



25 June 2021

Mr Ben Elias
C/O aeDesign Partnership
Elizabeth Drive Pty Ltd
3/780 Darling Street
Rozelle NSW 2039

Our ref: 12553567-52463-5
Your ref: 12553567

Dear Ben,

Elizabeth Drive Cecil Park DA Updated Flooding Assessment

1 Background

1.1 Introduction

We reference the NSW DPIE (EES) letter dated 09/11/2020 (reference DOC20/838219/SDD-8859). GHD Pty Ltd was commissioned by Elizabeth Drive Pty Ltd to undertake a stormwater and flooding assessment of the property located at 1111-1141 Elizabeth Drive (Lot 2 DP 2954), Cecil Park, NSW (the site) as shown in Figure 1. Our report 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) and advice letter September, 2020 refer.

GHD understands the site has historically been used as a rural residence and is currently unzoned under the Fairfield Local Environmental Plan (LEP) 2013. The proposal is to redevelop the site as multiple commercial/industrial lots serviced by a local roadway. The site is in the upper reaches of the Ropes Creek catchment and is bound to the east and west by tributaries of Ropes Creek. The two tributaries ultimately discharge to Ropes Creek (a tributary of the Hawkesbury-Nepean River system). These waterways are in the upper reaches of the catchment and a farm dam straddles the site northern boundary.

The purpose of this letter is to address the matters raised in the letter from NSW DPIE (EES) (09/11/2020) and respond to the SEAR's and comments from stakeholders. On 10/06/2021 a revised design was received from Martens Consulting Engineers. GHD understand this design includes preliminary information on the future Wallgrove Road alignment provided by TfNSW. Detailed design information on the Wallgrove Road alignment was not available and could therefore not be simulated in the flood model, at the time of the current assessment. This design has necessitated re-simulation of the previously developed TUFLOW model of the subject site using the latest design terrain supplied by Martens Consulting Engineers. The TUFLOW model was simulated for the critical storm duration for the 1 in 10 AEP, 1 in 100 AEP and Probable Maximum Flood (PMF) events together with a climate change simulation, factoring the 1 in 100 AEP rainfall by the RCP 8.5 (2090) factor of 19.7%. These events are considered a proxy for a full range of flood events at the site.

1.2 Scope and Limitations

This letter has been prepared by GHD for Elizabeth Drive Pty Ltd and may only be used and relied on by Elizabeth Drive Pty Ltd for the purpose agreed between GHD and the Elizabeth Drive Pty Ltd. GHD otherwise disclaims responsibility to any person other than Elizabeth Drive Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Elizabeth Drive Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report, which were caused by errors, or omissions in that information.



Figure 1 Site Location (referenced from Six Maps)

2 Flooding

The TUFLOW model developed for the 2018 study (GHD, 2018) was updated to simulate in the latest software release (Version 2020-01-AB). The recent DEM design supplied by Martens Consulting Engineers for the site was compiled into the model on a 2 metre grid cell size, with sub-grid sampling applied at 1 metre intervals. Detailed design information on the Wallgrove Road alignment was not available and could therefore not be simulated in the flood model, at the time of the current assessment. Inflow boundary hydrographs to the TUFLOW model were calculated using a RORB hydrologic model developed using Australian Rainfall and Runoff (AR&R) 2019 procedures. The TUFLOW modelling compared existing and design conditions. The TUFLOW modelling compared existing and design conditions. Referring to the attached flood maps, the following is noted:

- Under existing conditions, there are two tributaries discharging along the boundary of the site. From Figures 01 to 03, existing conditions 1 in 10 AEP flood levels range from 107 m AHD to 100 m AHD in the western tributary and 102.5 m AHD to 97 m AHD in the eastern tributary. Flood velocities generally between 0.5 to 1 m/s through the main channel of both tributaries. Flood hazard generally ranges between H1 to H3.
- From Figures 04 to 06 existing conditions 1 in 100 AEP flood levels vary from 107 m AHD to 100 m AHD in the western tributary and 102.5 m AHD to 97 m AHD in the eastern tributary. Flood velocities generally range between 0.5 to 1 m/s with increasing areas between 1 to 1.5 m/s in the main channel of both tributaries. Flood hazard is generally between H1 to H3 with some area increasing to H4 through the main channels of the eastern and western tributaries.

- From Figures 07 to 09 existing conditions PMF flood levels vary from 107.5 m AHD to 101.5 m AHD in the western tributary and 103 m AHD to 98 m AHD in the eastern tributary. Flood velocities are generally greater than 2 m/s throughout the main channel of both tributaries. Flood hazards are generally H5 through the main channels of both tributaries.
- From Figures 10 to 24, it is noted that the development footprint is located outside the flood extents of all events simulated up to the PMF. The site entry is marginally affected by flooding, however the development pad level is 3.5 m above the PMF flood levels associated with the western tributary and 3.5 m above the PMF flood levels associated with the eastern tributary. The site is thus not considered flood prone land under the NSW Floodplain Development Manual 2005.
- From Figures 13 to 15, it is noted that, factoring the 1 in 100 AEP rainfall by the RCP 8.5 (2090) factor of 19.7% to account for climate change, would have a small to negligible impact on flooding.
- Since the development pad generally outside the PMF flood extents, there are generally no flood impacts as presented in Figures 22 to 24, with exception of minor impacts on the site entry. However, this may change once the design of Wallgrove Road is determined (not available for this flood assessment).
- Since the development is predicted to be flood-free for events up to and including the PMF, a shelter in place approach to evacuation is suggested, depending on the future design and immunity associated with Wallgrove Road.

An assessment against the Fairfield City Council Fairfield City Wide Development Control Plan (DCP) 2013 has been completed in Table 1.

Table 1 Fairfield City Wide Development Control Plan 2013

Control	Response
Land Category from Schedule 2 (end of Chapter 11)	Subdivision
Floodplain	Rural Area Flood Study (Ropes, Reedy and Eastern Creeks) (BMT WBM, 2013) Low to Medium Flood Risk Precinct (Figure 5-20)
Planning Matrix	Schedule 6 (Other Floodplains)
Engineers report required to certify that the development will not increase flood effects elsewhere, having regard to (i) loss of flood storage, (ii) change in flood levels and velocities caused by alterations to the flood conveyance, and (iii) the cumulative impact of multiple potential development in the floodplain	See the letter and associated mapping here within demonstrating compliance with this control.
The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere, having regard to (i) loss of flood storage, (ii) changes in flood levels or velocities caused by alterations to the flood conveyance, and (iii) the cumulative impact of multiple potential development in the floodplain. AN engineer's report may be required.	See the letter and associated mapping within, demonstrating compliance with this control.
Applicant to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development following from the subdivision proposal.	Evacuation dependant on Wallgrove Road design (not available for this flood assessment). As demonstrated in the attached Figure 19, the development will be flood immune in events up to the PMF, therefore a shelter in place approach shall be adopted. Given the short duration, flash-flooding nature of events causing the inundation of surrounding access roads, this approach is considered practical and should not cause prolonged periods of isolation for any

Control	Response
Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with the DCP.	individuals sheltering in place within the subdivision. Subdivision proposal is flood free for all events up to and including the PMF. Therefore no impact on other potential development, as demonstrated by the flood impact maps.

3 Responses to SEARs and Stakeholder Comments

The response to the SEAR's and stakeholders are provided in Table 2.

Table 2 Responses to SEARs and Stakeholder Comments

Authority	SEARs	GHD Response
NSW Planning & Environment (ESS)	<p>Flooding - including:</p> <ul style="list-style-type: none"> - an assessment of any flood risk on-site, having consideration of any relevant provisions of the NSW Floodplain Development Manual 2005, for the full range of floods including events greater than the design flood, up to the probable maximum flood; and from inundation, catchment-based flooding or a combination of the two; - details of how the development would comply with relevant codes of practice and guidelines; and - details of how the development would ensure the safety of all persons on-site and ensure negligible impacts upon persons off site. 	<ul style="list-style-type: none"> - Flood risk has been assessed as part of this letter supported by flood mapping for a range of flood events, up to the PMF following the NSW Floodplain Development Manual 2005. - Mapping presented in this letter the attached Figure 22 to 24 demonstrates that impacts due to the proposed development are negligible off-site. - The development is predicted to be flood-free for events up to and including the PMF. On this basis, in formulating an evacuation plan for the site, a shelter in place approach is suggested, depending on the future design and immunity associated with Wallgrove Road.
Fairfield Council	<p>Floodplain Management</p> <ul style="list-style-type: none"> - The development is to be consistent with Chapter 11 of the Fairfield Citywide DCP 2013 Close attention should be paid to the Flood Effects control that requires that there is to be no flood effects elsewhere (which equates to a max 0.01 m change when modelling flood impacts). - The proponent must follow Council's standard procedure when undertaking a flood impact assessment and can contact Fairfield City Council's Catchment Planning Branch for further details of the process. 	<ul style="list-style-type: none"> - Assessment against this completed. Demonstrated on the attached Figure 22 to 24 show that negligible off-site impacts occur due to the development. See Table 1 for compliance with the DCP. - Details are presented in this letter and associated mapping in the attached. - Flooding impact demonstrated in the attached Figure 1 to 24 of this letter. Hydraulic model extends a sufficient distance upstream of the site to Elizabeth Drive on both the eastern and

Authority	SEARs	GHD Response
	<ul style="list-style-type: none"> - The flood impact assessment must model the fully developed lots (including likely buildings) to ensure the construction of buildings after the subdivision is viable. Modelling as part of the flood impact assessment must report results for a minimum of 500m upstream and downstream of the site. 	<p>western tributaries. This presents a conservative assessment considering flooding levels and impacts as any attenuation due to flows through culverts under Elizabeth Drive is not accounted for in the modelling and assumed to concentrate immediately downstream of Elizabeth Drive. Downstream of the site the model extends > 500 metres.</p>
Office of Environment & Heritage	<p>11. The EIS must assess the impact of the development on hydrology, including:</p> <ul style="list-style-type: none"> a. Water balance including quantity, quality and source. b. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas. C. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems. d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches). e. Changes to environmental water availability, both regulated/licensed and unregulated/rules based sources of such water. f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options. g. Identification of proposed monitoring of hydrological attributes. 	<ul style="list-style-type: none"> - (a) No water extraction proposed as part of the development therefore no impact on water balance. Refer to the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for compliance of stormwater quantity and quality of proposed stormwater management measures. - (b) as for (a), refer to the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for compliance of stormwater quantity and quality of proposed stormwater management measures with downstream receiving environment. - (c) refer to the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for compliance of stormwater quantity and quality of proposed stormwater management measures with downstream receiving ecosystem. No water extraction proposed as part of the development therefore no impact on groundwater from the proposal. - (d) refer to the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for compliance of stormwater quantity and quality of proposed stormwater management measures with downstream receiving environment.

