



Woods, as a participant in the Kāinga Ora LEAD Alliance

# HARMONY IN BROWNFIELD REVITALISATION: A HOLISTIC NATURE-BASED APPROACH

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# Transformation in Auckland suburbs

- Auckland is undergoing one of the largest urban regeneration projects in NZ history
- **Kāinga Ora Homes and Communities** is replacing ageing state homes by delivering suburb scale projects, and the infrastructure and amenity to support them
- Six organisations have come together to lay the groundwork for the new homes and spaces on behalf of Kāinga Ora.
- LEAD Alliance is responsible for planning, designing, and delivering the infrastructure required for Kāinga Ora Large Scale Projects - delivering build-ready land & infrastructure, consolidating and streamlining land development.
- Since the alliance was formed in 2018, more than \$700M of infrastructure has been delivered enabling more than 5,000 homes
- Challenge of working in & around communities



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# LEAD Alliance

- Holistic approach to neighbourhood designs with precinct and neighbourhood level infrastructure planning
- The goal is to enhance communities, provide better amenities and create connectivity
- Three-waters catchment analysis and modelling, integrated transport assessments, utility services, lengthy process of investigations and engagement
- Early engagement with CCOs
- Iwi consultation essential during master-planning & key infrastructure planning
- Precinct and neighbourhood level catchment analysis
- Large scale stormwater modelling



# Waikōwhai neighbourhood

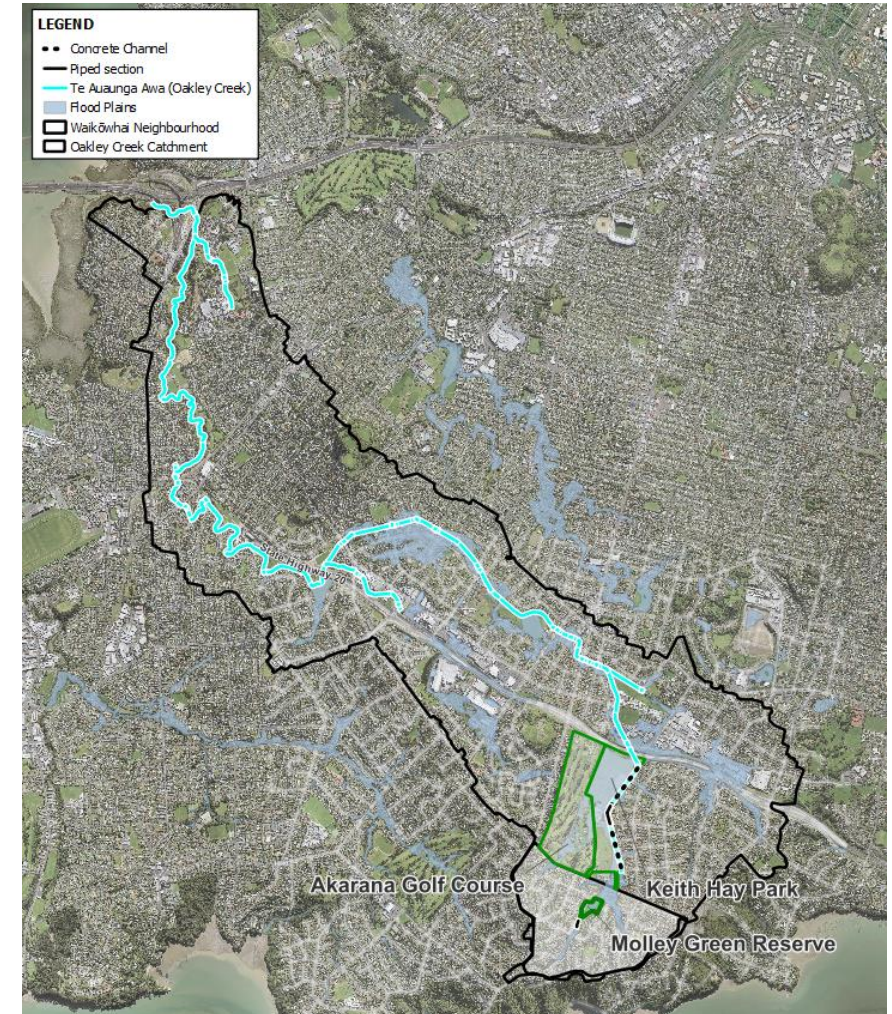
- Waikōwhai neighbourhood is approx. 91ha and is part of the Roskill Development Precinct
- Located south of Richardson Road, bound by Dominion Road Extension to the west and Hillsborough Road to the east
- Proposed increase from approximately 350 existing homes to 1110
- Some homes will be retained by Kāinga Ora, some are being developed commercially at both market and affordable price points
- LEAD Alliance, in partnership with its owner participant Kāinga Ora, prepared a Stormwater Management Plan (SMP) to support the development.
- The SMP has been adopted and integrated into the regional Network Discharge Consent (NDC) by Auckland Council.





# Wider catchment consideration

- Te Auaunga Awa is approx. 15km and largely unpiped
- Contributing catchment is heavily urbanised with more development planned
- Stormwater issues only addressed at subcatchment level (for RC) – misses what's best for overall stream health and assessment of cumulative effects
- **He Rautaki Waiora o Te Auaunga Awa Framework Stormwater Management Plan**
  - Integrated management approach for long-term management assessment
- Waikōwhai SMP uses Framework SMP as building block to align with overall management requirements
- Molley Green acts as headwater of Te Auaunga Awa (1200 ha of catchment area)
- Creek in Molley Green is partially piped and with a concrete lined channel.





