme plan, architect layout document for the development. Refer to Appendix G – Concept Master Plan of the Plan Change Report.

5.4. Earthworks

Earthworks will be consented with council after obtaining approval for plan change application. Earthworks associated with the proposed development within the subject site relate to a total area of 271,000 m² with a earthworks volume of 628,000 m³ is proposed in the consent design. This consists of 541,000m³ of cut 26,000 m³ of fill & 61,000 m³of topsoil. Earthworks are required for trimming and shaping the existing topography to form the following:

- The road network with adjacent pedestrian footpaths/berm
- Building platforms for the houses
- Trenching works related to drainage and utility services

The overall methodology is to create, house platforms following the existing landform. Unsupported earthworks batters will be restricted to a maximum 1V:3H slope. Due to the topography of the site, retaining walls will be required to create the level platforms.

6. Stormwater management

A review of the relevant stormwater guidelines and policies was carried out to determine the appropriate stormwater and flooding requirements to adopt as part of this SMP. The relevant documents are as follows:

The general provisions set out in the Auckland Unitary Plan – Operative in Part:

- Section E1 – Water quality and integrated management,
- Section E8 – Stormwater discharge and diversion
- Section E9 – High contaminant generating carparks and high use roads
- Section E10 – Stormwater management area – Flow 1 and Flow 2
- Section E36 – Natural hazards and flooding

Authorisation under Auckland Council's Healthy Waters Network Discharge Consent is sought. Under section E8 of the Auckland Unitary Plan, Council's assessment criteria includes whether the relevant network discharge consent has been considered (clause E.8.7.2.1.b) as part of the stormwater management strategy.

Per Auckland Council's regionwide network discharge consent, the development is classified as Greenfield.

6.1 Principles of stormwater management

The following principles will guide the management of stormwater for the site.

- Water Quality
    - Treatment of all impervious areas by a water quality device that removes contaminants and is approved by Auckland Council.
- SMAF1 Provisions
    - Retention (volume reduction) for the first 5mm of runoff for impervious areas where appropriate.
    - Detention (temporary storage) with a drain down period of 24 hours for the difference between the pre-development (grassed state) and post development runoff volumes from the 95th percentile, 24 hour rainfall event minus the retention volume for all impervious areas.
- Ensure that there is sufficient capacity within the pipe network downstream of the connection point to cater for the additional stormwater runoff associated with the development in a 10% AEP event; or
- Demonstrate that flows in excess of the pipe capacity in a 10% AEP event within the pipe network downstream of the connection point will not increase flooding of any other property; or
- Demonstrate through an assessment that flows in excess of the pipe capacity in the 10% AEP event within the pipe network downstream of the connection point will not increase adverse effects on any other property.

6.2 Proposed stormwater management

The proposed stormwater management strategy for the site is described in the following sections.

6.2.1 Water quality

Contaminants of concern for carparks are generally high levels of total suspended solids (TSS) and dissolved metals such as zinc and copper.

Under the Auckland Unitary Plan, car parking areas exceeding 30 spaces is considered a 'high contaminant generating activity' and requires runoff to be treated for contaminants of concern.

The COAL areas are proposed to be constructed of concrete thus impermeable. While the number of traffic movements do not class the COALs as a high contaminant generating activity, treatment of all new impervious surfaces is required under Schedule 4 of the NDC and Clause E.6.3.1 of the Auckland Unitary Plan. Storm filters are proposed to treat all the impervious COAL areas while roadways are proposed to be treated via litter traps, raingardens and wet ponds prior to slowly discharging the runoff into the natural stream.

Under Schedule 4 of the NDC, gross pollutant traps are required for runoff from communal waste storage areas. A LittaTrap will be placed in the catchpit capturing runoff from the waste storage areas.

6.2.2 Stream hydrology

To protect stream hydrology, the following SMAF1 equivalent hydrology mitigation is proposed for the site:

- Reuse of 5mm of roof runoff into the proposed dwellings for non-potable use (laundry and flushing purposes):
    - This will include private stormwater tanks on each individual lot for capturing roof runoff and feeding these back into the dwellings for non-potable reuse.
- Retention of 5mm of runoff from COAL areas.
- No soakage is proposed for Road areas due to risks around undermining the structure of the roadway and the creating of many small soakage assets that would required expensive maintenance. Instead, we proposed to distribute the 5mm volume requirement throughout the tanks and soakage areas for the private areas of the development, so that the retention volume of 5mm of impervious areas is provided within the development. Road pavement areas are approximately 15% of the development impervious area, based on this relatively small fraction of overall impervious surfaces not receiving retention directly the effects of this will be insignificant on receiving stream hydrology.
- Detention (temporary storage) with a drain down period of 24 hours for the difference between the pre-development (grassed state) and post development runoff volumes from the 95th percentile, 24 hour rainfall event minus the retention volume for all impervious areas:
    - This will include detention ponds within the development site for capture, detention, treatment and slow release of runoff from both COAL & Public Roading areas.

Post development areas and the proposed hydrology mitigation has been summarised in Table 3.

Table 4: Proposed mitigation

Location	Proposed Mitigation
Roof area on lots	Retention via tanks and reuse for non-potable purposes
COAL – Traditional hardstand area	Retention and detention via tanks, Water Quality treatment via stormfilter
Roadways	Water Quality treatment & detention via raingardens, litter traps and Detention Ponds
Landscaped Area	No mitigation required

6.2.3 Network capacity

The stormwater network will be designed to have sufficient capacity for the development. The flood basin for the site has been sized to utilise the existing culverts as hydraulic controls to maintain downstream flows and water levels at pre-development conditions. The TuFlow flood modelling for the 10-year scenario shows a reduction in water levels downstream so the development proposed is over mitigating the 10 year event.

6.2.4 Flooding

Rainfall

The latest rainfall modelling statistics in the Auckland Council Stormwater Code of Practice Version 3.0 have been utilised in the development of the TuFlow modelling for this development. TuFlow model files are available on request to review the modelling parameters utilised.

Curve Numbers

According to the site geotechnical investigation undertaken by Soil & Rock Consultants (dated December 2021), the site soils comprise a mix of tuff (volcanic soils) as described in Group A (CN =39) and alluvial soils more comparable to Group B (CN=61). This SCS soil classification is then used to determine the permeable curve number of 50 which is the average between the two soil groups found in the site. While a curve number of 98 was used for all impervious areas.

Impervious Coverages

Existing impervious coverages were calculated specific to delineated catchments based on known impervious coverages in the catchment.

Future impervious coverages have been modelled at 60% of the catchment area. This takes into account the expected development of the Residential Lots (70% impervious cover) as well as the large drainage reserve required. As the 100 year flows are slightly increased in the 100 yr event, any increase in this impervious cover will result in adverse flooding effects downstream. For this reason, we recommend that the residential lots are legally restricted to a maximum of 70% impervious cover to avoid adverse effects on flooding downstream.

Results

As indicated on Auckland Council Geomaps, several overland flowpaths (OLFP) with catchments are located across the extent of the site. Flood plains associated with these OLFP are also present.

A flood assessment evaluation has been undertaken to assess the flows within the site and upstream/downstream of the site. Flood modelling has been undertaken using TuFlow. The assessment calculations are based on maximum probable development and are factored for climate change. The extent of the flooding in the existing and proposed development scenarios are shown in drawing 55000 series. Refer to Appendix A - Tuflow Flooding Results of this report. The preliminary afflux results indicate the proposed development will not significantly affect water levels on downstream properties in the 100 year design events with the proposed drainage ponds.

There are some minor downstream water level changes which will be addressed via detailed design of the development levels and via detention tanks provided within the lots. Refer Flood Modelling Report for details on input parameters and results.

Based on the TuFlow Results, there is an increase in the peak flow discharging out of the site in the proposed scenario when compared to the existing. Detailed design of the proposed detention ponds will lower the difference between the proposed and existing scenario. Further stormwater mitigation for this additional flow is provided in the form of retention (resuse) and detention (temporary storage) within the site.

All the dwellings are proposed to be serviced with stormwater tanks that will facilitate reuse and detention of stormwater flows.