Authority	SEARs	GHD Response
	<p>12. The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:</p> <ul style="list-style-type: none"> a. Flood prone land b. Flood planning area, the area below the flood planning level. c. Hydraulic categorisation (floodways and flood storage areas). 	<ul style="list-style-type: none"> - (e) No water extraction proposed as part of the development therefore no disruption to water availability from the proposal. - (f) refer to the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for compliance of stormwater quantity related proposed stormwater management measures. - (g) Visual inspection recommended post-construction to ensure no disruption of hydrological attributes. <ul style="list-style-type: none"> (a) The extent of flood prone land is shown in the attached Figure 1, 4 and 7. (b) Flood planning level defined in Fairfield City Councils Local Environmental Plan (LEP) (2013) as the 1:100 ARI (average recurrence interval) (equivalent to the 1 in 100 AEP) plus 0.5 metres freeboard. The development is above the flood planning level and has flood immunity in the PMF. (c) There are no floodways and flood storages located on the development site.
	<p>13. The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.</p>	<ul style="list-style-type: none"> - The hydrologic model was developed using Australian Rainfall and Runoff (AR&R) 2019 procedures. A RORB hydrological model was compiled to calculate rainfall-runoff hydrographs for input to the TUFLOW model. The results from the 1 in 10 AEP, 1 in 100 AEP and PMF event storms were enveloped to determine the maximum flood depth, levels, extent, velocity, hazard and impacts. Mapping presented in this letter in the attached Figure 1 to 24 demonstrates that impacts due to the proposed development are negligible off-site. - Flood risk has been assessed in GHD's letter (September, 2020) and the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for a

Authority	SEARs	GHD Response
		<p>range of flood events, up to the PMF in line with the NSW Floodplain Development Manual 2005. Details are presented in the previous report titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018).</p>
Office of Environment & Heritage	<p>14. The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:</p> <p>a. Current flood behaviour for a range of design events as identified in 11 above. This includes the 1 in 200 and 1 in 500-year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.</p> <p>15. Modelling in the EIS must consider and document:</p> <p>a. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood.</p> <p>b. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories.</p> <p>c. Relevant provisions of the NSW Floodplain Development Manual 2005.</p>	<p>(a) The 1 in 200 and 1 in 500 AEP events have not been modelled. However, the PMF (probable maximum flood) event has been modelled showing the maximum flood extent. The 1 in 100 AEP climate change event has also been modelled to test rainfall sensitivity by increasing the rainfall-runoff by 19.7%. This factor has been taken from the ARR2019 interim climate change factors considering the RCP 8.5 (2090) scenario). Refer to the attached Figure 16, 17 and 18 showing the 1 in 100 AEP event climate change flood level, depth, velocity and impact maps.</p>
		<p>(a) Flood risk has been assessed in the GHD letter (September, 2020) and the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for a range of flood events, up to the PMF in line with the NSW Floodplain Development Manual 2005. Details are presented in the previous report titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018).</p> <p>(b) In general, mapping presented in this letter in the attached Figure 1 to 24 demonstrates that impacts due to the proposed development are negligible off-site during the 1 in 10 AEP and 1 in 100 AEP events.</p> <p>(c) Flood risk has been assessed in the GHD (September, 2020) and the previous report by GHD titled 1111-1141 Elizabeth Drive DA Stage Stormwater, Flooding and Dams (GHD, 2018) for a range of flood events, up to the PMF in</p>

Authority	SEARs	GHD Response
Office of Environment & Heritage	<p>16. The EIS must assess the impacts on the proposed development on flood behaviour, including:</p> <ul style="list-style-type: none"> a. Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure. b. Consistency with Council floodplain risk management plans. c. Compatibility with the flood hazard of the land. d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land. e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site. f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses. g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council. h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council. i. Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES. j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding. 	<p>line with the NSW Floodplain Development Manual 2005.</p> <ul style="list-style-type: none"> (a) In general, mapping presented in this letter in the attached Figure 1 to 24 demonstrates that impacts due to the proposed development are negligible off-site during the 1 in 10 AEP and 1 in 100 AEP events. (b) Existing and developed case maps are consistent with the floodplain risk management plans provided by Fairfield Council. See Table 1. (c) The development site has PMF flood immunity and is therefore compliant with the flood hazard of the land. (d) The site is located outside the PMF extent and there are no impacts to the flood ways and flood storage areas as demonstrated in flooding impact maps provided in the attached Figure 1 to 24. (e) No adverse effect to inundation of the floodplain environment, on, adjacent to or downstream of the site. (f) No change in flood level, therefore unlikely to have an impact on direct or indirect increase in erosion. (g) During the 1 in 10 AEP, 1 in 100 AEP and PMF event the flood extent encroaches 30 m into the entry/exit from the site. However, the site has PMF event immunity. Therefore a "stay at home" order would need to be enforced during a flood event. (h) The proposal incorporate PMF event flood immunity for all properties located within the development. (i) No evacuation likely during flood events. The development site has PMF level immunity. A "shelter-in-place" approach should be considered when developing an evacuation plan, depending on the future design and immunity associated with Wallgrove Road. (j) The development would have no tangible social or economic costs to the

Authority	SEARs	GHD Response
		community as a consequence of flooding.

4 Summary

With reference the NSW DPIE (EES) letter dated 09/11/2020 (reference DOC20/838219/SDD-8859), Table 3 below summarises the response to the key matters raised.

Table 3

FLOOD	
<i>Issue Raised</i>	<i>Response</i>
EES recommends the applicant liaise with Transport for NSW to confirm design details of the realignment of Wallgrove Road and its timeframe and include this information in an updated flooding assessment. If this information is not available, it is recommended the proposal disregard the road realignment in consideration of flooding matters.	The recent DEM design supplied by Martens Consulting Engineers for the site was compiled into the flood model on a 2 metre grid cell size, with sub-grid sampling applied at 1 metre intervals. Detailed design information on the Wallgrove Road alignment was not available and could therefore not be simulated in the flood model, at the time of the current assessment
A revised civil design has been prepared by Martens Consulting Engineers for the updated EIS. The revised civil design has not been referred to in the letter on flooding from GHD and it is unclear whether it has been taken into consideration for the assertions made therein.	See above
A Flood Impact Risk Assessment needs to be prepared, having regard to the revised civil design and EES comments dated 18 March 2019. If information is available on the realignment of Wallgrove Road, two scenarios should be investigated: with and without the road realignment.	This is addressed by the current letter, supported by the attached flood mapping.

Sincerely
GHD



Dr Rainer Berg
Senior Technical Director: Hydrology, Stormwater & Flooding

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Attachment: Flood Mapping

Legend

Property Lots

Flood Level

Contour (m

AHD)

Flood Depth and Extent (m)

0.00 - 0.01

0.01 - 0.05

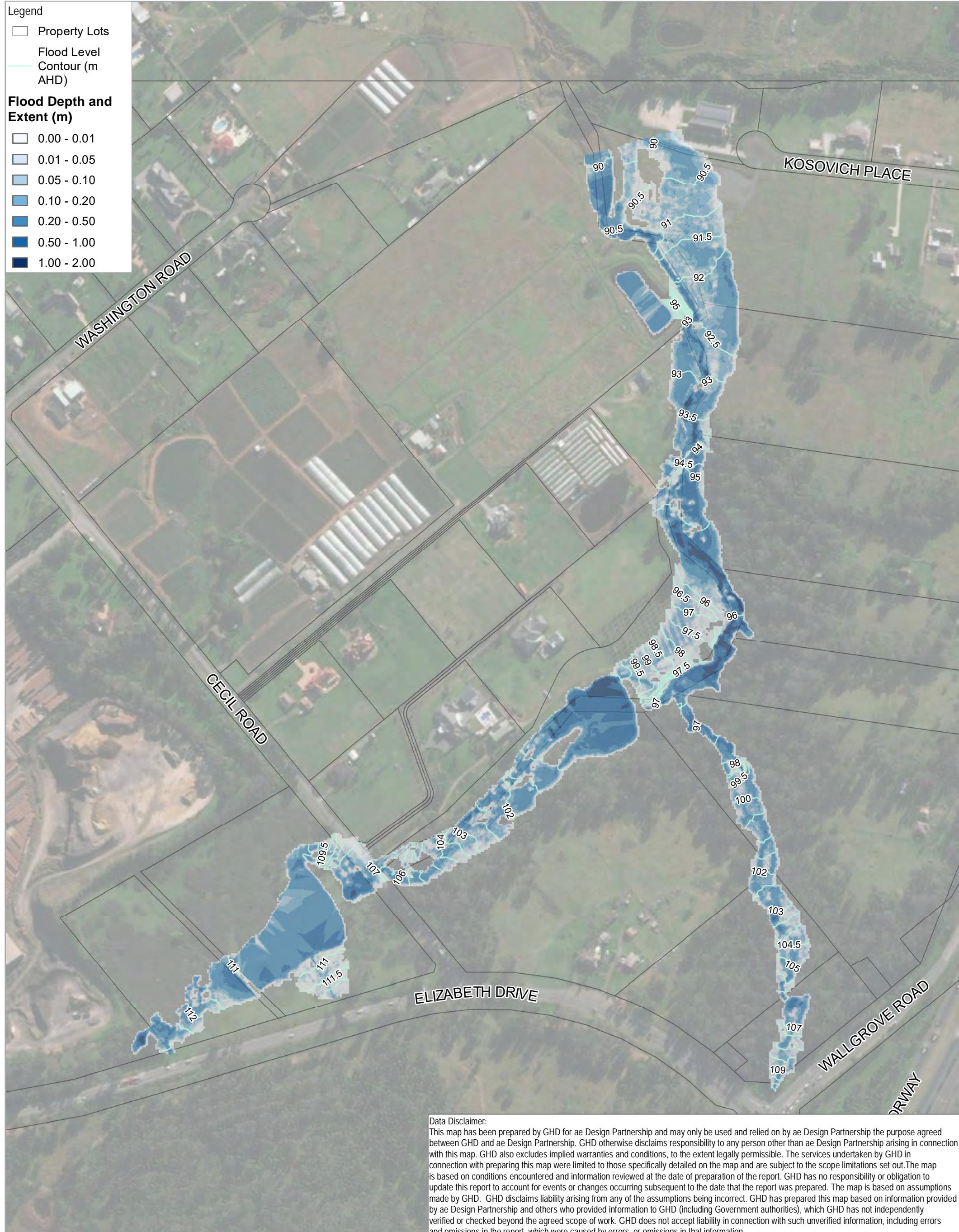
0.05 - 0.10

0.10 - 0.20

0.20 - 0.50

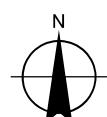
0.50 - 1.00

1.00 - 2.00



Paper Size ISO A3
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 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Existing Condition Scenario
 Flood Depth and Level Contours
 1 in 10 AEP Event