# Existing flood issues

- Neighbourhood is already developed with an approximate impervious coverage of 43%.
- As per AUP, area has a mix of residential and commercial zoning which will increase the impervious coverage to approximately 63%.
- The existing stormwater network was installed in 1950s-1960s. The level of serviceability is for a 5-year ARI- storm event without any allowance for climate change.
- The latest SWCOP states a serviceability of 10-year ARI with allowance for 2.1°C climate change.
- The neighbourhood has two key discharge locations along low points at Richardson Road
- Four significant overland flow paths (OLFP) from the neighbourhood travel towards Richardson Road, overtopping the road at its two significant sag areas, and travel to Akarana Golf Course and to Keith Hay Park.





# Existing Flood Issues

- OLFP 1 tips over Richardson Road, and traverses over to Akarana Golf Course
- OLFP 2-4 converge around sag point on Richardson Road and traverse to Keith Hay Park
- Natural low point and key flood hazard location

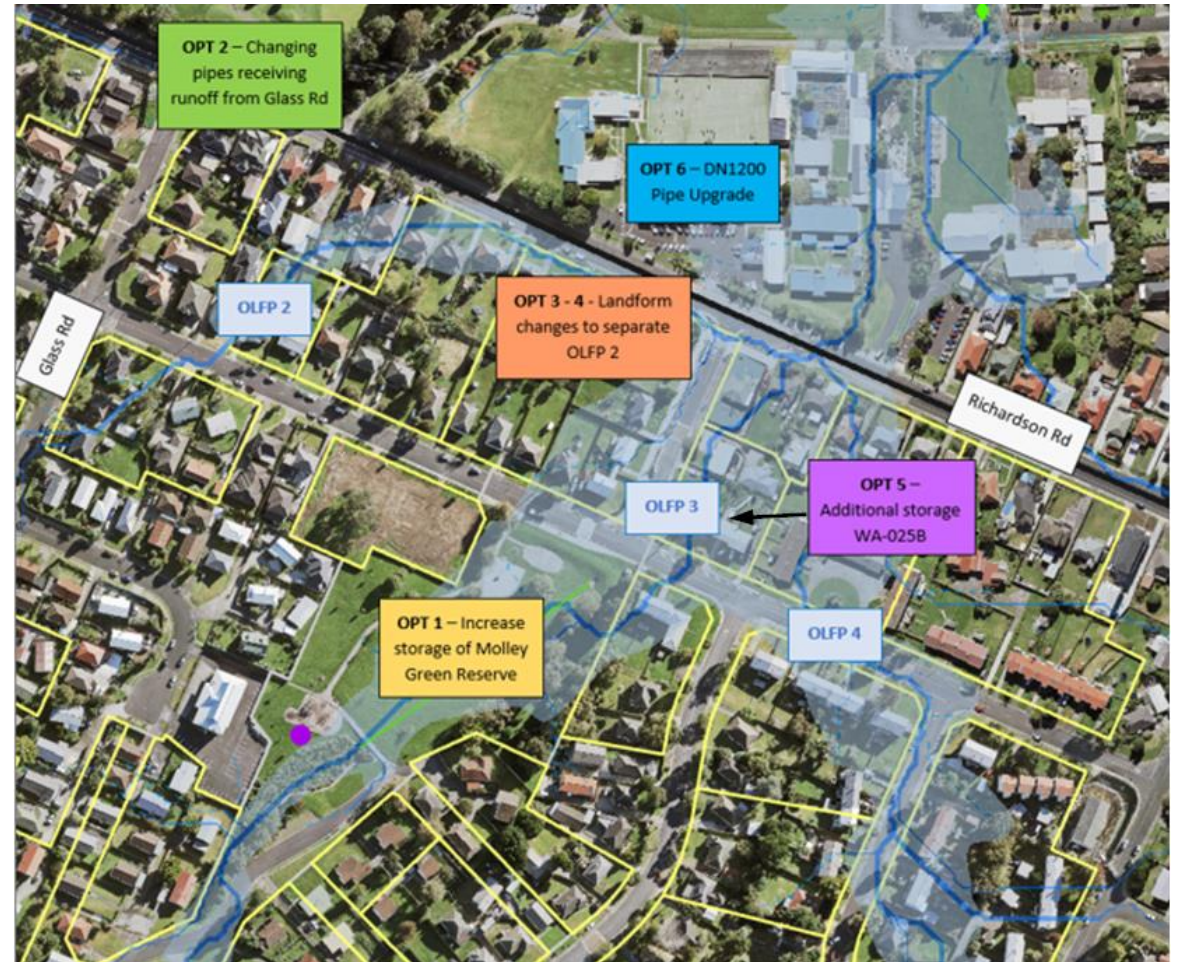




# Flood Model Optioneering

## Increase of storage in Molley Green Reserve

- Reserve is in a strategic location as it receives significant overland flows from upstream catchment.
- Enhancement of reserve provides opportunity for:
  - Stream daylighting. There was an existing naturalised 50m of the stream at the upstream part of the Molley Green Reserve.
  - Water quality enhancement
  - Connectivity with wider awa
- In parallel, additional storage basin considered at WA-025B due to existing high flood depths
  - Option not progressed as the basin indicated to fill up before the peak of the storm and provided limited benefits