All finished floor levels for the proposed dwellings will be set a minimum of 150mm above flood levels where these are less than 100mm depth and a minimum 500mm above flood level where this is more than 100mm depth.

Flow depths within the public road reserve are generally below 200mm. Flow depth x velocities are generally below 0.6 m^2/s, which is considered acceptable.

6.3. Development staging

Construction is intended to be staged according to the scheme plans provided to council. SMAF detention mitigation for roadways and COALs will be provided via the proposed detention ponds which will be installed with the first stage of the development. The primary stormwater network will be developed to allow flexibility with staging.

6.4. Hydraulic connectivity

The development is connected Hydraulically through a new public Stormwater piped network which discharges into the constructed ponds.

6.5. Asset ownership

Drainage assets that drain more than 1 title are proposed as public. Treatment and mitigation systems for privately owned lots are proposed as private.

6.6. Ongoing maintenance requirements

Ongoing maintenance of the private drainage system and tanks on individually owned lots will be the responsibility of the private landowner.

Ongoing maintenance of COAL areas and the treatment systems mitigating these areas will be the responsibility of an Incorporated Society which is owned by all residents of the development.

Ongoing maintenance of the public drainage network, the raingardens mitigating road runoff, and wet ponds will be the responsibility of Council / Auckland Transport.

7. Conclusions

- SMAF mitigation requirements for the site are met via dual use tanks for residential lots and private COALs.
- The 10 year flood event can be safely conveyed through a new public drainage network system within the site. Flows and levels downstream in the 10 year event are not predicted to increase.
- The 100 year flood event can be safely conveyed through the site via the proposed 3D form of the site.
- The proposed development will not increase flood risk for surrounding properties through the mitigation of peaks flows by 100 year detention.
- Ecology of the significant ecological areas will be maintained/enhanced.

8. Limitations

- This assessment contains the professional opinion of Civix Staff relating to this development. Civix 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 for the client and is exclusively for its client use and reliance. It is not possible to make an assessment of this report without understanding the terms of engagement under which it has been prepared, including the scope of the instructions and

directions given to and the assumptions made by Civix. The assessment will not address issues which would need to be considered for another party if that parties' particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. 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 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, completed, and adequate. To the extent that any information is inaccurate, incomplete or inadequate, Civix takes no responsibility or liability whatsoever for any loss or damage that results from any design and assessment based on information that has been provided to Civix.

ANNEXURE 1:

Integrated Stormwater Management Approach has been adopted in the design and associated stormwater management in accordance with the policies in the AUP 3 Sections E1.3, B7 and B8.

Chapter E1.3

AUP Section E1.3 (Policies)	Comment
(1) Manage discharges, until such time as objectives and limits are established in accordance with Policy E1.3(7), having regard to: (a) the National Policy Statement for Freshwater Management National Bottom Lines; (b) the Macroinvertebrate Community Index as a guideline for freshwater ecosystem health associated with different land uses within catchments in accordance with Policy E1.3(2); or (c) other indicators of water quality and ecosystem health.	Recommendations provided in the ecological report from Bioresearches : Assessment of Ecological Effects" ("Bioresearches Report");
(2) Manage discharges, subdivision, use, and development that affect freshwater systems to: (a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below; or (b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below.	Proposed detention ponds, rain gardens and litter traps will maintain the quality and flows of freshwater systems and a significant amount of extra riparian planting will be provided in landscape yet to be done and comments will be made accordance with the landscape plan
(3) Require freshwater systems to be enhanced unless existing intensive land use and development has irreversibly modified them such that it practicably precludes enhancement	Freshwater systems will be addressed with the Bioresearches Report.
(4) When considering any application for a discharge, the Council must have regard to the following matters: (a) the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of freshwater including on any ecosystem associated with freshwater; and (b) the extent to which it is feasible and dependable that any more than a minor adverse effect on freshwater, and on any ecosystem associated with freshwater, resulting from the discharge would be avoided.	Treatment is used as much as practicable in accordance with the green infrastructure policy. Limited but controlled stormwater flows will be discharged to freshwater systems.
(5) When considering any application for a discharge the Council must have regard to the following matters: (a) the extent to which the discharge would avoid contamination that will have an adverse effect on the health of people and communities as affected by their secondary contact with fresh water; and (b) the extent to which it is feasible and dependable that any more than minor adverse effect on the health of people and communities as affected by their secondary contact with fresh water resulting from the discharge would be avoided.	Treatment is used as much as practicable in accordance with the green infrastructure policy. Limited but controlled stormwater flows will be discharged to freshwater systems.
6) Policies E1.3(4) and (5) apply to the following discharges (including a diffuse discharge by any person or animal): (a) new discharge; or (b) a change or increase in any discharge of any contaminant into freshwater, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering freshwater.	See above
(7) Develop Freshwater Management Unit specific objectives and limits for freshwater with Mana Whenua, through community engagement, scientific research and mātauranga Māori, to replace the Macroinvertebrate Community Index interim guideline and to give full effect to the National Policy Statement for Freshwater Management.	See cultural impact assessments.

AUP Section E1.3 (Policies)	Comment
(8) Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by: (a) taking an integrated stormwater management approach (refer to Policy E1.3.10); (b) minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments; (c) minimising or mitigating changes in hydrology, including loss of infiltration, to: (i) minimise erosion and associated effects on stream health and values; (ii) maintain stream baseflows; and (iii) support groundwater recharge; (d) where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and (e) providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue.	Adverse effects have been avoided as far as practicable through: • 5mm Retention tanks • Detention Ponds • Rain gardens • Litter traps • Implementing recommendations of Bioresearches Report and controlling rate and speed of discharges when natural systems are involved.
(9) Minimise or mitigate new adverse effects of stormwater runoff, and where practicable progressively reduce existing adverse effects of stormwater runoff, on freshwater systems, freshwater and coastal waters during intensification and redevelopment of existing urban areas by all of the following: (a) requiring measures to reduce contaminants, particularly from high contaminant-generating car parks and high-use roads; (b) requiring measures to reduce the discharge of gross stormwater pollutants; (c) requiring measures to be adopted to reduce the peak flow rate and the volume of stormwater flows: (i) within sites identified in the Stormwater Management Area – Flow 1 and Flow 2 Control (as shown on the planning maps); (ii) where development exceeds the maximum impervious area for the relevant zone; or (iii) from areas of impervious surface where discharges may give rise to flooding or adversely affect rivers and streams; (d) taking an integrated stormwater management approach for large-scale and comprehensive redevelopment and intensification (refer to Policy E1.3.10 below) and encourage the restoration of freshwater systems where practicable; and (e) ensuring intensification is supported by appropriate stormwater infrastructure, including natural assets that are utilised for stormwater conveyance and overland flow paths.	Adverse effects have been avoided as far as practicable through: • 5mm Retention tanks • Detention Ponds • Rain gardens • Litter Traps • Implementing recommendations of Bioresearches Report and controlling rate and speed of discharges when natural systems are involved.
(10) In taking an integrated stormwater management approach have regard to all of the following: (a) the nature and scale of the development and practical and cost considerations, recognising: (i) greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas; (ii) intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and (iii) site operational and use requirements may preclude the use of an integrated stormwater management approach. (b) the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments; (c) the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments; (d) reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimization of on-site and larger communal devices where these are required; and (e) the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable.	Recommendations will be addressed in the Bioresearches Report.