Project No. 21-12553567
 Revision No. A
 Date 24 Jun 2021

Figure 01

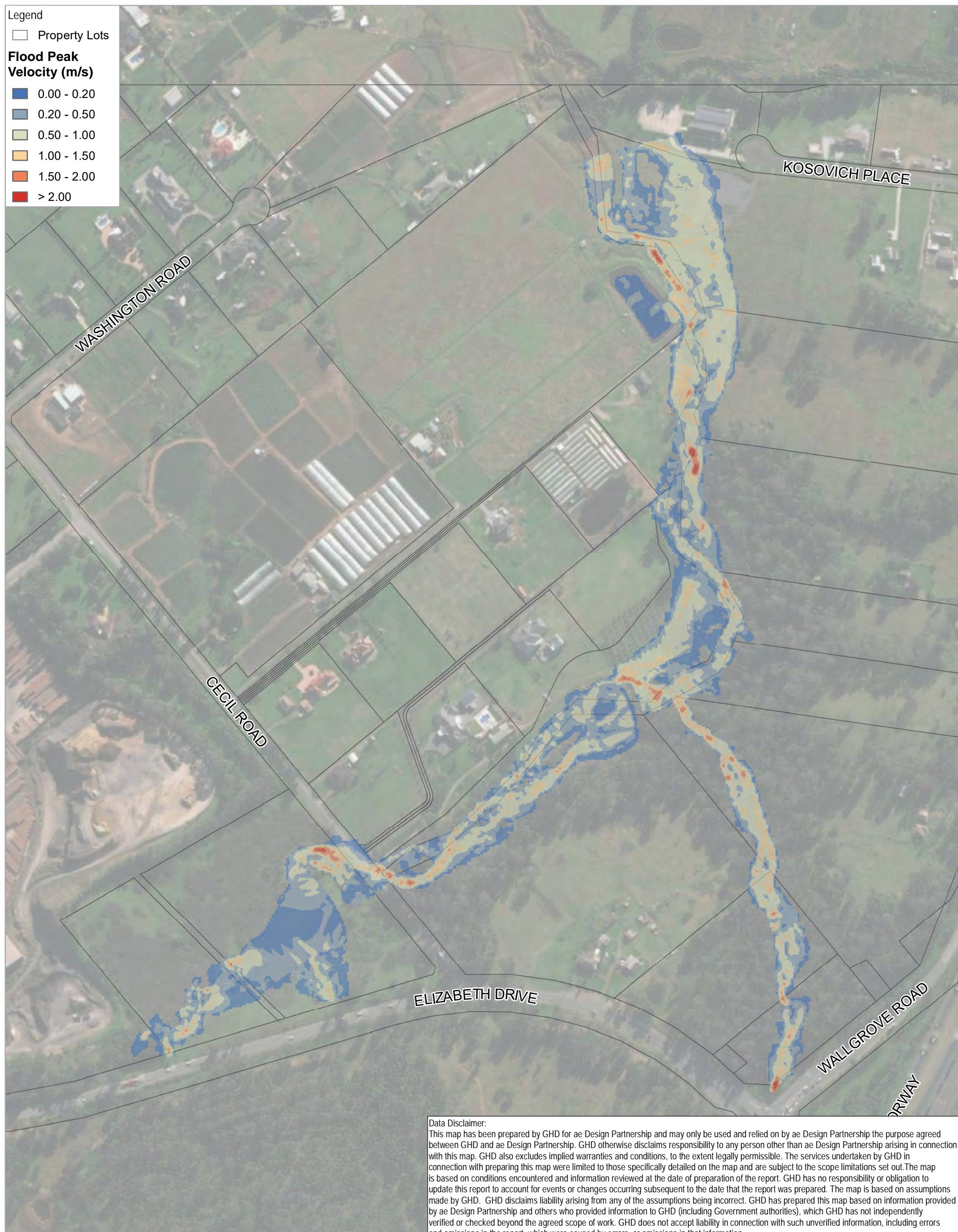
Data Source: Jacobs & Aeronetex 2016. Created by Syntex

Legend

Property Lots

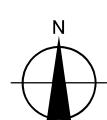
Flood Peak Velocity (m/s)

- 0.00 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00



Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

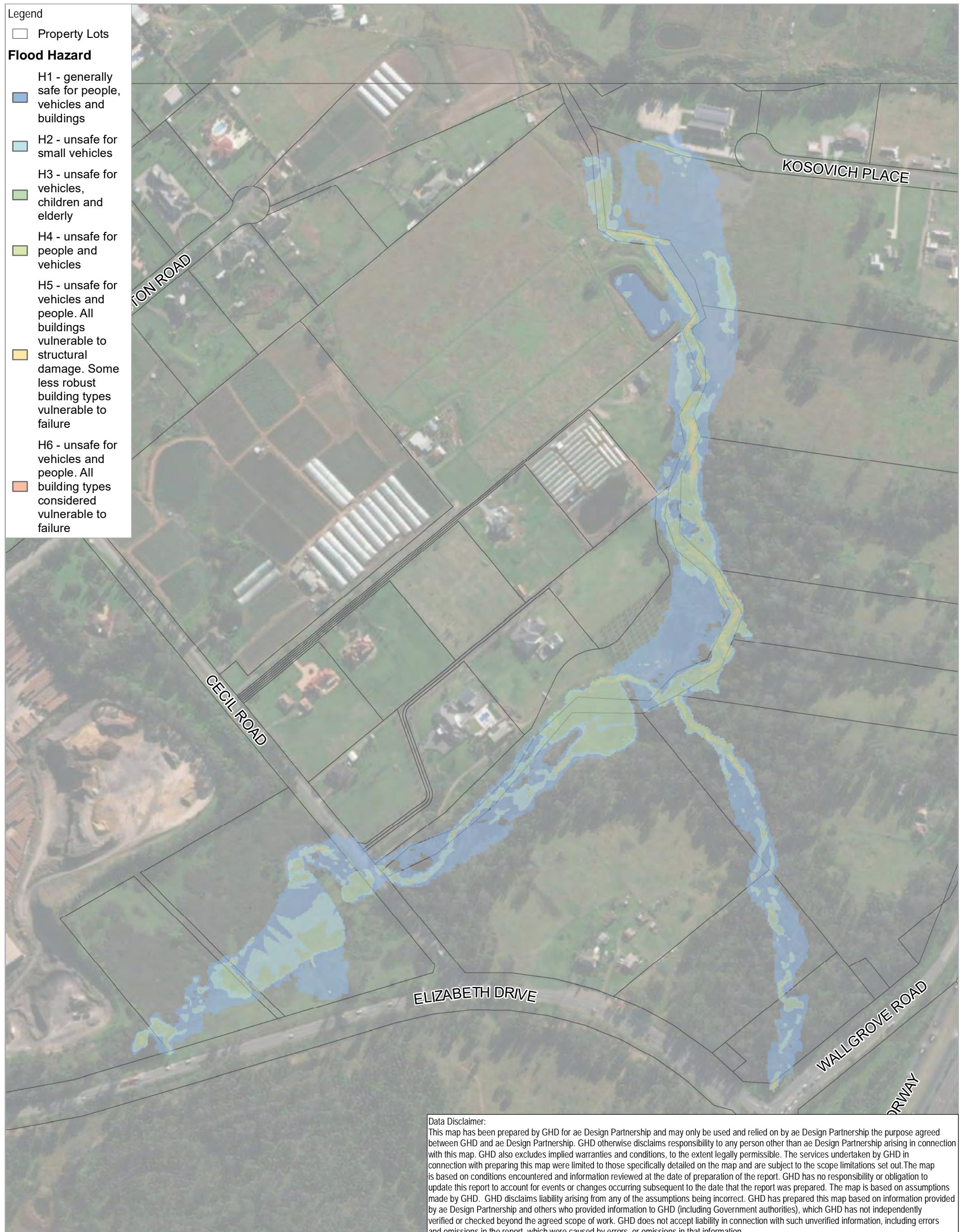


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 Existing Condition Scenario
 Flooding Velocity
 1 in 10 AEP Event

Project No. 21-12553567
 Revision No. A
 Date 24 Jun 2021

Figure 02

Data Source: Jacobs & Aeronetrix 2016. Created by Syntex

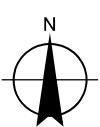


Part B: List

Data Disclaimer:
This map has been prepared by GHD for ae Design Partnership and may only be used and relied on by ae Design Partnership the purpose agreed between GHD and ae Design Partnership. GHD otherwise disclaims responsibility to any person other than ae Design Partnership arising in connection with this map. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this map were limited to those specifically detailed on the map and are subject to the scope limitations set out. The map is based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The map is based on assumptions made by GHD. GHD disclaims liability arising from any of the assumptions being incorrect. GHD has prepared this map based on information provided by ae Design Partnership and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report, which were caused by errors, or omissions in that information.

Paper Size ISO A3
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 Kilometers
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

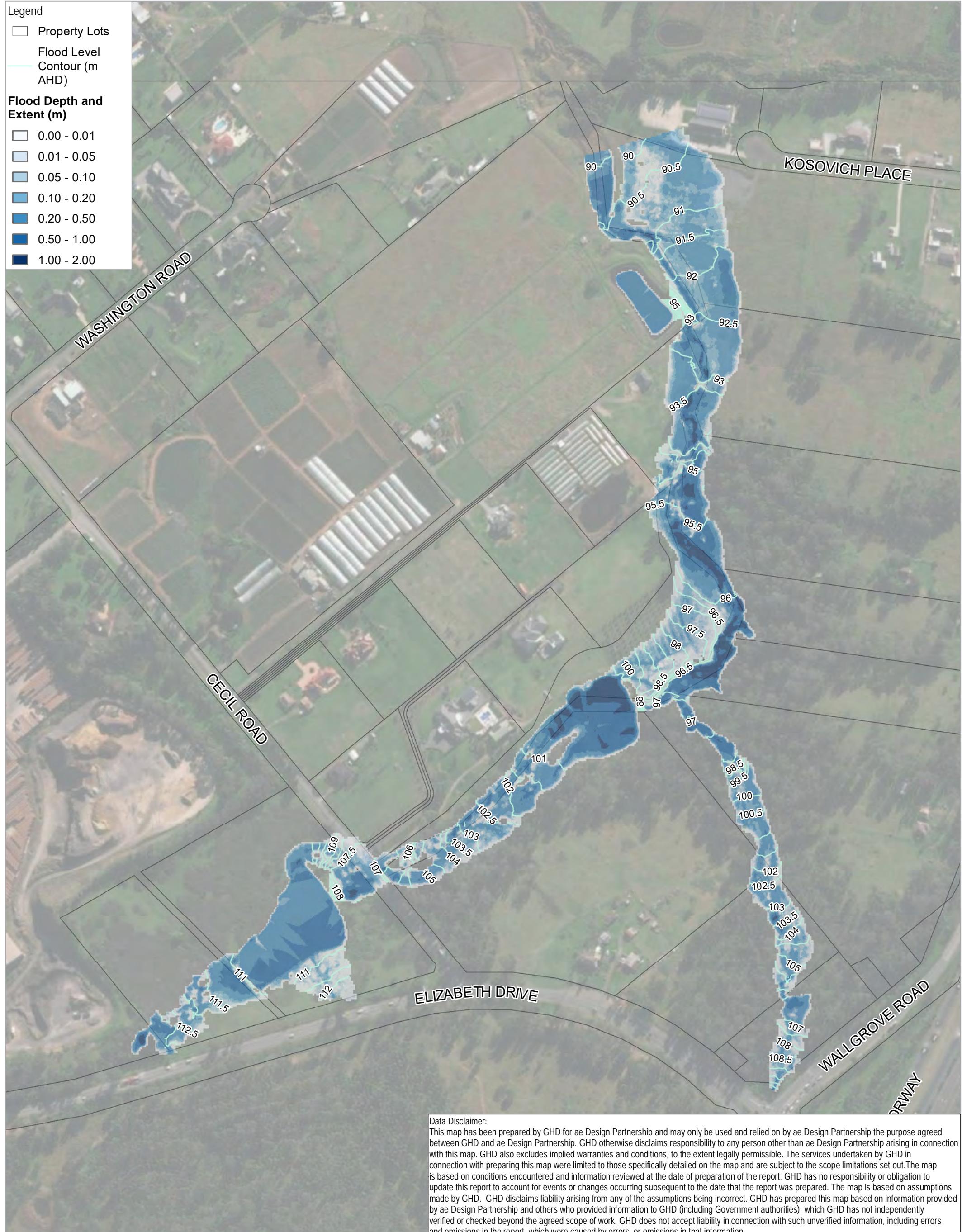
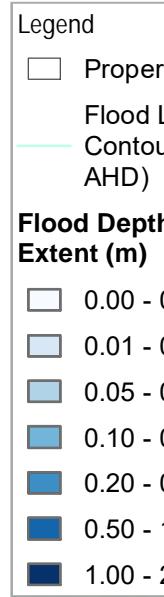