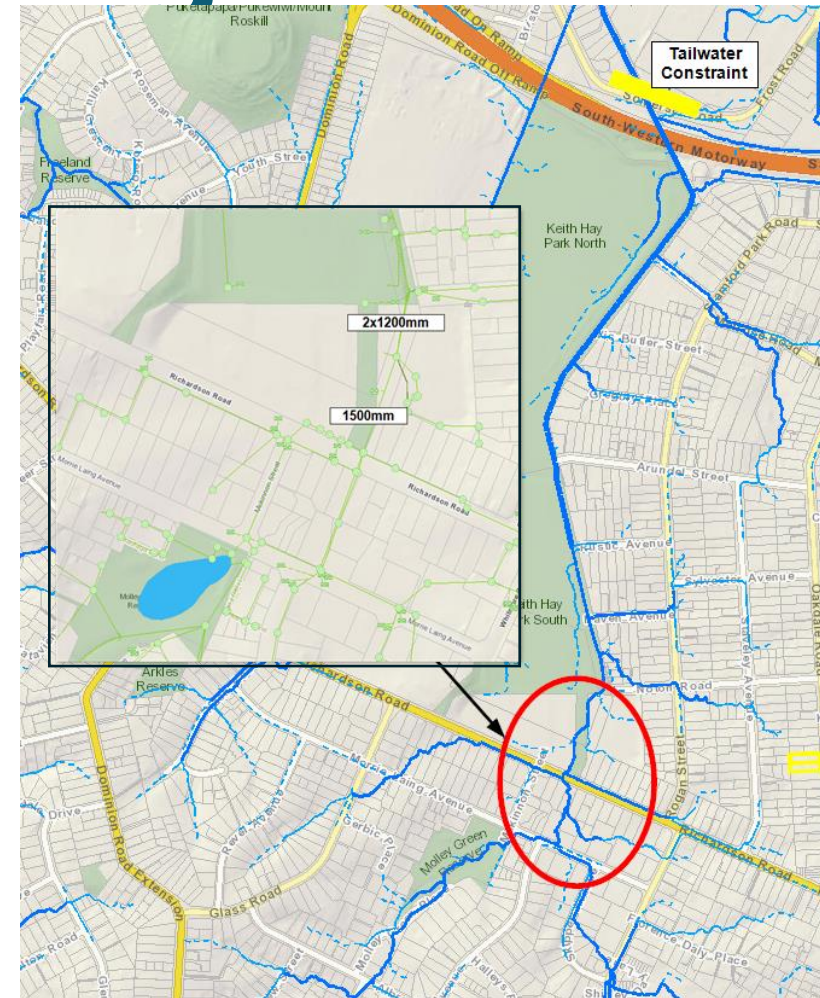
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# Flood Model Optioneering

## Infrastructure upgrade

- The existing stormwater network has insufficient capacity
- Proposal to increase the capacity of the downstream pipes discharging underneath Richardson Road to Keith Hay Park considered
- This option provided limited improvement and poses challenges:
  - Downstream tailwater level of the awa causes backwatering effect which in turn restricts the pipe network to drain runoff at the peak of the storm.
  - Depth and cover issues