AUP Section E1.3 (Policies)	Comment
(11) Avoid as far as practicable, or otherwise minimise or mitigate adverse effects of stormwater diversions and discharges, having particular regard to: (a) the nature, quality, volume and peak flow of the stormwater runoff; (b) the sensitivity of freshwater systems and coastal waters, including the Hauraki Gulf Marine Park; (c) the potential for the diversion and discharge to create or exacerbate flood risks; (d) options to manage stormwater on-site or the use of communal stormwater management measures; (e) practical limitations in respect of the measures that can be applied; and (f) the current state of receiving environments.	Adverse effects have been avoided as far as practicable through: • 5mm Retention tanks • Detention Ponds • Litter Traps • Rain gardens • Implementing recommendations will be addressed in Bioresearches Report and controlling rate and speed of discharges when natural systems are involved.
(12) Manage contaminants in stormwater runoff from high contaminant generating car parks and high use roads to minimise new adverse effects and progressively reduce existing adverse effects on water and sediment quality in freshwater systems, freshwater and coastal waters.	Adverse effects have been avoided as far as practicable through: • 5mm Retention tanks • Detention Ponds • Rain gardens • Litter Traps • Implementing recommendations will be addressed in Bioresearches Report and controlling rate and speed of discharges when natural systems are involved.
(13) Require stormwater quality or flow management to be achieved on-site unless there is a downstream communal device or facility designed to cater for the site's stormwater runoff.	Flow management is achieved in downstream Detention device.
(14) Adopt the best practicable option to minimise the adverse effects of stormwater discharges from stormwater network and infrastructure including road, and rail having regard to all of the following: (a) the best practicable option criteria as set out in section 2 of the Resource Management Act 1991; (b) the reasonable timeframes over which adverse effects can be avoided as far as practicable, or otherwise minimised or mitigated; (c) the scale and significance of the adverse effects; (d) infrastructure investment priorities and the consequences of delaying infrastructural improvements in other areas; (e) the ability to prevent or minimise existing adverse effects having regard to the effectiveness and timeframes of other feasible methods, including land use controls; (f) opportunities to integrate with other major infrastructure projects or works; (g) the need to maintain and optimize existing stormwater networks and provide for planned land use and development; and (h) operational requirements and space limitations.	The identified matters will be taken into account and the proposed stormwater management response will be largely considered best practice. Recommendations of the Bioresearches Report will be provided.
(15) – (16): Ground Soakage	N/A Ground Soakage not proposed
(17) Wastewater	N/A stormwater is not combined with wastewater
(18) Wastewater treatment plant	N/A no wastewater treatment plant is proposed
(19) – (22) Wastewater network	N/A this aspect is not for wastewater
(23) – (25) On site and small scale wastewater network	
(26) Other discharges	

CHAPTER B7

AUP Section B7 (Policies)	Comment
B7.2. Indigenous biodiversity	
(1) Identify and evaluate areas of indigenous vegetation and the habitats of indigenous fauna in terrestrial and freshwater environments considering the following factors in terms of the descriptors contained in Schedule 3 Significant Ecological Areas – Terrestrial Schedule: (a) representativeness; (b) stepping stones, migration pathways and buffers; (c) threat status and rarity; (d) uniqueness or distinctiveness; and (e) diversity.	No SEA's are within the development area. Bioresearches Report for ecological assessment will be provided.
(2) Include an area of indigenous vegetation or a habitat of indigenous fauna in terrestrial or freshwater environments in the Schedule 3 of Significant Ecological Areas – Terrestrial Schedule if the area or habitat is significant	No SEA's are within the development area, but see Bioresearches Report for ecological assessment will be provided.
(3) Identify and evaluate areas of significant indigenous vegetation, and the significant habitats of indigenous fauna, in the coastal marine area considering the following factors in terms of the descriptors contained in Schedule 4 Significant Ecological Areas – Marine Schedule: (a) recognised international or national significance; (b) threat status and rarity; (c) uniqueness or distinctiveness; (d) diversity; (e) stepping stones, buffers and migration pathways; and (f) representativeness	No SEA's are within the development area, but see Bioresearches Report for ecological assessment will be provided.
(4) Include an area of indigenous vegetation or a habitat of indigenous fauna in the coastal marine area in the Schedule 4 Significant Ecological Areas – Marine Schedule if the area or habitat is significant.	No SEA's are within the development area, but see Bioresearches Report for ecological assessment will be provided.
(5) Avoid adverse effects on areas listed in the Schedule 3 of Significant Ecological Areas – Terrestrial Schedule and Schedule 4 Significant Ecological Areas – Marine Schedule.	No SEA's are within the development area, but see Bioresearches Report for ecological assessment will be provided.
B7.3. Freshwater systems	
Integrated management of land use and freshwater systems	
(1) Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification; (b) ensuring catchment management plans form part of the structure planning process; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and (d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.	The relevant outcomes will be achieved in the Infrastructure Report in terms of adequate servicing, management of stormwater, and Bioresearches Report for ecological effects. No significant adverse effects arise.
Management of freshwater systems	
(2) Identify degraded freshwater systems	Bioresearches Report will be provided.
(3) Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects.	Bioresearches Report and Landscape Report will be provided.
(4) Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and ponds and their margins, unless all of the following apply: (a) it is necessary to provide for: (i) the health and safety of communities; or (ii) the enhancement and restoration of freshwater systems and values; or (iii) the sustainable use of land and resources to provide for growth and development; or (iv) infrastructure; (b) no practicable alternative exists; (c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and (d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided.	Permanent loss of permanent and intermittent streams has been avoided.

AUP Section B7 (Policies)	Comment
(5) Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers, streams, and wetlands, to do all of the following: (a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas; (b) minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands; (c) limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and (d) maintain or where appropriate enhance: (i) freshwater systems not protected under Policy B7.3.2(5)(a); (ii) navigation along rivers and public access to and along lakes, rivers and streams; (iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and (iv) areas of significant indigenous biodiversity.	Most of the sensitive features referred to are not applicable. Otherwise, there will be significant planting around the stream.
(6) Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur.	There will be significant planting around the stream. Landscape Report will be provided.
B7.4. Coastal water, freshwater and geothermal water	
Integrated management	
(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and (b) requiring catchment management planning as part of structure planning; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and (d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.	The Infrastructure Report will be provided and will be sufficient capacity for the development. The design achieves best practice and is consistent with the green infrastructure policy. There are no significant adverse effects on water.
National Policy Statement for Freshwater Management	
(2) Give effect to the National Policy Statement for Freshwater Management 2014 by establishing all of the following: (a) freshwater objectives; (b) freshwater management units and, for each unit: (i) values; (ii) water quality limits; (iii) environmental flows and/or levels; and (c) targets and implementation methods where freshwater units do not meet freshwater objectives.	The recommendations will be provided in the Bioresearches Report for ecological effect
(3) Integrate Mana Whenua values, mātauranga and tikanga when giving effect to the National Policy Statement for Freshwater Management 2014 in establishing all of the following: (a) water quality limits for freshwater, including groundwater; (b) the allocation and use of freshwater resources, including groundwater; and (c) measures to improve the integrated management of the effects of the use and development of land and freshwater on coastal water and the coastal environment.	N/A
Water quality	
(4) Identify areas of coastal water and freshwater bodies that have been degraded by human activities.	N/A
(5) Engage with Mana Whenua to: (a) identify areas of degraded coastal water where they have a particular interest; and (b) remedy or, where remediation is not practicable, mitigate adverse effects on these degraded areas and values.	N/A
(6) Progressively improve water quality in areas identified as having degraded water quality through managing subdivision, use, development and discharges.	Bioresearches Report and Landscape report for recommendations will be provided.