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Existing Condition Scenario Flood Hazard Category 1 in 10 AEP Event

Figure 03

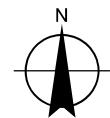


Paper Size ISO A3

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Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Existing Condition Scenario
 Flood Depth and Level Contours
 1 in 100 AEP Event

Project No. 21-12553567
 Revision No. A
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Figure 04

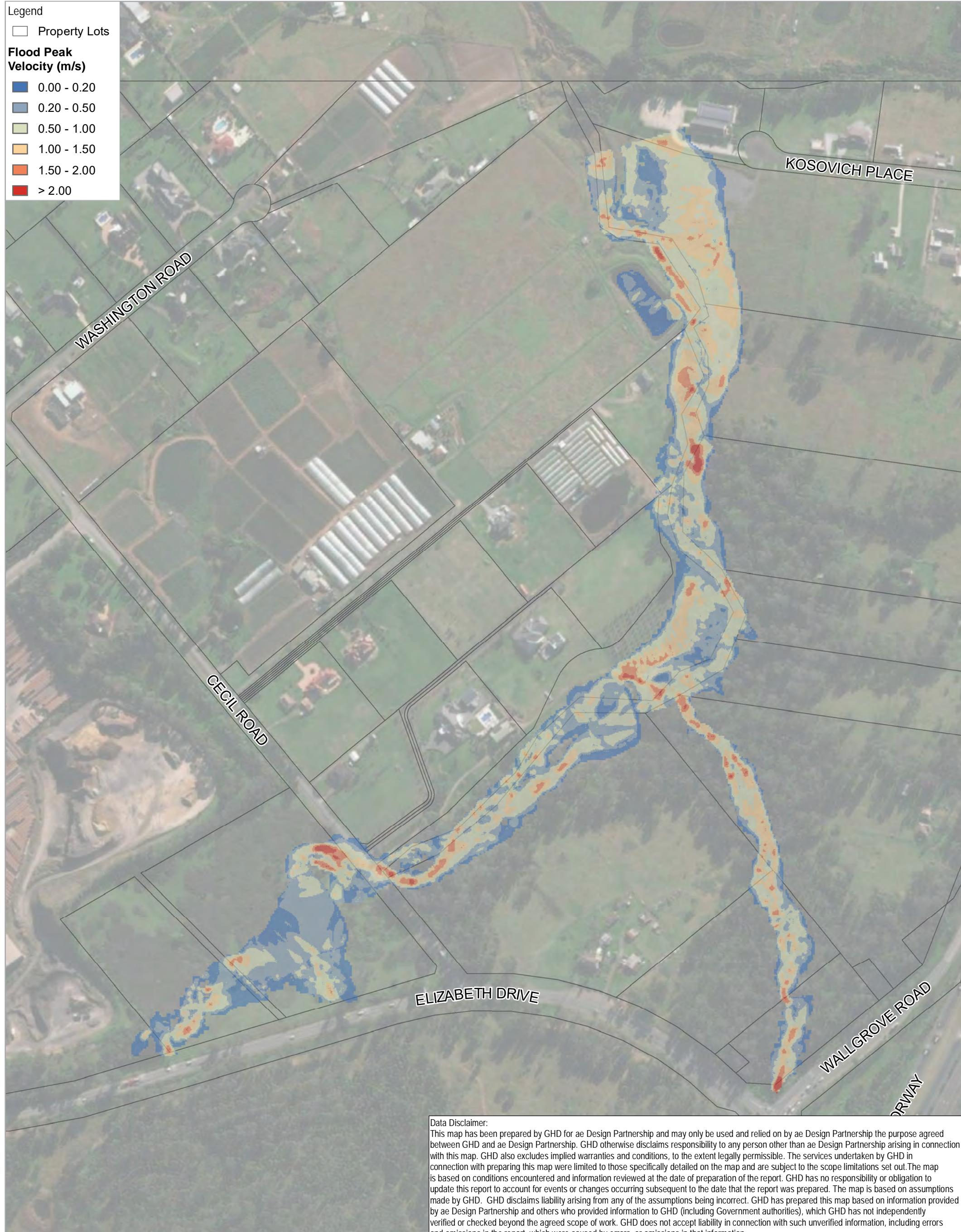
Data Source: Jacobs & Aeronetex 2016. Created by Syntex

Legend

Property Lots

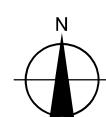
Flood Peak Velocity (m/s)

- 0.00 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00



Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Existing Condition Scenario
 Flooding Velocity
 1 in 100 AEP Event

Project No. 21-12553567
 Revision No. A
 Date 24 Jun 2021

Figure 05

Data Source: Jacobs & Aeronetex 2016. Created by Syntex

Legend

Property Lots

Flood Hazard

H1 - generally safe for people, vehicles and buildings

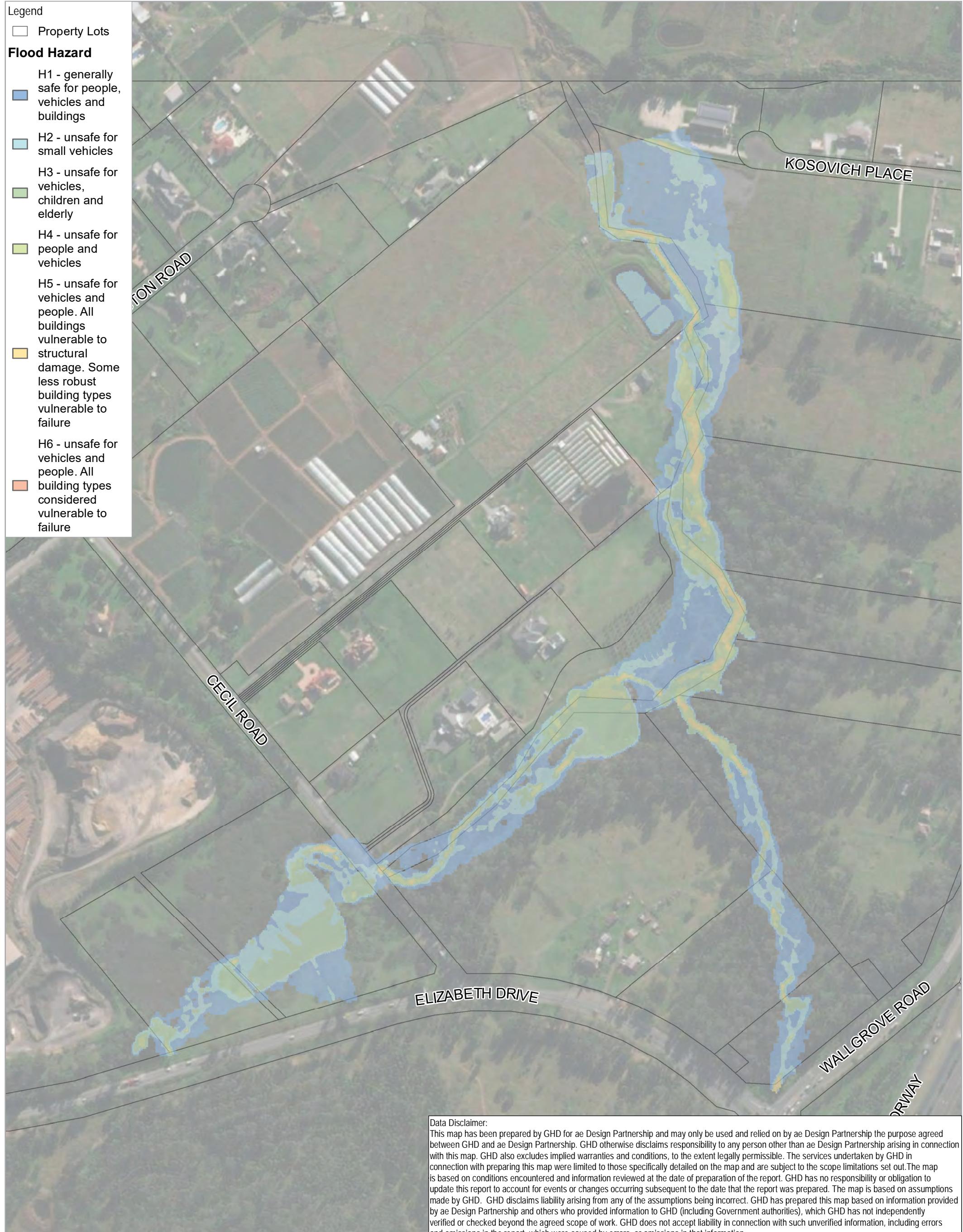
H2 - unsafe for small vehicles

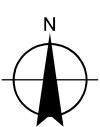
H3 - unsafe for vehicles, children and elderly

H4 - unsafe for people and vehicles

H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure

H6 - unsafe for vehicles and people. All building types considered vulnerable to failure


 Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

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 Existing Condition Scenario
 Flood Hazard Category
 1 in 100 AEP Event