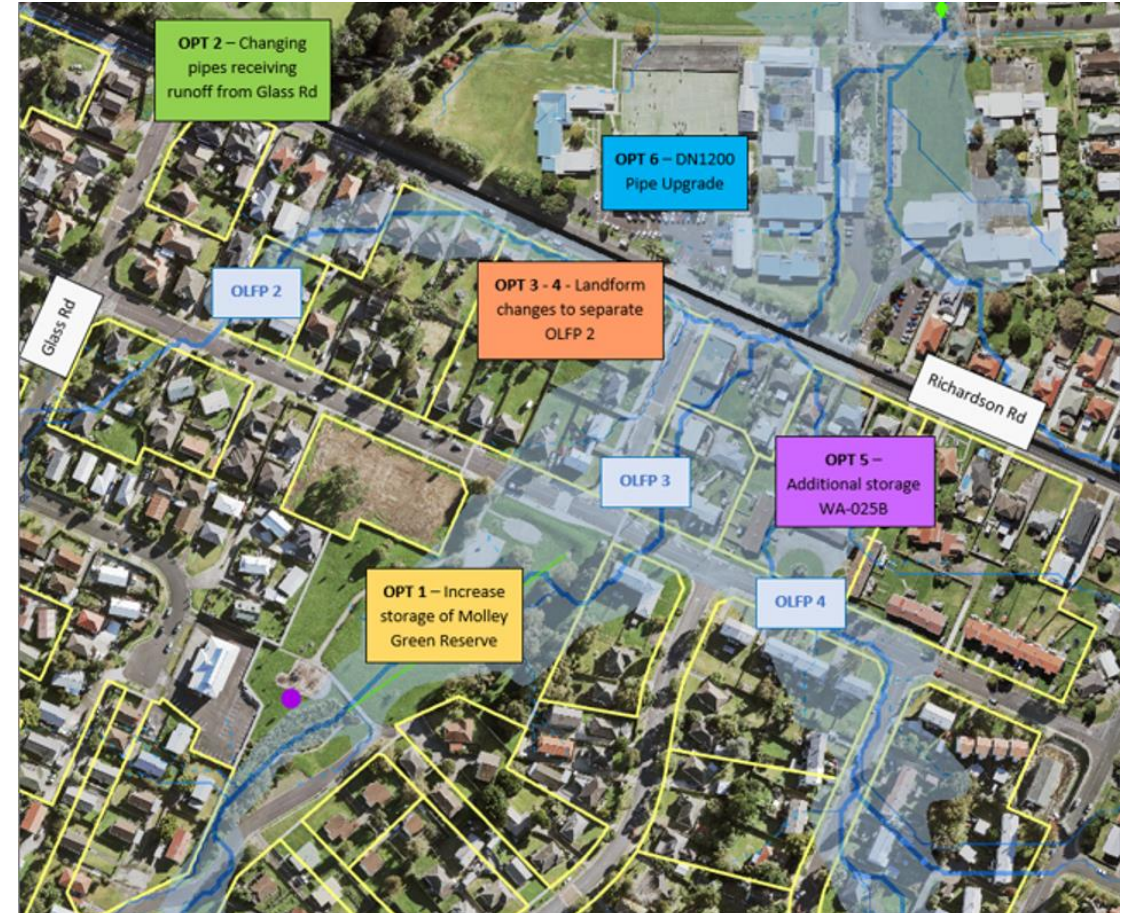


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# Flood Model Optioneering

## Landform changes

- Landform change options were assessed to separate OLFP 2 from discharging to the Richardson Road
- Changes around the western side of the school was considered to create a channel and discharge OLFP 2 directly to Keith Hay Park.
- Option provided limited benefit and the constraints outweighed the benefit.

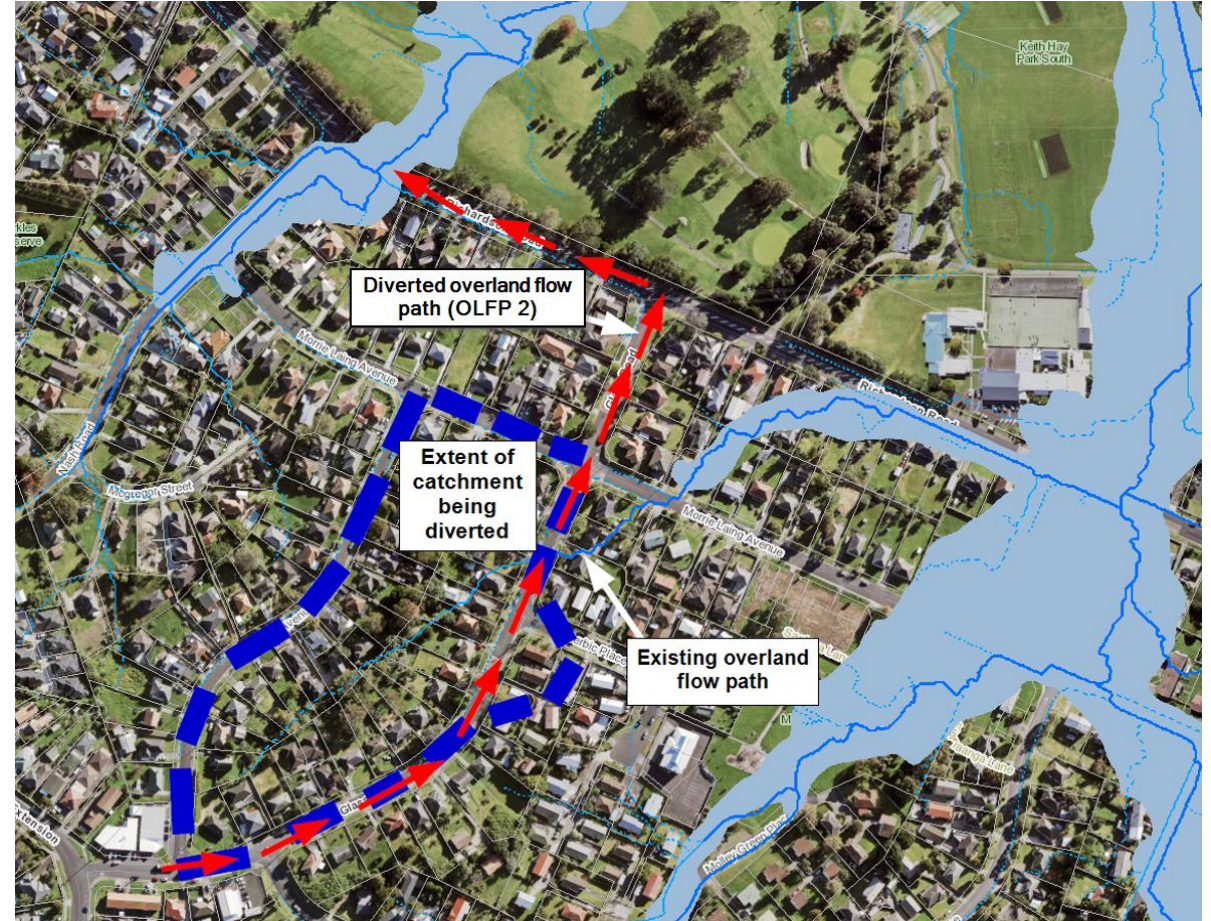




# Flood Model Optioneering

## Landform changes

- Glass Road was proposed to be regraded to separate OLFP 2 to discharge west, which would effectively reduce the runoff volume at the natural low point of the road
- This was not recommended due to construction impracticalities and limited flood improvement benefit
- Challenges identified:
  - The road regrading would require further steepening of already steep berms (more than 1 in 3).
  - Maintaining privately owned accessways with new steep berms would be hard.
  - The amount of cut (>0.8m) & fill (>1m) required to achieve this was considered excessive.