AUP Section B7 (Policies)	Comment
(7) Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following: (a) significant bacterial contamination of freshwater and coastal water; (b) adverse effects on the quality of freshwater and coastal water; (c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both point and non-point sources; (d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and (e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply.	No significant bacterial contamination will come from the stormwater network. The quality of freshwater will be appropriately managed through onsite treatment.
Sediment runoff	
(8) Minimise the loss of sediment from subdivision, use and development, and manage the discharge of sediment into freshwater and coastal water, by: (a) promoting the use of soil conservation and management measures to retain soil and sediment on land; and (b) requiring land disturbing activities to use industry best practice and standards appropriate to the nature and scale of the land disturbing activity and the sensitivity of the receiving environment.	Impervious surfaces minimize sedimentation. Stormwater will be treated to minimize sedimentation.
Stormwater management	
(9) Manage stormwater by all of the following: (a) requiring subdivision, use and development to: (i) minimise the generation and discharge of contaminants; and (ii) minimise adverse effects on freshwater and coastal water and the capacity of the stormwater network; (b) adopting the best practicable option for every stormwater diversion and discharge; and (c) controlling the diversion and discharge of stormwater outside of areas serviced by a public stormwater network.	The development achieves this outcome through onsite treatment of stormwater, adopting the best practice option for green infrastructure.
Wastewater	
(10) Manage the adverse effects of wastewater discharges to freshwater and coastal water by all of the following: (a) ensuring that new development is supported by wastewater infrastructure with sufficient capacity to serve the development; (b) progressively reducing existing network overflows and associated adverse effects by all of the following: (i) making receiving environments that are sensitive to the adverse effects of wastewater discharges a priority; (ii) adopting the best practicable option for preventing or minimising the adverse effects of discharges from wastewater networks including works to reduce overflow frequencies and volumes; (iii) ensuring plans are in place for the effective operation and maintenance of the wastewater network and to minimise dry weather overflow discharges; (iv) ensuring processes are in place to mitigate the adverse effects of overflows on public health and safety and the environment where the overflows occur; (c) adopting the best practicable option for minimising the adverse effects of discharges from wastewater treatment plants; and (d) ensuring on-site wastewater systems avoid significant adverse effects on freshwater and coastal water.	N/A this is not a wastewater discharge.
Freshwater and geothermal water quantity, allocation and use	
(11) Promote the efficient allocation of freshwater and geothermal water by all of the following: (a) establishing clear limits for water allocation; (b) avoiding over-allocation of water, including phasing out any existing overallocation; (c) safeguarding spring flows, surface waterbody base flows, ecosystem processes, life-supporting capacity, the recharge of adjacent aquifers, and geothermal temperature and amenity; and (d) providing for the reasonable requirements of domestic and municipal water supplies.	N/A this is not a water take / allocation or use of water (including geothermal water).
(12) Promote the efficient use of freshwater and geothermal water	N/A this is not a water take / allocation or use of water (including geothermal water).
(13) Promote the taking of groundwater rather than the taking of water from rivers and streams in areas where groundwater is available for allocation	N/A this is not a water take / allocation or use of water (including geothermal water).
(14) Enable the harvesting and storage of freshwater and rainwater to meet increasing demand for water and to manage water scarcity conditions, including those made worse by climate change.	N/A this is not a water take / allocation or use of water (including geothermal water).
B7.5. Air	

AUP Section B7 (Policies)	Comment
Not Applicable	
B7.6. Minerals	
Not Applicable	

Chapter B8

AUP Section B8 (Policies)	Comment
B8.2. Natural character	
(1) Identify and evaluate areas of outstanding natural character or high natural character considering the following factors: (a) natural elements, processes and patterns; (b) biophysical, ecological, geological and geomorphological aspects; (c) natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks; (d) the natural movement of water and sediment; (e) the natural darkness of the night sky; (f) places or areas that are wild or scenic; and (g) experiential attributes, including the sounds and smell of the sea, and their context or setting.	N/A – not outstanding natural character or high natural character
(2) Include an area in the coastal environment with outstanding or high natural character in Schedule 8 Outstanding Natural Character and High Natural Character Overlay Schedule.	N/A: Not natural character and high natural character
(3) Preserve and protect areas of outstanding natural character and high natural character from inappropriate subdivision, use and development by: (a) avoiding adverse effects of activities on natural character in areas of the coastal environment scheduled as outstanding natural character; and (b) avoiding significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment.	N/A: Not natural character and high natural character
(4) Avoid significant adverse effects and avoid, remedy or mitigate other adverse effects on natural character of the coastal environment not identified as outstanding natural character and high natural character from inappropriate subdivision, use and development.	N/A this does not relate to stormwater discharges to an existing network or to streams
(5) Enable land use practices and restoration projects that will restore, rehabilitate or enhance natural character in outstanding natural character and high natural character areas in the coastal environment.	Applicant will be consistent with this. Landscape Report will be provided.
(6) Provide for the use of transferable development rights to avoid inappropriate subdivision, use and development in or on land adjoining to areas of outstanding natural character and high natural character.	N/A transferable development rights not applicable.
B8.3. Subdivision, use and development	
(1) Recognise the contribution that use and development of the coastal environment make to the social, economic and cultural well-being of people and communities	Land will be developed for social wellbeing – housing.
(2) Avoid or mitigate sprawling or sporadic patterns of subdivision, use and development in the coastal environment by all of the following: (a) concentrating subdivision, use and development within areas already characterised by development and where natural character values are already compromised; (b) avoiding urban activities in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal, historic heritage and special character; and (c) ensuring that subdivision, use or development involving land above and below the mean high water springs can provide for any associated facilities or infrastructure in an integrated manner.	N/A

AUP Section B8 (Policies)	Comment
(3) Provide for use and development in the coastal marine area that: (a) have a functional need which requires the use of the natural and physical resources of the coastal marine area; (b) are for the public benefit or public recreation that cannot practicably be located outside the coastal marine area; (c) have an operational need making a location in the coastal marine area appropriate and that cannot practicably be located outside the coastal marine area; or (d) enable the use of the coastal marine area by Mana Whenua for Māori cultural activities and customary uses	N/A: not development in the CMA.
(4) Require subdivision, use and development in the coastal environment to avoid, remedy or mitigate the adverse effects of activities above and below the mean high water springs, including the effects on existing uses and on the coastal receiving environment.	N/A
(5) Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown or little understood, but could be significantly adverse.	N/A stormwater discharges are well understood.
(6) Consider the purposes for which land or water in the coastal environment is held or managed under any enactment for conservation or protection purposes and: (a) avoid adverse effects that are significant in relation to those purposes; and (b) avoid, remedy or mitigate other adverse effects in relation to those purposes.	The overall development has been sensitive to the protection of sensitive land and a large are of reserve top up is being provided.
(7) Set back development from the coastal marine area, where practicable, to protect the natural character and amenity values of the coastal environment.	
Ports – Not Applicable	
Reclamation – Not Applicable	
Aquaculture – Not Applicable	
B8.4. Public access and open space	
(1) Subdivision, use and development in the coastal environment must, where practicable, do all of the following: (a) maintain and where possible enhance public access to and along the coastal marine area, including through the provision of esplanade reserves and strips; (b) be designed and located to minimise impacts on public use of and access to and along the coastal marine area; (c) be set back from the coastal marine area to protect public open space values and access; and (d) take into account the likely impact of coastal processes and climate change, and be set back sufficiently to not compromise the ability of future generations to have access to and along the coast.	N/A
(2) Provide for a range of open space and recreational use of the coastal environment by doing all of the following: (a) identifying areas for recreational use, including landbased facilities for those uses, where this ensures the efficient use of the coastal environment; (b) enabling the provision of facilities in appropriate locations that enhance public access and amenity values; (c) enabling Māori cultural activities and customary use; and (d)) managing uses to avoid conflicts and mitigate risks.	N/A
(3) Restrict public access to and along the coastal marine area, particularly walking access, only where it is necessary to do any of the following: (a) protect public health and safety; (b) provide for defence, port or airport purposes; (c) protect areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal, historic heritage and special character; (d) protect threatened indigenous species; (e) protect dunes, estuaries and other sensitive natural areas or habitats; (f) have a level of security necessary to carry out an activity or function that has been established or provided for; (g) provide for exclusive use of an area to carry out an activity granted an occupation consent under section12 of the Resource Management Act 1991; (h) enable a temporary activity or special event; or (i) in other exceptional circumstances sufficient to justify the restriction.	Will comply with Landscape Plan.
B8.5. Managing the Hauraki Gulf/Te Moana Nui o Toi/Tīkapa Moana	
Integrated management	
(1) Encourage and support the restoration and enhancement of the Hauraki Gulf's ecosystems, its islands and catchments	Will comply with Bioresearches report.