 Project No. 21-12553567
 Revision No. A
 Date 24 Jun 2021

Figure 06

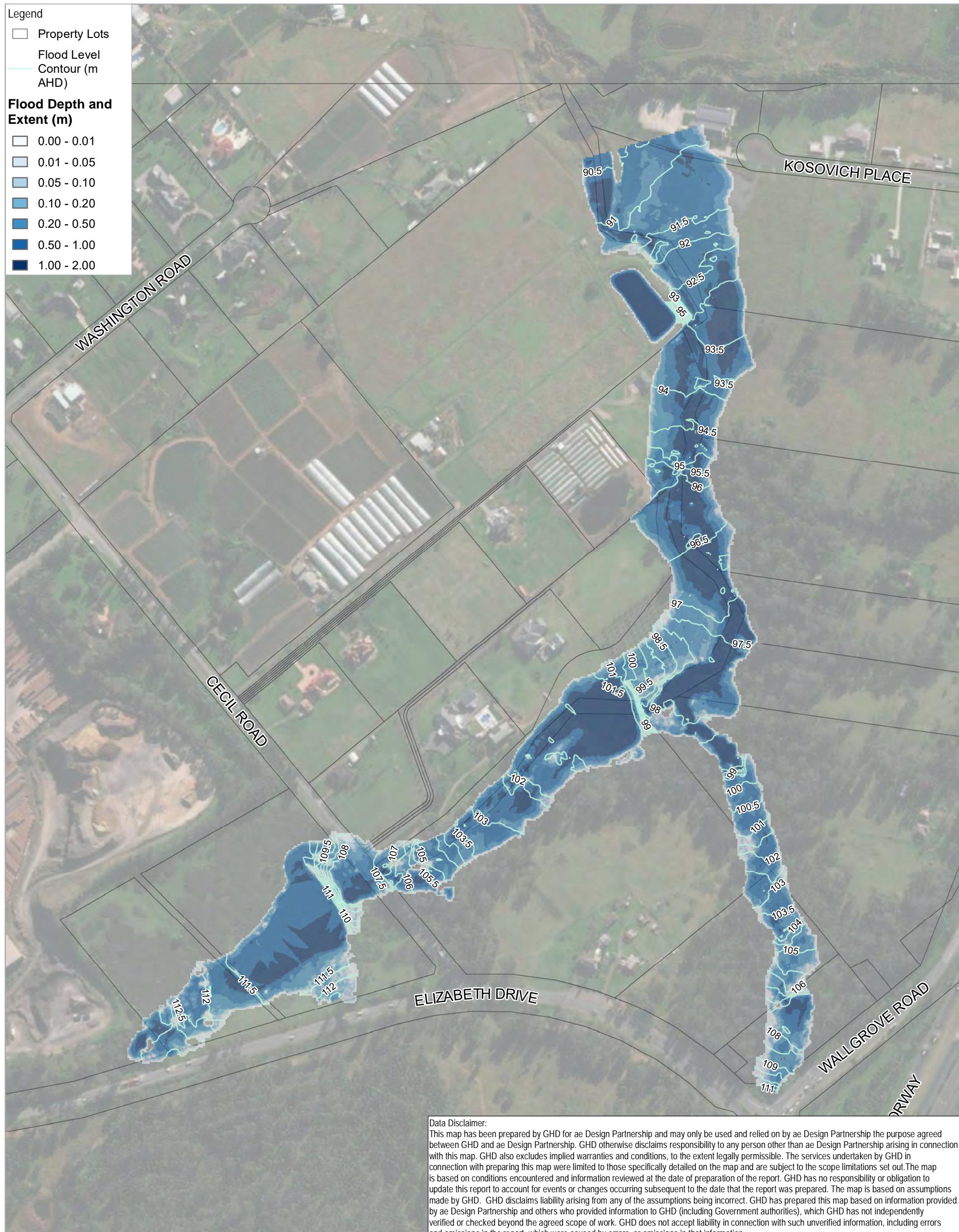
Data Source: Jacobs & Aerometrex 2016. Created by Syntex

Legend

- Property Lots
- Flood Level
- Contour (m AHD)

Flood Depth and Extent (m)

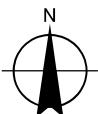
- 0.00 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00



Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

 ae Design Partnership
 Existing Condition Scenario
 Flood Depth and Level Contours
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Figure 07

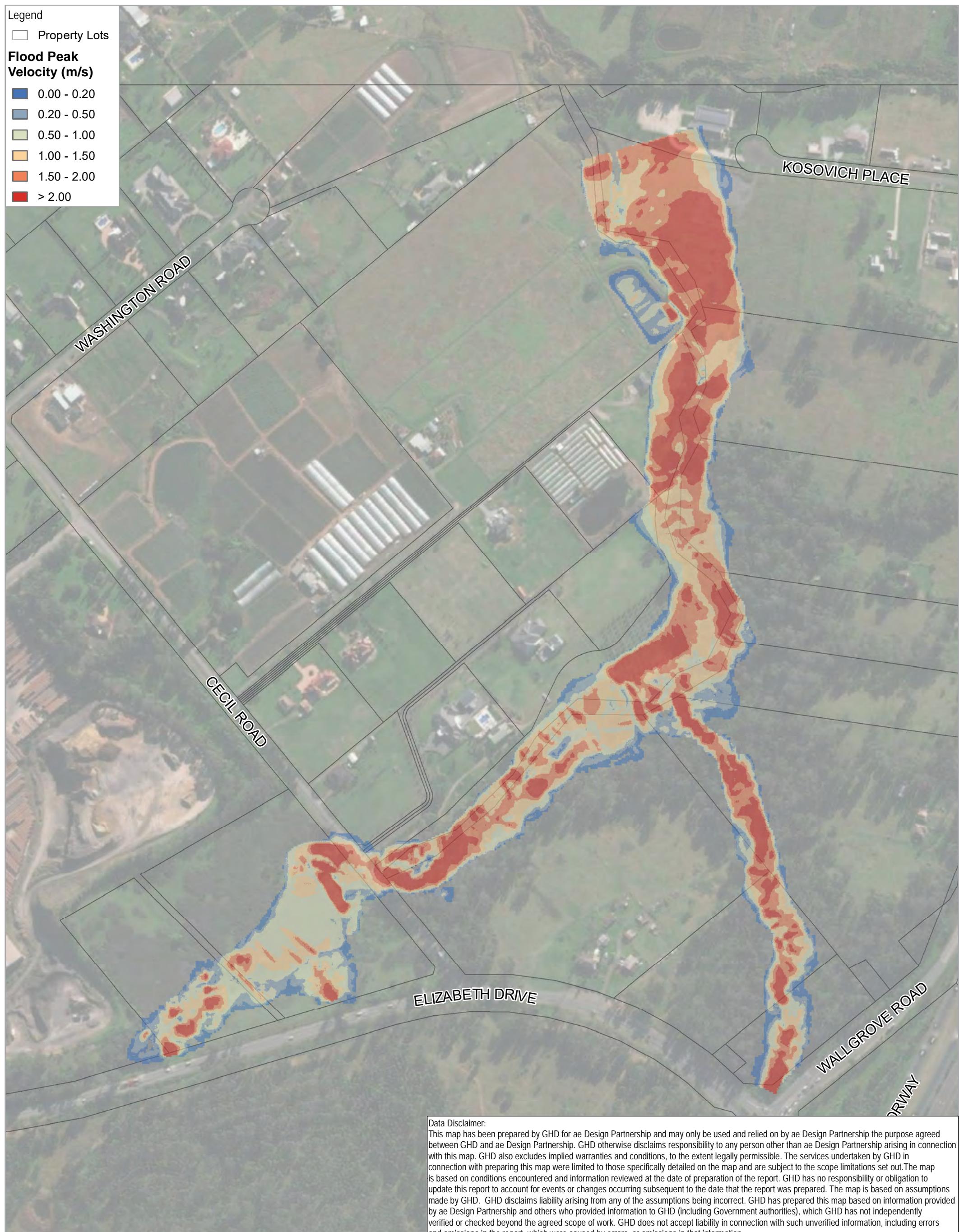
Data Source: Jacobs & Aeronetrex 2016. Created by Syntex

Legend

Property Lots

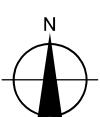
Flood Peak Velocity (m/s)

- 0.00 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00



Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Figure 08

Data Source: © Jacobs & Aeronetex 2016. Created by Syntex

Legend

Property Lots

Flood Hazard

H1 - generally safe for people, vehicles and buildings

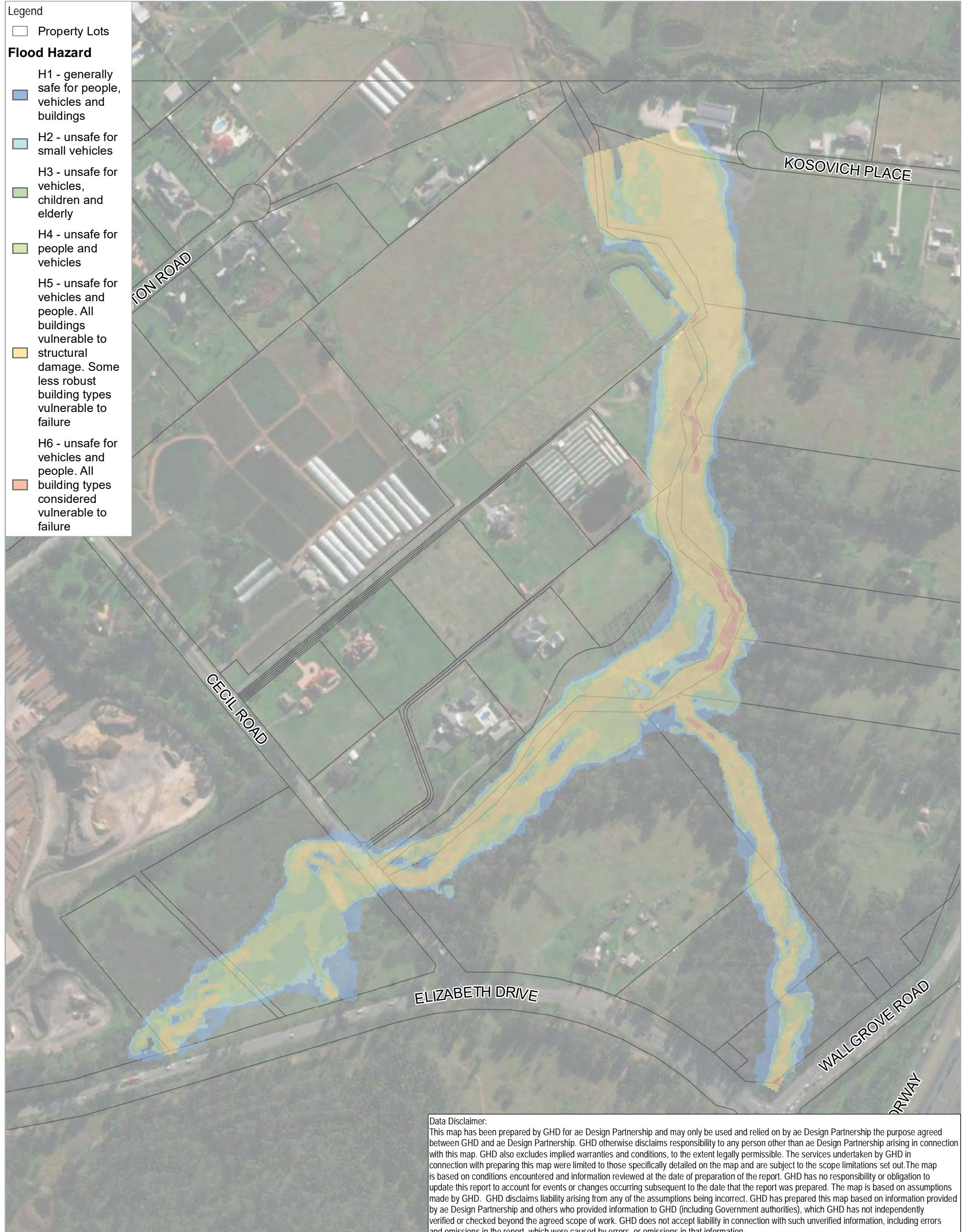
H2 - unsafe for small vehicles

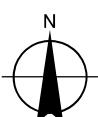
H3 - unsafe for vehicles, children and elderly