# Green Solutions – Key Reasons

- Options previously discussed are more traditional, consisting of large infrastructure upgrades and considered 'hard engineering' solutions.
- Simultaneously, green infrastructure solutions were considered.
- Inclusion of green infrastructure aligns with the principles of GD04 (Auckland Council), incorporating water sensitive design.
- Provides harmony with nature as they mimic the natural process and are aesthetically pleasing.

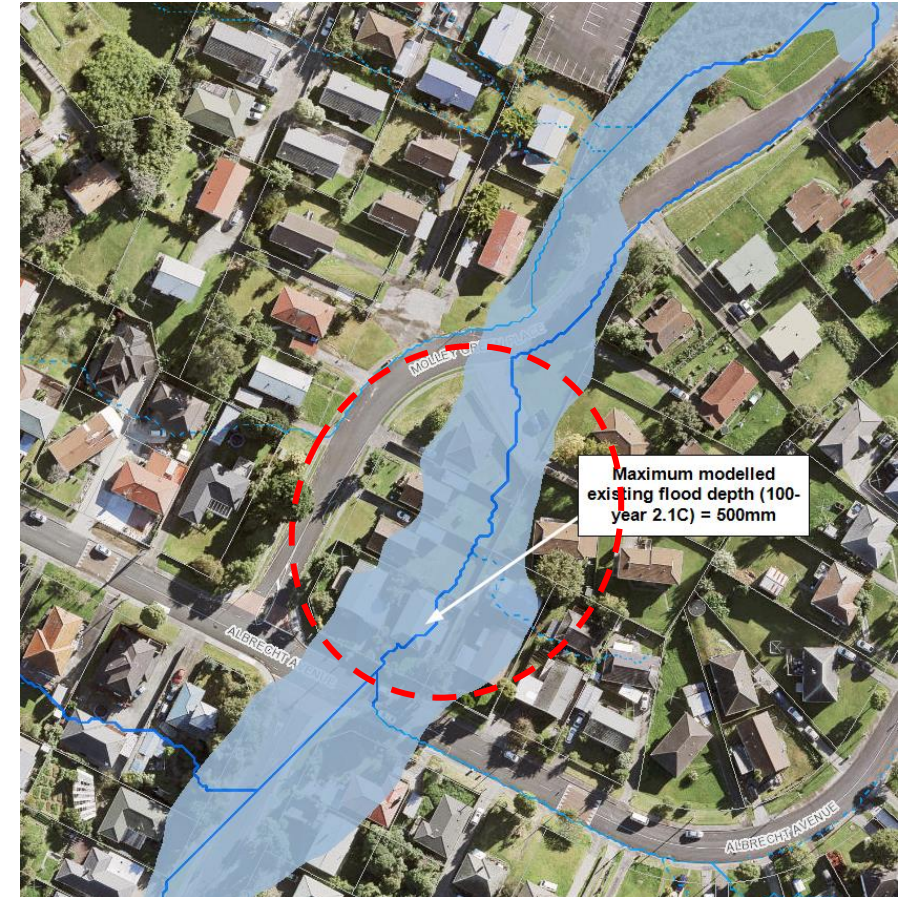


Source – GD04 by Auckland Council



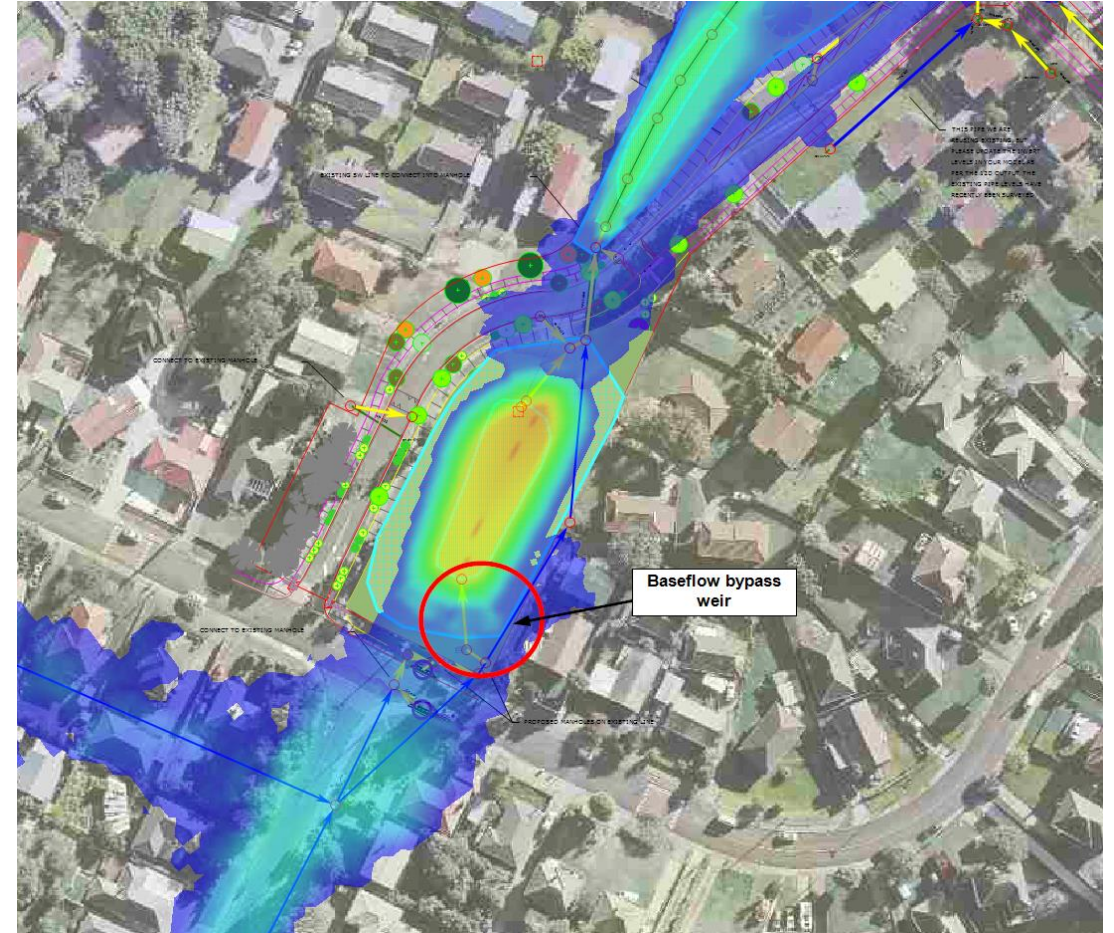
# Green Solutions – Albrecht Basin

- Creating another reserve in conjunction with increasing storage at Molley Green Reserve, referred to as Albrecht Basin.
- The land, owned by Kāinga Ora, was significantly flooded. While this area is zoned as residential in the AUP and highly unlikely to be re-developable due to flood risk.