AUP Section B8 (Policies)	Comment
(2) Require the integrated management of use and development in the catchments, islands, and waters of the Hauraki Gulf to ensure that the ecological values and life-supporting capacity of the Hauraki Gulf are protected, and where appropriate enhanced.	Complies see site masterplan.
(3) Require applications for use and development to be assessed in terms of the cumulative effect on the ecological and amenity values of the Hauraki Gulf, rather than on an area-specific or case-by-case basis.	Complies, development is consistent with zoning.
(4) Maintain and enhance the values of the islands in the Hauraki Gulf	N/A not a Hauraki Gulf Island.
(5)Avoid use and development that will compromise the natural character, landscape, conservation and biodiversity values of the islands, particularly in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal, historic heritage and special character.	N/A not a Hauraki Gulf Island.
(6) Promote the restoration and rehabilitation of natural character values of the islands of the Hauraki Gulf.	N/A not a Hauraki Gulf Island.
(7) Ensure that use and development of the area adjoining conservation islands, regional parks or Department of Conservation land, does not adversely affect their scientific, natural or recreational values.	N/A not a Hauraki Gulf Island.
(8) Enhance opportunities for educational and recreational activities on the islands of the Hauraki Gulf if they are consistent with protecting natural and physical resources, particularly in areas where natural and physical resources have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal, historic heritage and special character.	N/A not a Hauraki Gulf Island.
(9) Identify and protect areas or habitats, particularly those unique to the Hauraki Gulf, that are: (a) significant to the ecological and biodiversity values of the Hauraki Gulf; and (b) vulnerable to modification.	Will comply with Bioresearches report.
(10) Work with agencies and stakeholders to establish an ecological bottom line, or agreed target, for managing the Hauraki Gulf's natural and physical resources which will do all of the following: (a) provide greater certainty in sustaining the Hauraki Gulf's ongoing lifesupporting capacity and ecosystem services; (b) assist in avoiding incremental and ongoing degradation; (c) co-ordinate cross-jurisdictional integrated management and effort to achieve agreed outcomes; (d) better measure the success of protection and enhancement initiatives; (e) assist in establishing a baseline for monitoring changes (f) enable better evaluation of the social and economic cost-benefits of management; and (g) provide an expanded green-blue network linking restored island and mainland sanctuaries with protected, regenerating marine areas where the ecological health and productivity of the marine area will be enhanced.	Will comply with Bioresearches report.
Providing for the relationship of Mana Whenua with the Hauraki Gulf	
(11) Work in partnership with Mana Whenua to protect and enhance culturally important environmental resources and values of the Hauraki Gulf that are important to their traditional, cultural and spiritual relationship with the Hauraki Gulf.	N/A
(12) Incorporate mātauranga Māori with western knowledge in establishing management objectives for the Hauraki Gulf	N/A
(13) Require management and decision-making to take into account the historical, cultural and spiritual relationship of Mana Whenua with the Hauraki Gulf, and the ongoing capacity to sustain these relationships.	N/A
Maintaining and enhancing social, cultural and recreation values	
(14) Identify and protect the natural and physical resources that have important cultural and historic associations for people and communities in and around the Hauraki Gulf.	N/A
(15) Identify, maintain, and where appropriate enhance, areas of high recreational use within the Hauraki Gulf by managing water quality, development and potentially conflicting uses so as not to compromise the particular values or qualities of these areas that add to their recreational value	N/A

AUP Section B8 (Policies)	Comment
(16) Encourage the strategic provision of infrastructure and facilities to enhance public access and recreational use and enjoyment of the Hauraki Gulf.	N/A
Providing for the use of natural and physical resources, and for economic activities	N/A
(17) Provide for commercial activities in the Hauraki Gulf and its catchments while ensuring that the impacts of use, and any future expansion of use and development, do not result in further degradation or net loss of sensitive marine ecosystems.	N/A – not a commercial activity
(18) Encourage the strategic provision of infrastructure and facilities that support economic opportunities for the resident communities of Waiheke and Great Barrier islands.	NA/ not Waiheke or Great Barrier
(19) Promote economic development opportunities that complement the unique values of the islands and the Hauraki Gulf.	N/A not a Hauraki Gulf Island.
(20) Promote the national significance of the Hauraki Gulf Marine Park by: (a) supporting the development of Auckland's waterfront as the gateway to the Hauraki Gulf; and (b) promoting the Hauraki Gulf as a visitor destination	Complies see site masterplan.

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7/03/2023

47 GOLDING ROAD & 50 PUKEKOHE EAST ROAD, PUKEKOHE

FLOOD MODELLING METHODOLOGY

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PO Box 5204 Wellesley St, Auckland 1141

Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe | Flood Modelling Methodology

Dear Aedifice Development n.1 Ltd,

Thank you for the opportunity for Civix to provide an Flood Modelling Methodology for the Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe.

This report details the flood modelling methodology used in the Development of 47 Golding Road & 50 Pukekohe East Road, Pukekohe.

Please do not hesitate to contact us if you have any questions on this report,

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Contents

1. Introduction

This document details the flood modelling methodology utilised by Civix in the modelling of flood plains in the Tuflow modelling package. Modelling is completed via ARCGIS Pro. The full TuFlow modelling package for a project can be provided on request for review as required.

The model has been developed for the purpose of demonstrating that the mitigation measures included within the site mitigate the effects of the development. This means that the existing and proposed scenarios are only different in the ways that the development will affect the site, i.e. change in imperviousness within the site and increased efficiency of the drainage network in the site. Changes outside the effects of the development including Climate Change and development of upstream catchment areas are not legally required to be mitigated within the development, this was a principal established in the Queenstown-Lakes District Council v Hawthorn Estate Ltd (2006) 12 ELRNZ 299; [2006] NZRMA 424 (CA) decision.

2. Model Extent

The extent of the flood model has been set to account for upstream, adjacent and downstream hydraulic features including the plan change to the west (Plan Change 76) that could affect the location and extent of flow into, through and out of the subject site. The location of overland flow paths in Council GIS is also taken into account to ensure flow paths entering the site are captured.