H4 - unsafe for people and vehicles

H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure

H6 - unsafe for vehicles and people. All building types considered vulnerable to failure

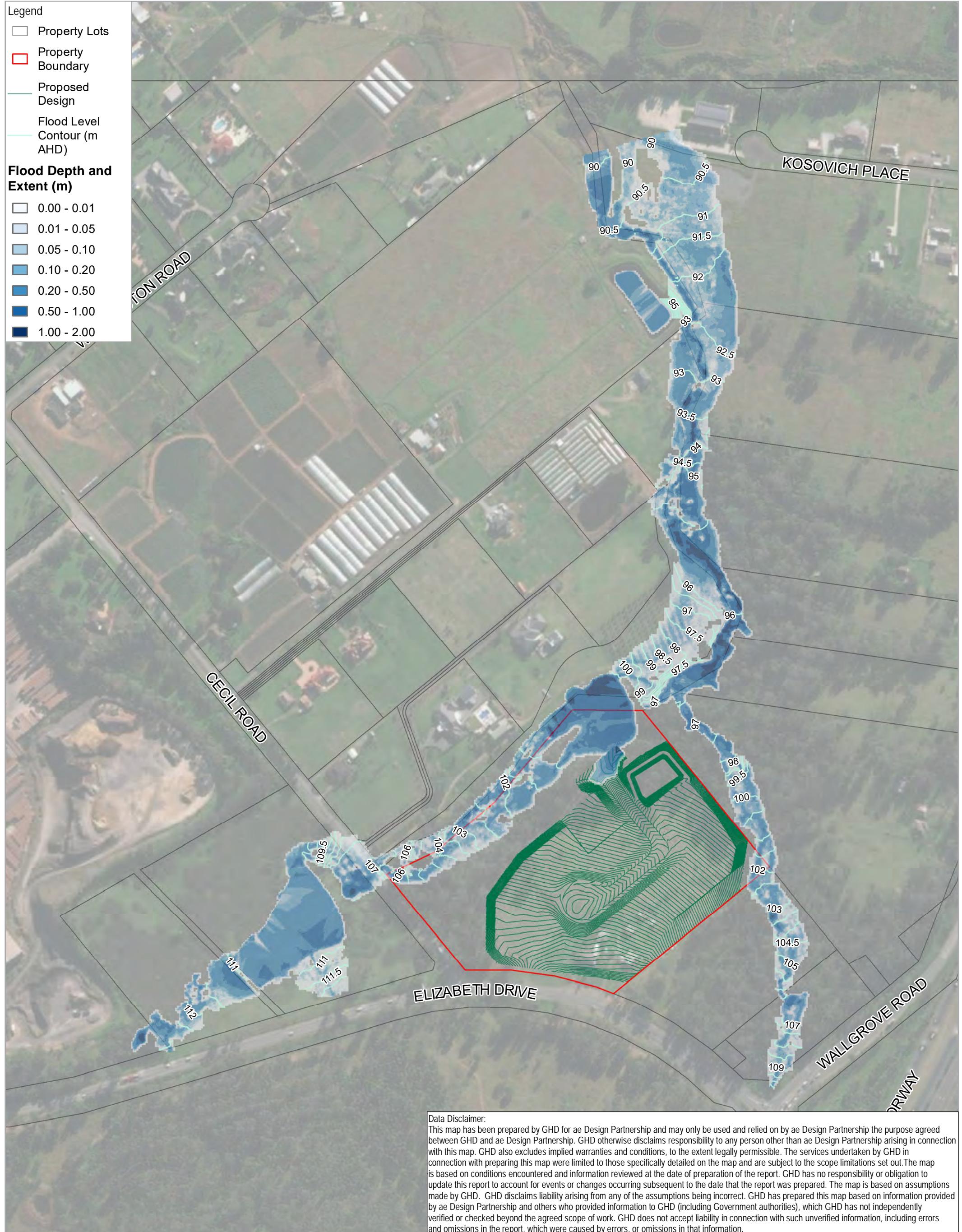

 Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

 ae Design Partnership
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Figure 09

Data Source: Jacobs & Aeronetex 2016. Created by Syntex

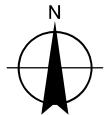


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Figure 10

Data Source: Jacobs & Aeronetrix 2016. Created by Syntex

Legend

Property Lots

Property Boundary

Proposed Design

Flood Peak Velocity (m/s)

0.00 - 0.20

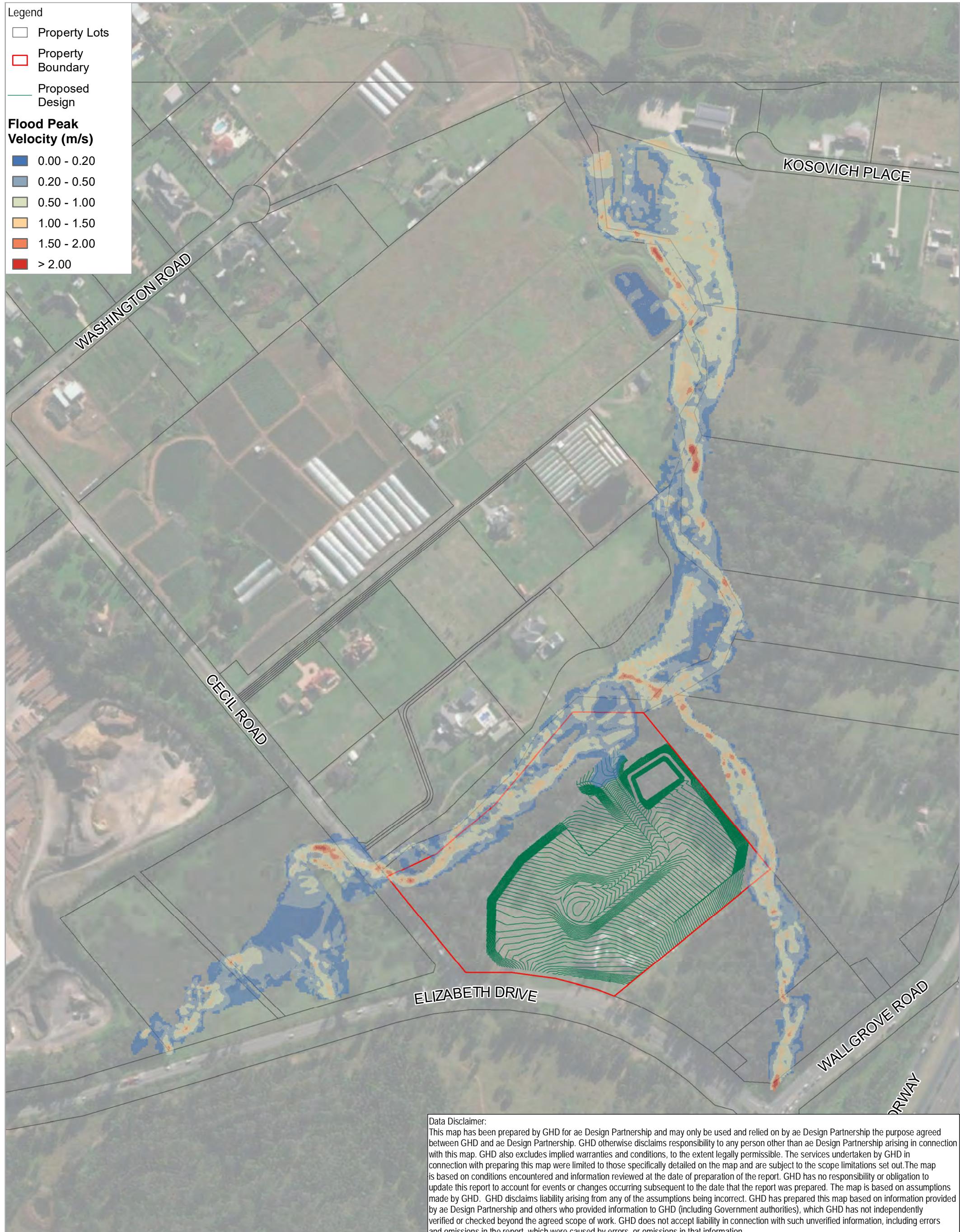
0.20 - 0.50

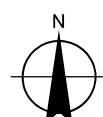
0.50 - 1.00

1.00 - 1.50

1.50 - 2.00

> 2.00


 Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

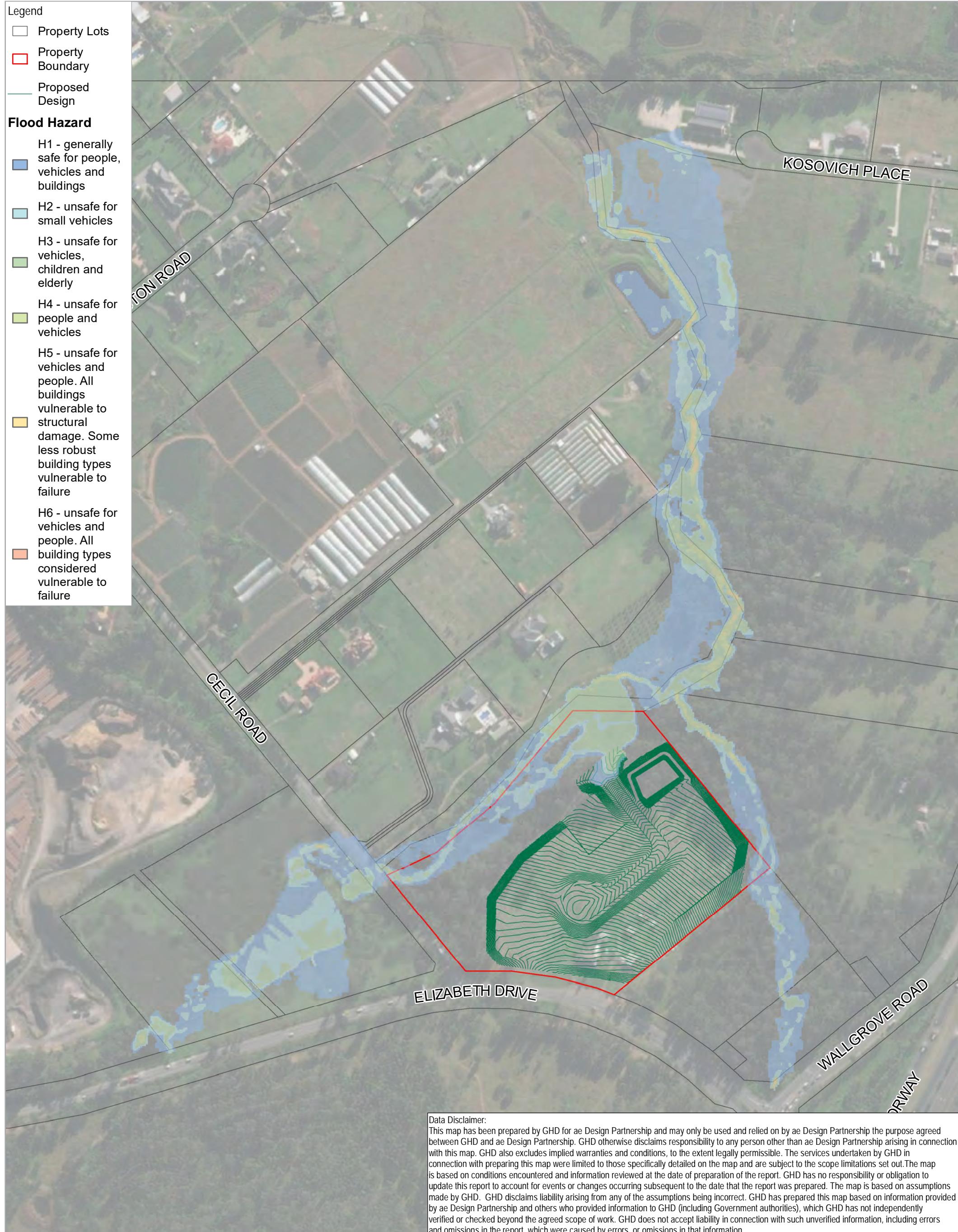
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56