- Daylighting opportunities and wider connectivity with Awa.



# Green Solutions – Albrecht Basin

- Albrecht Basin has been designed to attenuate the peak of storm events from overland flows and provides flood storage.
- Modelling confirms that storage is utilised during the peak of storms and is effective in reducing flows which impacts flooding downstream i.e. Richardson Road.
- For daylighting - allowance for base flows to enter the basin, however larger piped flows are bypassed through a weir.





# Results

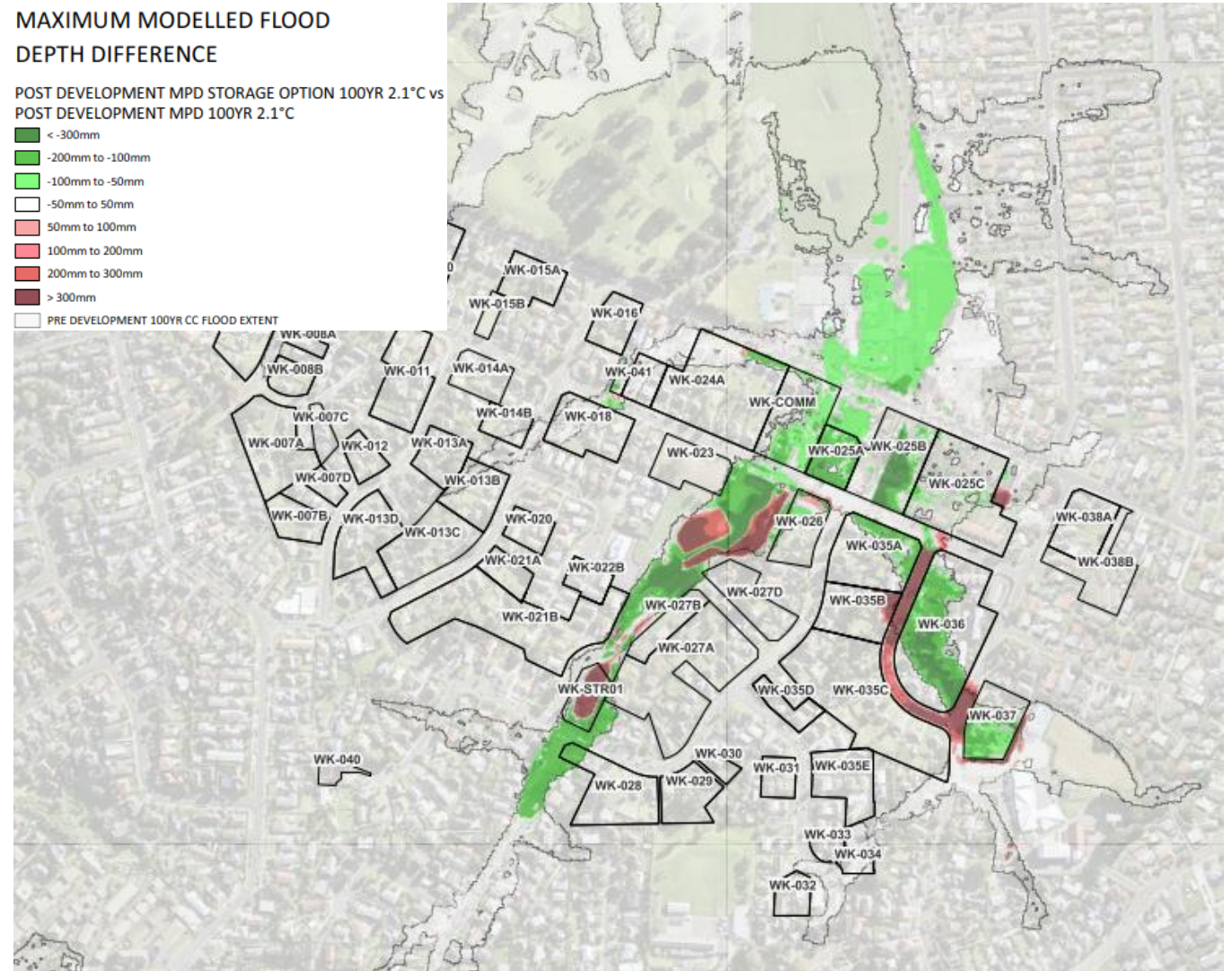
- The proposal increases flood storage capacity and extends the upstream reach of Te Auaunga Awa.
- Flood improvements noted at key areas. Increases will be addressed in future stages.
- The solution aims to mitigate flood impacts while promoting community wellbeing and greater environmental value.