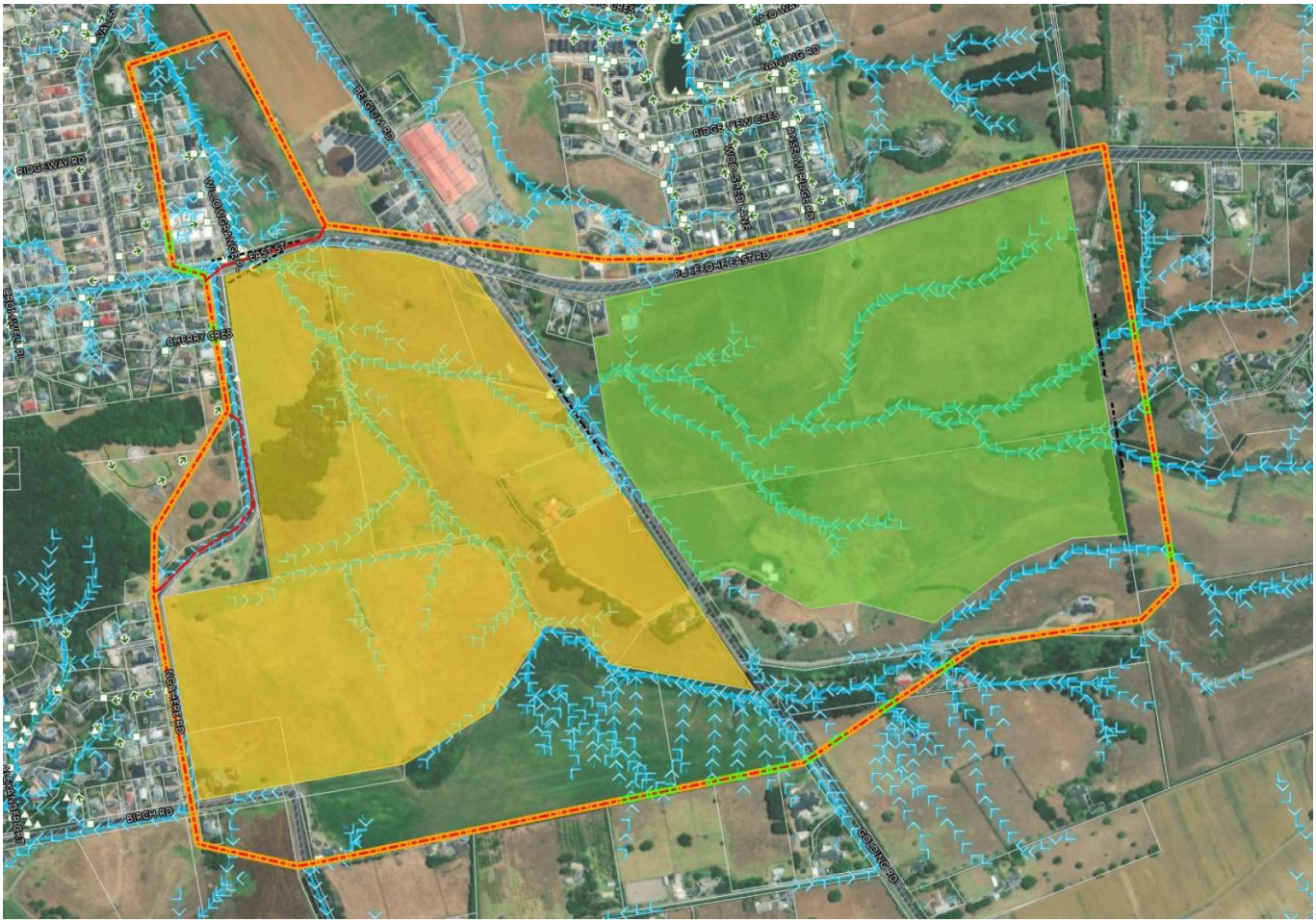

Figure 1 - showing the western Plan Change 76 site (in yellow), subject site (in green) and model extent (in dashed red/orange)

3. Site flows

Site characteristics for the TuFlow modelling are determined based on a Citywide overlay of rainfall depths and soil classifications. The rainfall depths have been found through a linear interpolation for each storm based on the rainfall contour plots in TP108. Rainfall depths are then adjusted for Climate Change to give rainfall depths used in the modelling. Percentage Increase in 24-hour design rainfall depth due to future climate change, assuming 2.1°C increase in temperature is in accordance with Auckland CoP Chapter 4: Stormwater Version 3.0. Below table summarises the rainfall depths used for the site extent.

Table 1: Rainfall depths used for the model

Annual Exceedance Probability (AEP)	Rainfall Depth (TP108)	Climate Change % increase	Rainfall Depth include Climate Change
10%	130 mm	13.2%	147 mm
1%	190 mm	16.8%	222 mm

According to the site geotechnical investigation undertaken by Soil&Rock Consultants (dated March 2022), the soil comprises of a mix of tuff volcanic material as described in Group A (CN=39) and alluvial material as described in Group B (CN=61). The SCS soil classification is then used to determine the permeable curve number of 50 which is the average between the two soil groups found in the site. While a curve number of 98 was used for all impervious areas within the site.

Table 2: Key parameters used in the model for the development site

	Existing Scenario	Proposed Scenario
Rainfall Depth (TP108 – 10% AEP) incl. cc	147mm	147mm
Rainfall Depth (TP108 – 100% AEP) incl. cc	222mm	222mm
Pervious Curve Number	50	50
Impervious Curve Number	98	98
Channelisation	0.8	0.6
Site Imperviousness Percentage	5%	60%

Table 3: Demonstrates the total imperviousness of the site

	Area (ha)	Impervious (%)	Impervious Area (ha)	Pervious (%)	Pervious Area
Western Plan Change (PC76)					
Wastewater Pump Station	0.12	100	0.12	0	0
Residential	17.26				
Impervious (Buildings, COALs & Parkings)		70	12.08		
Pervious (Landscape)				30	5.18
Roads	7.28				
Impervious (Pavement)		65	4.73		
Pervious (Berm/Verge)				35	2.55
Drainage Reserve	4.40	0	0	100	4.40
Significant Ecological Area	0.90	0	0	100	0.90
Total Site	**29.96**	**57**	**16.93**	**43**	**13.03**
Eastern Plan Change (subject site)					
Residential	12.70				
Impervious (Buildings, COALs & Parkings)		70	8.90		
Pervious (Landscape)				30	3.80
Roads	5.80				
Impervious (Pavement)		65	3.77		
Pervious (Berm/Verge)				35	2.03
Natural Stream/Riparian	5.40	0	0	100	5.40
Drainage Reserve	2.50	0	0	100	2.50
Public Open Space Reserve	0.60	0	0	100	0.60
Total Site	**27.00**	**47**	**12.67**	**53**	**14.33**

Refer to Concept Master Plan Drawing A103 for more details on the area classification.

Thus, the proposed impervious coverages have been modelled at 60% of the catchment area. This takes into account the expected development of the Residential Lots (70% impervious cover) as well as the large drainage reserve required. As the 100 year flows are slightly increased in the 100 YR event, any increase in this impervious cover will result in adverse flooding effects downstream. For this reason, we recommend that the residential lots are legally restricted to a maximum of 70% impervious cover to avoid adverse effects on flooding downstream.

4. Upstream Catchment Inflows

The upstream catchment areas are set based on the area accumulation model in the Citywide GIS layer. Catchment lengths are determined through the model designer tracing the catchment length in GIS, this is then draped on the Citywide LIDAR layer and the equal area slope calculated to give the upstream catchment slope.

Soil classifications are determined based on soil mapping information available at Auckland Council and also national datasets. These datasets have been combined to provide an SCS soil classification across the city.

The catchment factors and then used to calculate inflow Hydrographs using the SCS Curve runoff method, as recommended in TP108.

For the upstream catchments, the impervious percentage of 5% has been used in both existing and proposed scenarios which is based on the current upstream catchment condition, i.e., greenfield. All new Greenfields developments upstream of the site are expected to have to comply with the same flood mitigation requirements for this development, which requires peak runoff to be maintained at existing levels, therefore the 5% impervious coverage should be representative of future flows in a Maximum Possible Development (MPD) scenario. As noted in the introduction to this report, the development is only required to mitigate the effects of the development itself, not upstream development, therefore the impervious coverage upstream of the site should be consistent between the existing and proposed scenarios.

Note there is an existing 225mm dia. culvert pipe under Golding Road which is likely to be upgraded to a 525mm dia. culvert pipe for the MPD scenario. This will not have any impact to 1% AEP flood modelling as pipe size is below 600mm and therefore, assumed to be fully blocked.

Table 4 TuFlow Upstream Catchment Details and flows incoming to the model

Input ID	Imp. Area	Perv. Area	Tot. Area	Length	Slope	Perm. Curve No.	Perm. Int. Abstraction	Rainfall Depth	Runoff Depth	Peak Flow
Units	m2	m2	m2	m	%		mm	mm	mm	m3/s
AIN001	11812	7875	19686	320	4	61	5	259	215	0.741
AIN002	12488	8325	20814	387	7	58	5	259	212	0.772
AIN003	1760	1173	2934	20	5	45	5	259	198	0.101
AIN004	2097	1398	3495	40	6	60	5	259	214	0.131
AIN005	1912	1275	3187	20	4	46	5	259	199	0.110
AIN006	2000	1333	3333	40	7	57	5	259	211	0.123
AIN007	2068	1379	3447	100	10	59	5	259	213	0.128
AIN008	2127	1418	3544	40	3	39	5	259	192	0.117
AIN009	1518	1012	2530	40	4	58	5	259	212	0.094
AIN010	1744	1163	2907	80	8	60	5	259	214	0.109
AIN011	1649	1100	2749	80	8	61	5	259	215	0.103

Input ID	Imp. Area	Perv. Area	Tot. Area	Length	Slope	Perm. Curve No.	Perm. Int. Abstraction	Rainfall Depth	Runoff Depth	Peak Flow
Units	m2	m2	m2	m	%		mm	mm	mm	m3/s
AIN012	1532	1021	2554	20	10	61	5	259	215	0.096
AIN013	41339	27560	68899	517	6	57	5	259	211	2.493
AIN014	30938	20625	51563	305	9	57	5	259	211	1.901
AIN015	124085	82723	206808	1304	5	39	5	259	192	5.863
AIN016	26182	17455	43637	363	5	39	5	259	192	1.417
AIN017	22630	15087	37717	301	8	60	5	259	214	1.413
AIN018	3869	2579	6448	140	12	39	5	259	192	0.214
AIN019	2875	1917	4792	106	2	39	5	259	192	0.159
AIN020	1411	941	2352	14	4	48	5	259	201	0.082
AIN021	99546	66364	165911	670	5	39	5	259	192	5.239
AIN022	25100	16733	41833	467	8	39	5	259	192	1.358

5. Levels and Landuse

Model levels are determined based on topography survey (for the site extent including the streams) and Auckland CityWide 1m 2019 LIDAR information (for outside of the site). A tin is prepared for the existing and proposed scenarios and used to create the level raster used by the TuFlow modelling engine.