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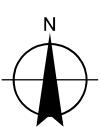
Figure 11



Paper Size ISO A3

0 0.025 0.05 0.075 0.1
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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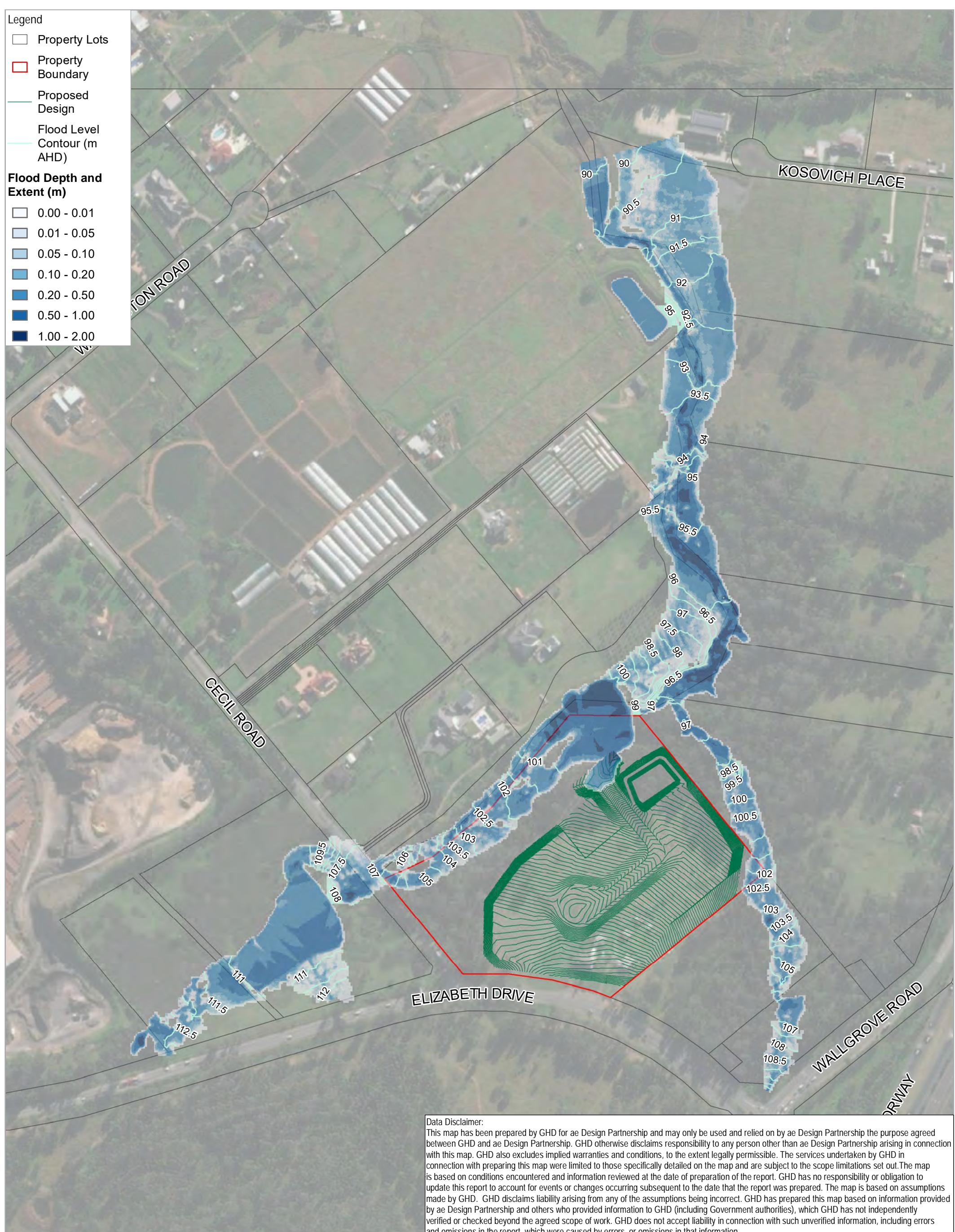
Figure 12

Legend

- Property Lots
- Property Boundary
- Proposed Design
- Flood Level Contour (m AHD)

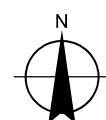
Flood Depth and Extent (m)

0.00 - 0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.20
0.20 - 0.50
0.50 - 1.00
1.00 - 2.00



Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Flood Depth and Level Contours
 1 in 100 AEP Event

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Data Source: Jacobs & Aeronetex 2016. Created by Syntex

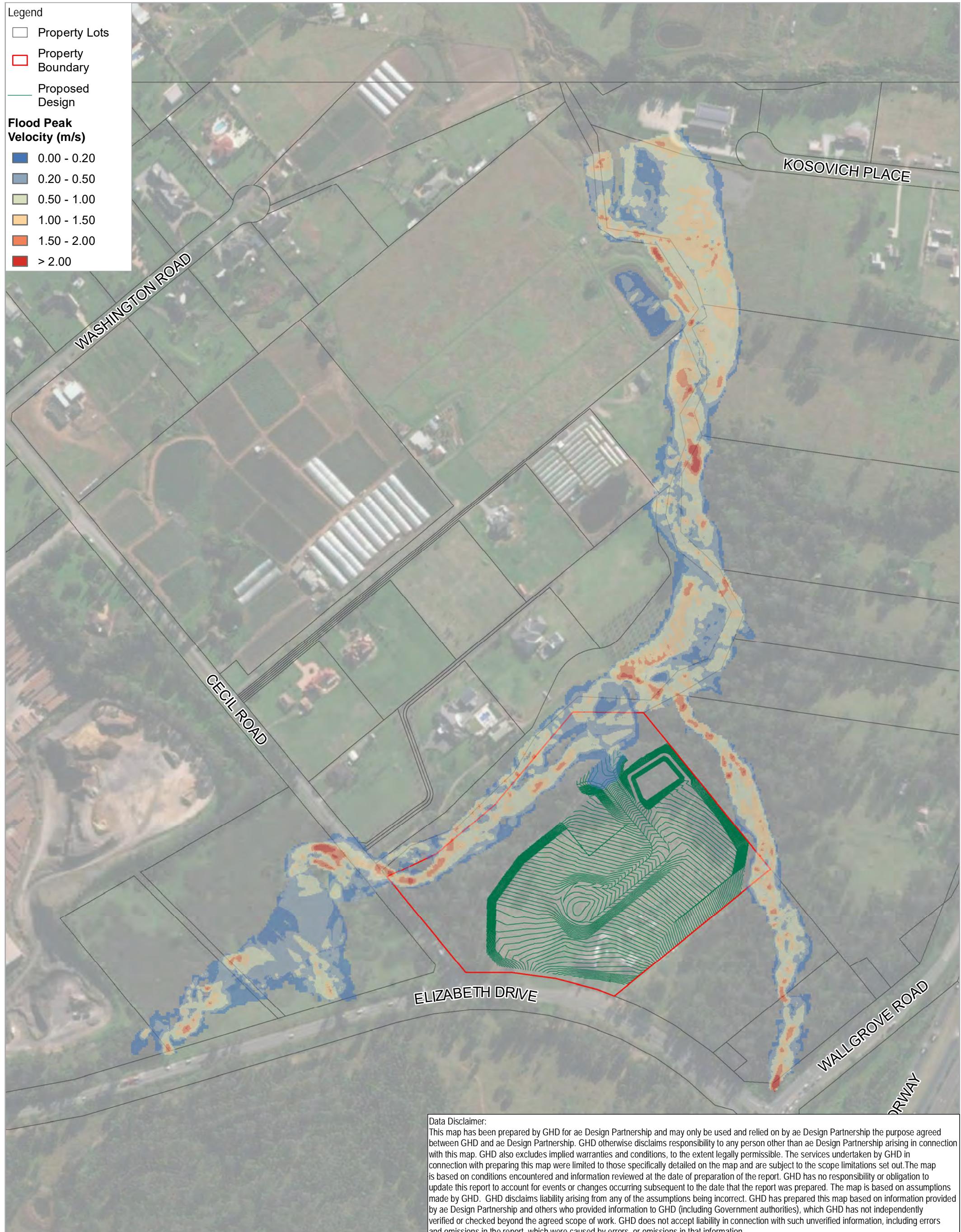
Figure 13

Legend

- Property Lots
- Property Boundary
- Proposed Design

Flood Peak Velocity (m/s)