## MAXIMUM MODELLED FLOOD DEPTH DIFFERENCE

POST DEVELOPMENT MPD STORAGE OPTION 100YR 2.1°C vs  
POST DEVELOPMENT MPD 100YR 2.1°C



PRE DEVELOPMENT 100YR CC FLOOD EXTENT



# Design outcomes

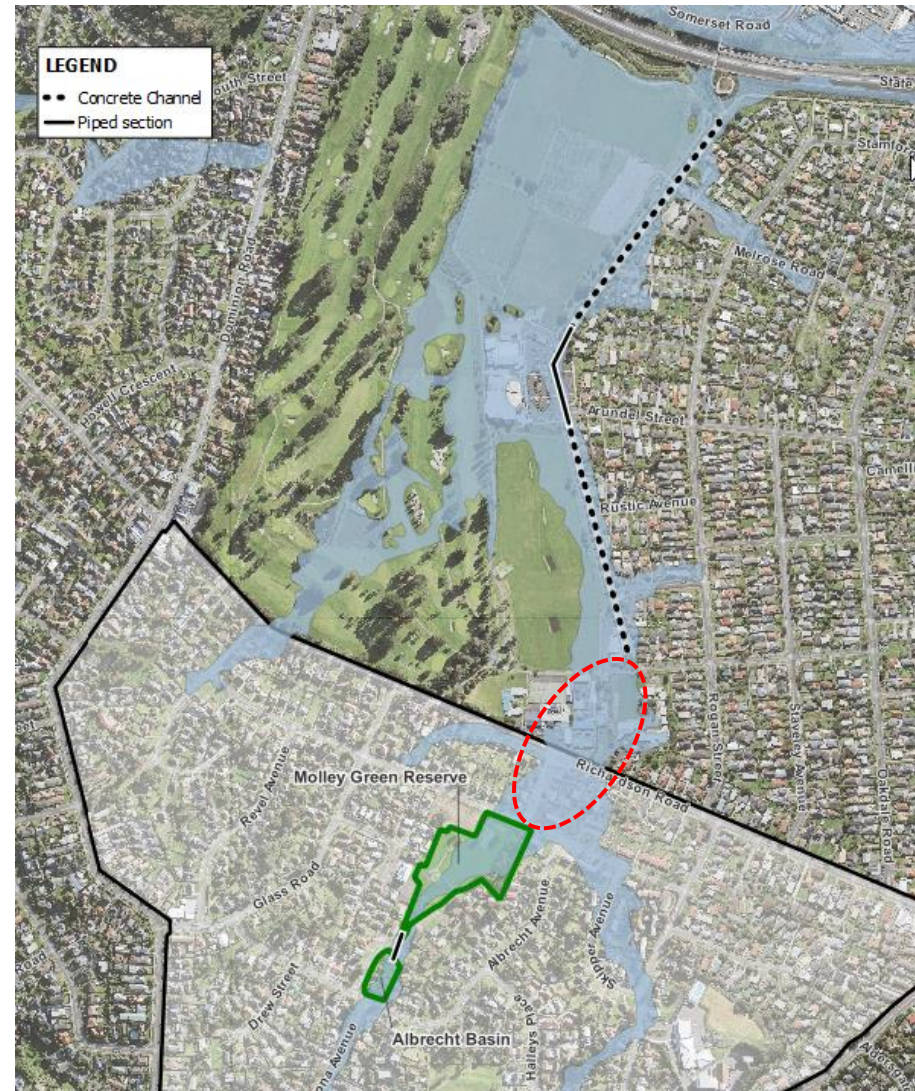
- Molley Green Reserve + Albrecht Basin provides flood improvement.
- The proposal further extended the daylighted portion of stream to the reserve outlet.
- Nature-based solutions and improve environmental values of existing stream networks.
- New blue-green spaces mean more amenities for community recreation.