To determine the manning values and to model the existing and proposed buildings in the catchment an analysis of buildings and surfaces is undertaken. Firstly, the model determines the location of existing and proposed buildings in the catchment and deactivates these cells in the 2D domain, unless the building is flagged as being on poles in the GIS data.

For the remaining active areas of the model, the manning n value is set based on the surface type. Manning N values used in this model are given below in Table 5.

Table 5 TuFlow Landuse Mannings N Values

Landuse Description	Grass	Pave Road	Pave Lot	Pipe	Stream	Building	Retaining Wall
Mannings N Value	0.030	0.015	0.020	0.014	0.050	0.150	0.100

6. Pipes

Pipe assets that are sufficiently sized to not be considered 100% blocked as per the Auckland Council Modelling Guidelines are included in the model as 1D assets with 1D to 2D connections made at the manhole locations. Blockage factors are applied based on the guidance in the Auckland Council Stormwater Code of Practice. To ensure flow is captured at the manhole locations, the level raster for the model is adjusted at manhole locations to lower levels around the manhole. This ensure the manhole is filled up prior to overland flow proceeding downstream of the manhole location. Inlet losses are modelled via an inlet loss on the pipe model link, rather than the manhole model node. An inlet loss value of 0.5 is used in the model on the links. No head discharge relationship is applied on the manhole itself.

7. Outflows

Outflows from the modelled area are modelled using a manning N value channel set at a 1% grade. The TuFlow software automatically determines the ground profile along the outlet location and develops a stage storage relationship using the Manning N values from Table 5. These are then used to control outflow from the model. In general, the model extent will include significant downstream hydraulic features, so the effect of the outflow stage storage should be reduced.

8. Afflux Plots

Where pre and post development scenarios are being modelled our outputs present these results as afflux plots as well as with the results of the pre and post models in the 55000 drawing series. These drawings have three panes, the left-hand pane is the existing model results, the middle pane is the proposed modelling results and the right-hand pane is the afflux results which is the differences between the pre and the post modelling results. An afflux plot is similar in nature to a cut-fill plan, using the existing and proposed water level surfaces.

The output existing and proposed drawings show the model depth via colours, flow directions at the time of peak flow and peak depth and velocity values are labelled across the drawing to provide further information on modelling results. The afflux plots are also labelled with the depth difference and velocity differences between the pre and post modelling scenarios.

9. Model Health

To determine the accuracy of the modelling, we consider the model health parameters shown below as well as any surrounding flood level information from council where available to determine that the results presented in our analysis are accurate. The results of the modelling undertaken are shown below in Table 6**Error! Reference source not found.**, in general, a Final Cumulative ME of less than 5% is considered good and less than 10% is considered adequate for land development assessment purposes.

Table 6 TuFlow Model Run Statistics

Item	Units	22_Ex_100_PC2	23_Pr_100_PC2
Warnings During Simulation		0	0
Total Volume Out	m^3	209,011	254,085
Volume Error	m^3	-31170 or -7.5%	-29877 or -6.2%
Final Cumulative ME	%	-7.5	-6.2
Peak Flow In	m^3/s	44.9	53.7
Peak Flow Out	m^3/s	30.7	34.3

10. Results

Please see attached the Tuflow Flooding result plans and associated sections/calculations which compare the pre-development level for the site and show the estimated effects to the upstream/downstream properties post-development.

As indicated on Auckland Council Geomaps, several overland flowpaths (OLFP) with catchments are located across the extent of the site. Flood plains associated with these OLFP are also present.

A flood assessment evaluation has been undertaken to assess the flows within the site and upstream/downstream of the site. Flood modelling has been undertaken using TuFlow. The assessment calculations are based on maximum probable development for the site and are factored for climate change. The extent of the flooding in the existing and proposed development scenarios are shown in drawing 55000 series. Refer to Appendix A - Tuflow Flooding Results of this report.

The afflux indicates that there is no increase All finished floor levels for the proposed dwellings will be set a minimum of 150mm above flood levels where these are less than 100mm depth and a minimum 500mm above flood level where this is more than 100mm depth.

The peak flow from the subject site (PC2) exits through 8 Pukekohe East Road, overtops Golding Road and enters Western Plan Change site (PC76). The overtopping flow on Golding Road has been taken as the control point for the subject site as shown on Figure 2 below.

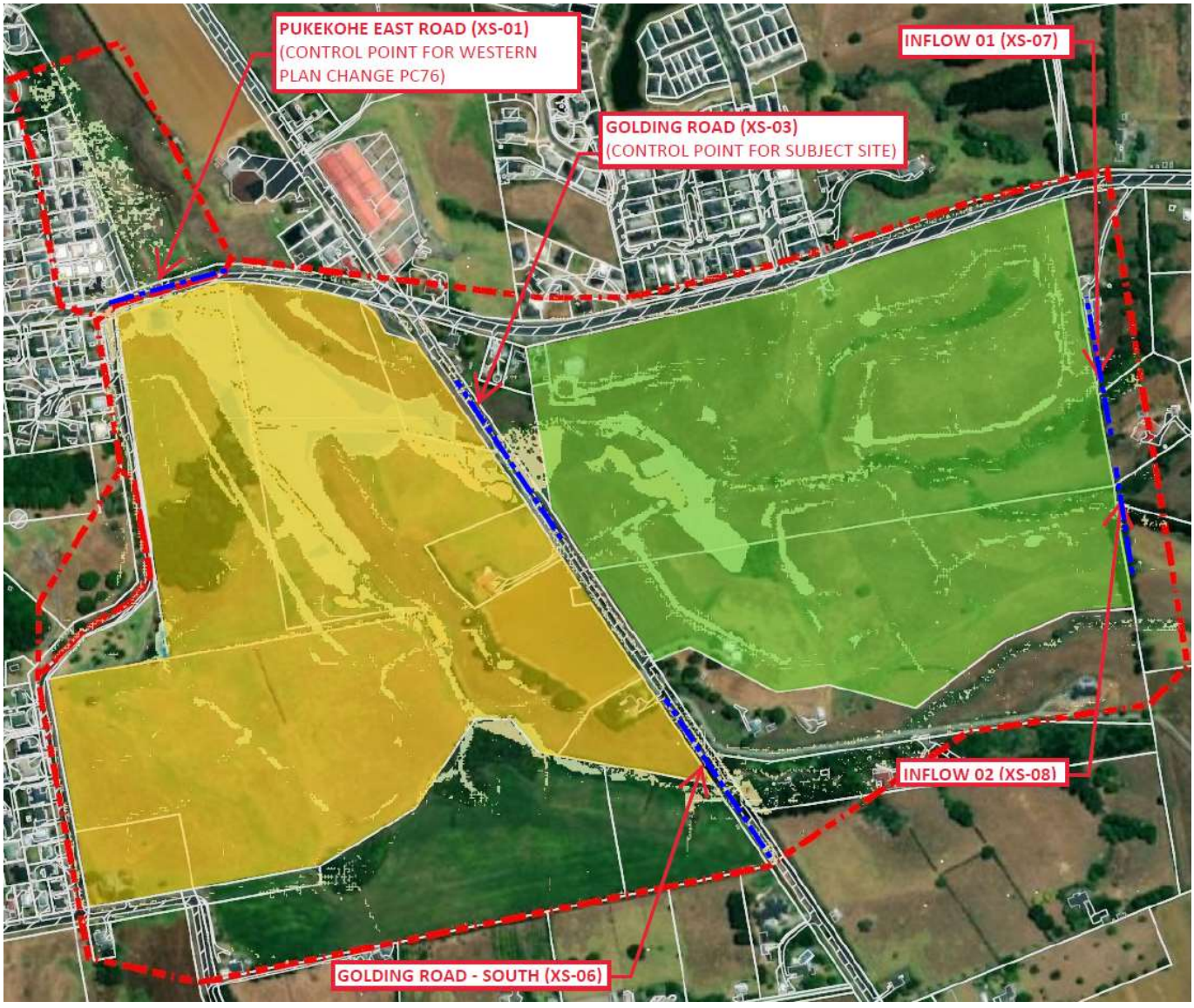

Figure 2 – Showing the key locations of significant flow entering / exiting the site