# Future works

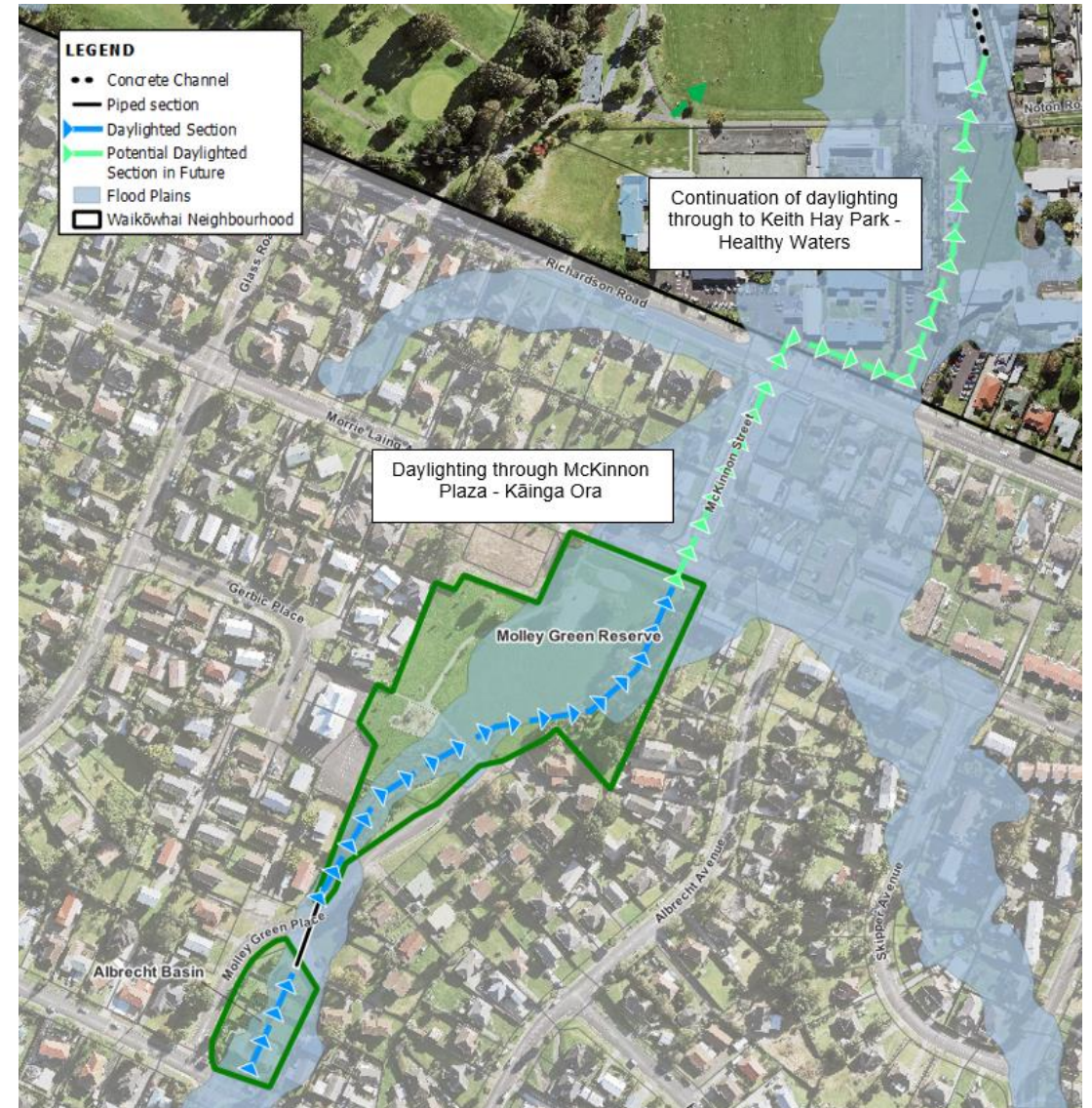
- Further to Albrecht Basin and Molley Green Reserve, the opportunity to further create a connection between the basins and Keith Hay Park was also explored.
- An extension of the channel providing runoff conveyance from Molley Green Reserve, through McKinnon Street to Richardson Road was considered by Kāinga Ora.
- The connection from Richardson Road through to Keith Hay Park was considered as an opportunity to complete the connectivity by Healthy Waters.





# Future works

- The results indicated this would provide further flood improvement; however, this extension was not recommended in the adopted SMP due to various stakeholder dependencies.
- Concept of daylighting past Molley Green Reserve to Richardson Road is currently being worked through by LEAD and Kāinga Ora.
- Alignment is subject to change based on design currently being undertaken





# Conclusion

- Significant increase in the connectivity of Waikōwhai catchment with the overall Te Auaunga Awa catchment.
- Integration of nature-based solutions is often challenging in a brownfield development due to limited availability of green space.
- This project demonstrates a holistic approach of intensifying in a brownfield development and incorporating nature-based solutions
- Provided benefit to not only the existing flooding conditions but also provides ecological restoration and community wellbeing while allowing for urban expansion.

# Thank you!

# Questions? Patai?



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## Stormwater 2024

15-17 May | Takina Wellington Te Whanganui-a-Tara