The pre and post flows through Golding Road and Pukekohe East Road have been provided in the table below for details:

Table 7 – Peak flows that are incoming to the subject site and outgoing over Golding Road from the subject site

Scenario ID	Existing Peak Flow	Proposed Peak Flow
Units	m^3/s	m^3/s
1% AEP		
Inflow 01 to Subject Site (XS-07)	2.57	2.54
Inflow 02 to Subject Site (XS-08)	2.69	2.74
Sub Total	**5.26**	**5.28**
Outflow (XS-03 from the subject site Over Golding Road)	9.38	11.49
Sub Total	**9.38**	**11.49**
Difference between Pre and Post flows (for the subject site)	**2.11 m3/s**	
Inflow 01 to PC76 (XS-03 from the subject site)	9.38	11.49
Inflow 02 to PC76 (XS-06 from south of the subject site)	0.17	0.41
Sub Total	**9.55**	**11.90**
Outflow 1 (via culvert 1500Ø)	1.87	1.07
Outflow 2 (via culvert 675Ø)	0.35	0.35
Outflow 3 (via culvert 600Ø)	0.28	0.28
Outflow 4 (XS-01) from PC76 site over Pukekohe East Road	16.16	16.69
Sub Total	**9.38**	**11.49**
Difference between Pre and Post flows (for PC76 & the subject site combined)	**- 0.27 m3/s**	

Thus, the 100 year pre and post flows are managed within the PC76 and the subject site. Furthermore, the drainage reserve area within the subject site will be contoured to attenuate the pre and post flow difference within the subject site.

Note, the flow depths within the public road reserve are generally below 200mm. Flow depth x velocities are generally below 0.6 m2/s, which is considered acceptable. Refer to Appendix A - Tuflow Flooding Results for the Pedestrian and Vehicle Hazard extents.

Refer to Stormwater Management Plan for more details.

11. Limitations

- This assessment contains the professional opinion of Civix Staff relating to this development. Civix 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 for the client and is exclusively for its client use and reliance. It is not possible to make an assessment of this report without understanding the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Civix. The assessment will not address issues which would need to be considered for another party if that parties' particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. 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.
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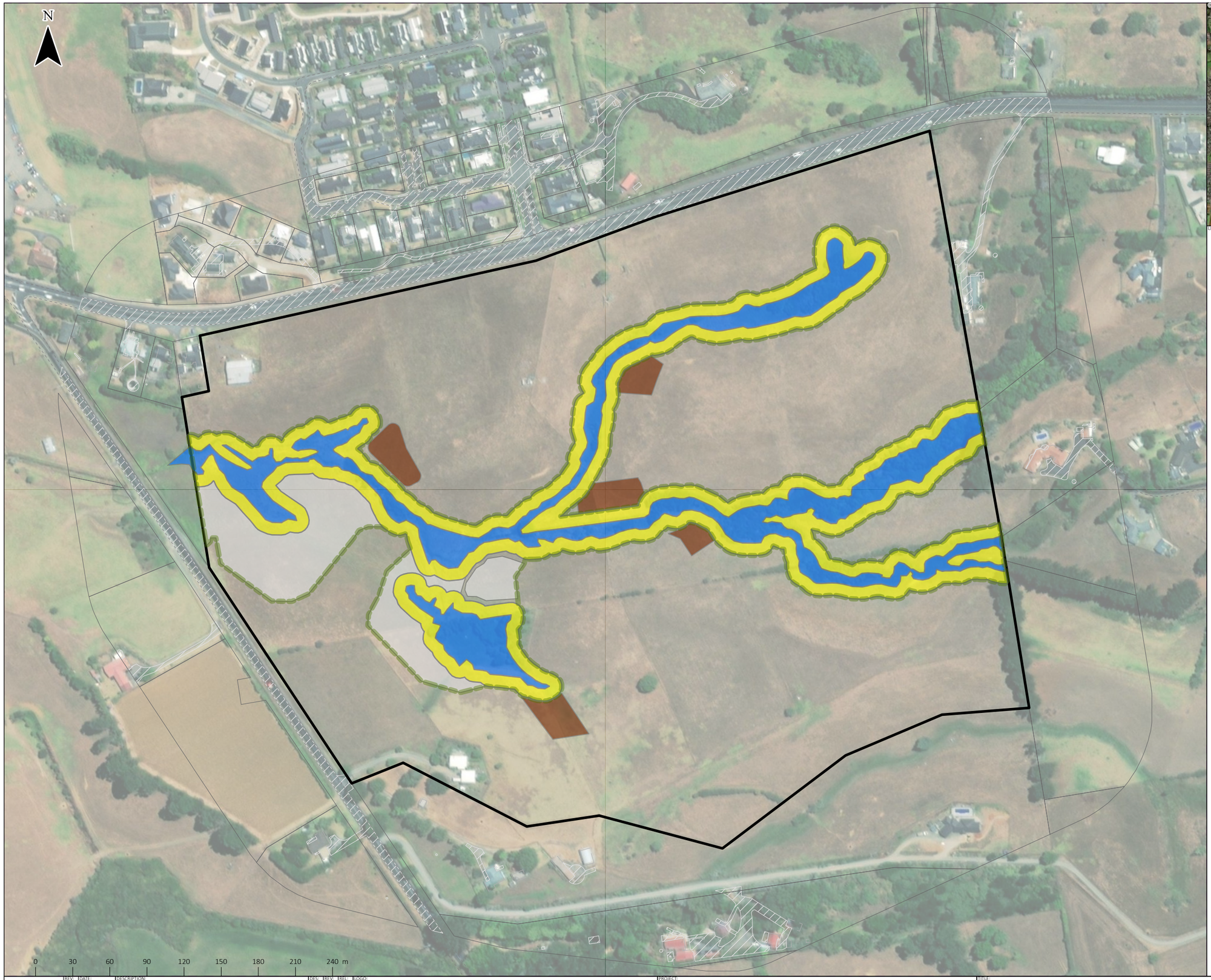

LEGEND:

- EXISTING PARCELS
- NEW PARCELS
- EXISTING KERBLINES
- EXISTING IMPERVIOUS
- EXISTING BUILDINGS
- 10M WETLAND SETBACK
- NATURAL WETLAND
- WET POND
- FLOOD STORAGE
- DRAINAGE RESERVE EXTENT

NOTES:
1. THE DRAWING IS IN NEW ZEALAND TRANSVERSE MERCATOR
2. WHERE HEIGHT TO BOUNDARY RELATIONSHIPS ARE REQUIRED, ADDITIONAL GROUND LEVELS MAY BE REQUIRED TO ENSURE COMPLIANCE.
3. CONTRACTOR IS REQUIRED TO LOCATE AND PROTECT ALL EXISITING SERVICES PRIOR TO COMMENCING ANY WORKS. NO EXCAVATION IS TO TAKE PLACE WITHOUT PERMISSION FROM THE RELEVANT SERVICE PROVIDER.
4. LOT AREAS AND BOUNDARY DIMENSIONS ARE SUBJECT TO CONFIRMATION UPON FINAL LAND TRANSFER SURVEY.

IMAGERY CREDITS:
Earthstar Geographics, LINZ

SCAN FOR 3D:

allsite.ai

REV:	DATE:	DESCRIPTION:	DES:	REV:	REL:

LOGO: CIVIX

PROJECT: GOLDING ROAD 47 & PUKEKOHE EAST ROAD 50, PUKEKOHE

TITLE: DRAINAGE RESERVE EXTENT PLAN

STATUS: FOR INFORMATION ONLY

DRAWING NO: 20000

SCALE:	SIZE:	REVISION:	DATE:
1:3,000	A3	06/03/23	06/03/23