- 0.00 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

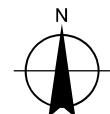


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



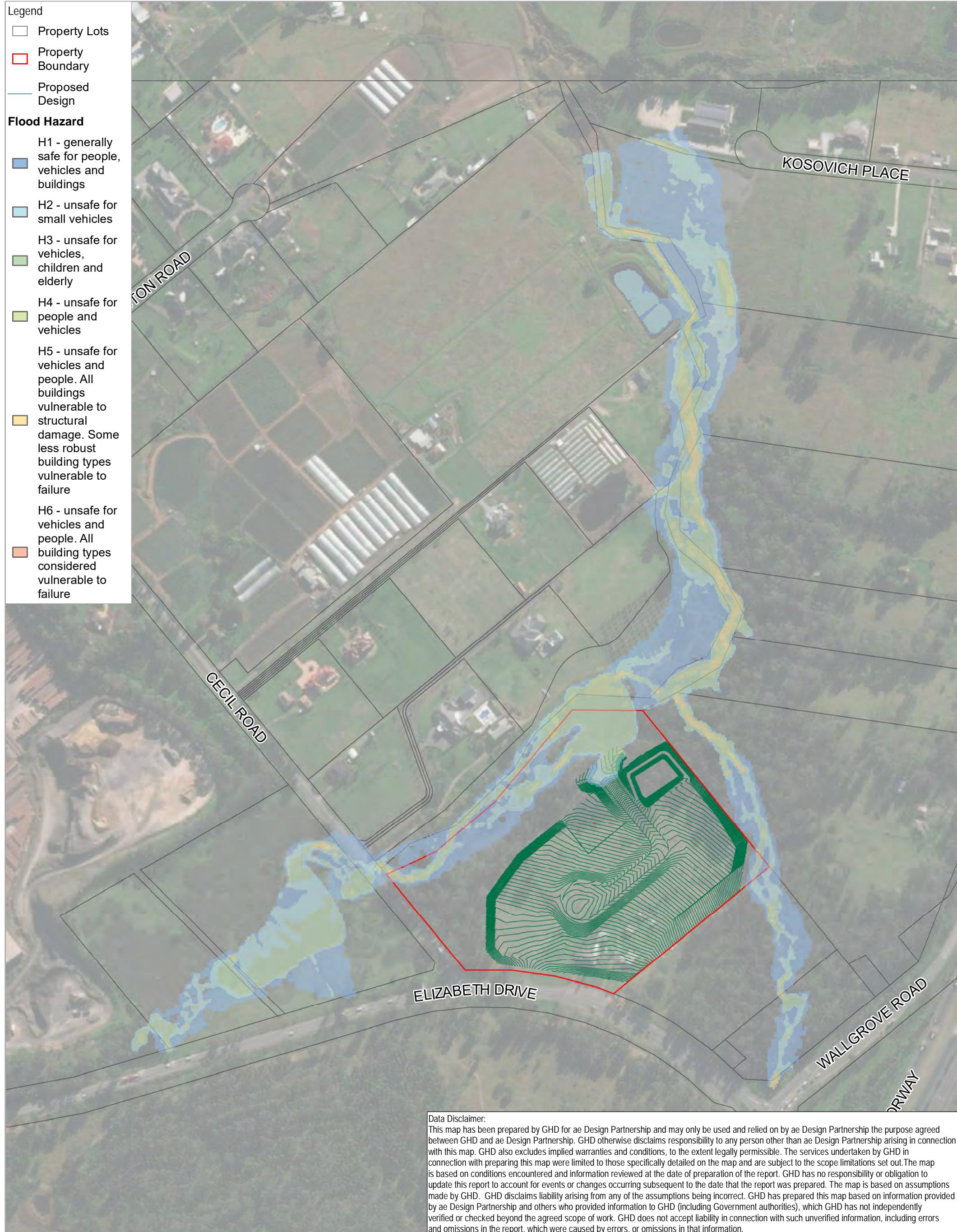
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 Flooding Velocity
 1 in 100 AEP Event

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Figure 14

Data Source: Jacobs & Aeronetex 2016. Created by Syntex

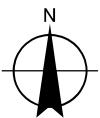


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Flood Hazard Category
 1 in 100 AEP Event

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Figure 15

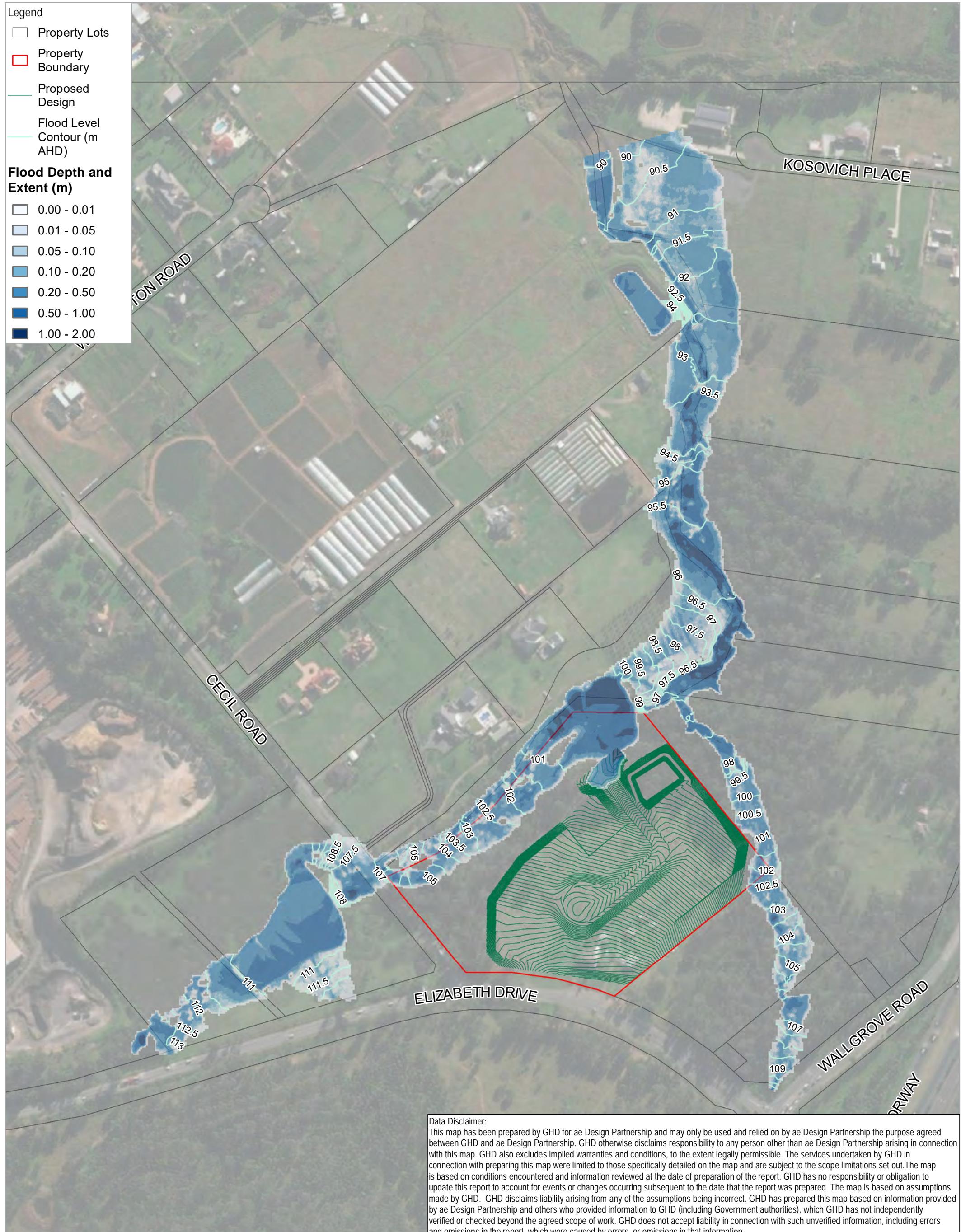
Data Source: Jacobs & Aeronetex 2016. Created by Syntex

Legend

- Property Lots
- Property Boundary
- Proposed Design
- Flood Level Contour (m AHD)

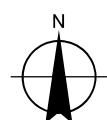
Flood Depth and Extent (m)

- 0.00 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00



Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 1 in 100 AEP Climate Change

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Data Source: Jacobs & Aeronetex 2016 Created by Syntex

Figure 16

Legend

Property Lots

Property Boundary

Proposed Design

Flood Peak Velocity (m/s)

0.00 - 0.20

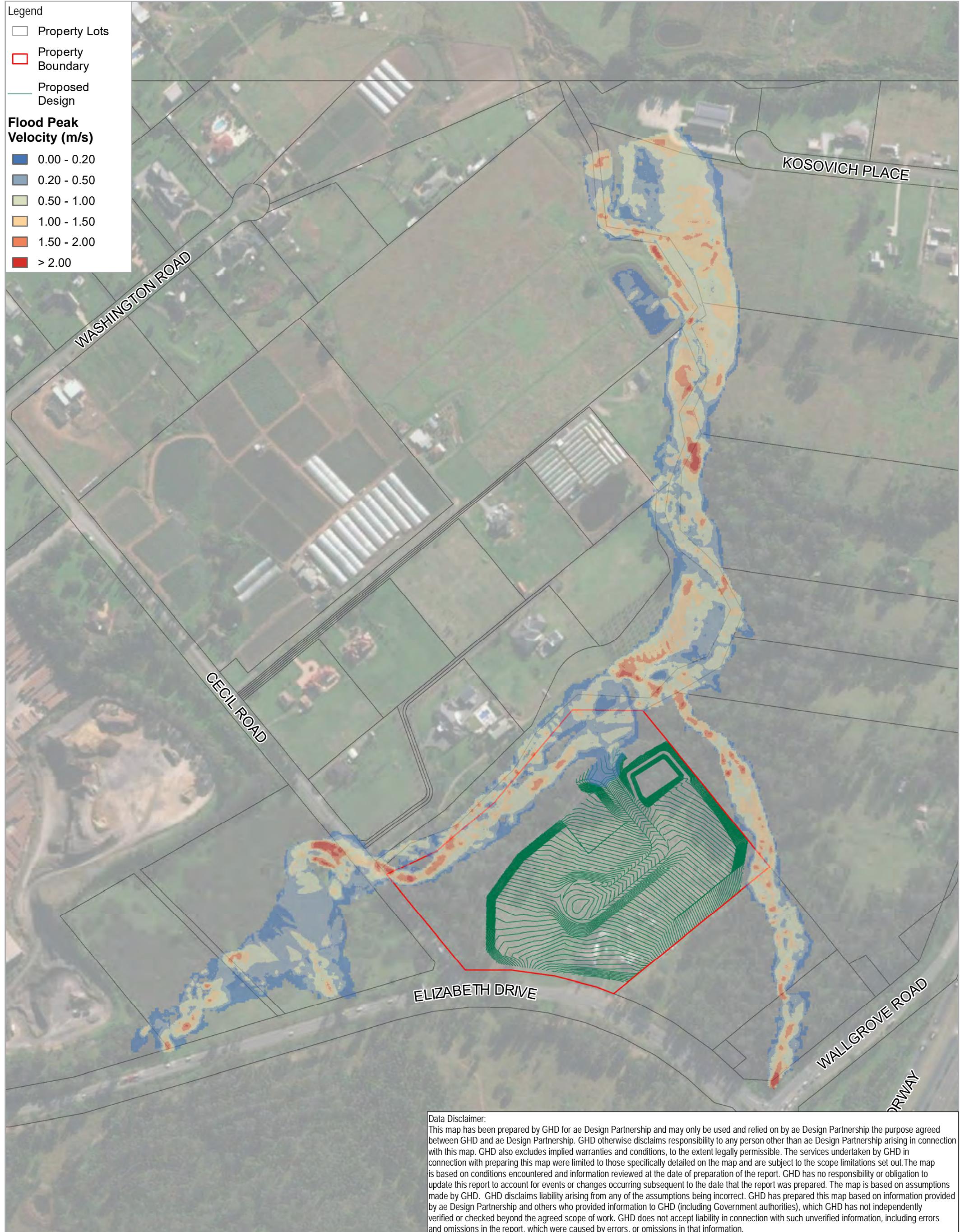
0.20 - 0.50

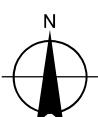
0.50 - 1.00

1.00 - 1.50

1.50 - 2.00

> 2.00

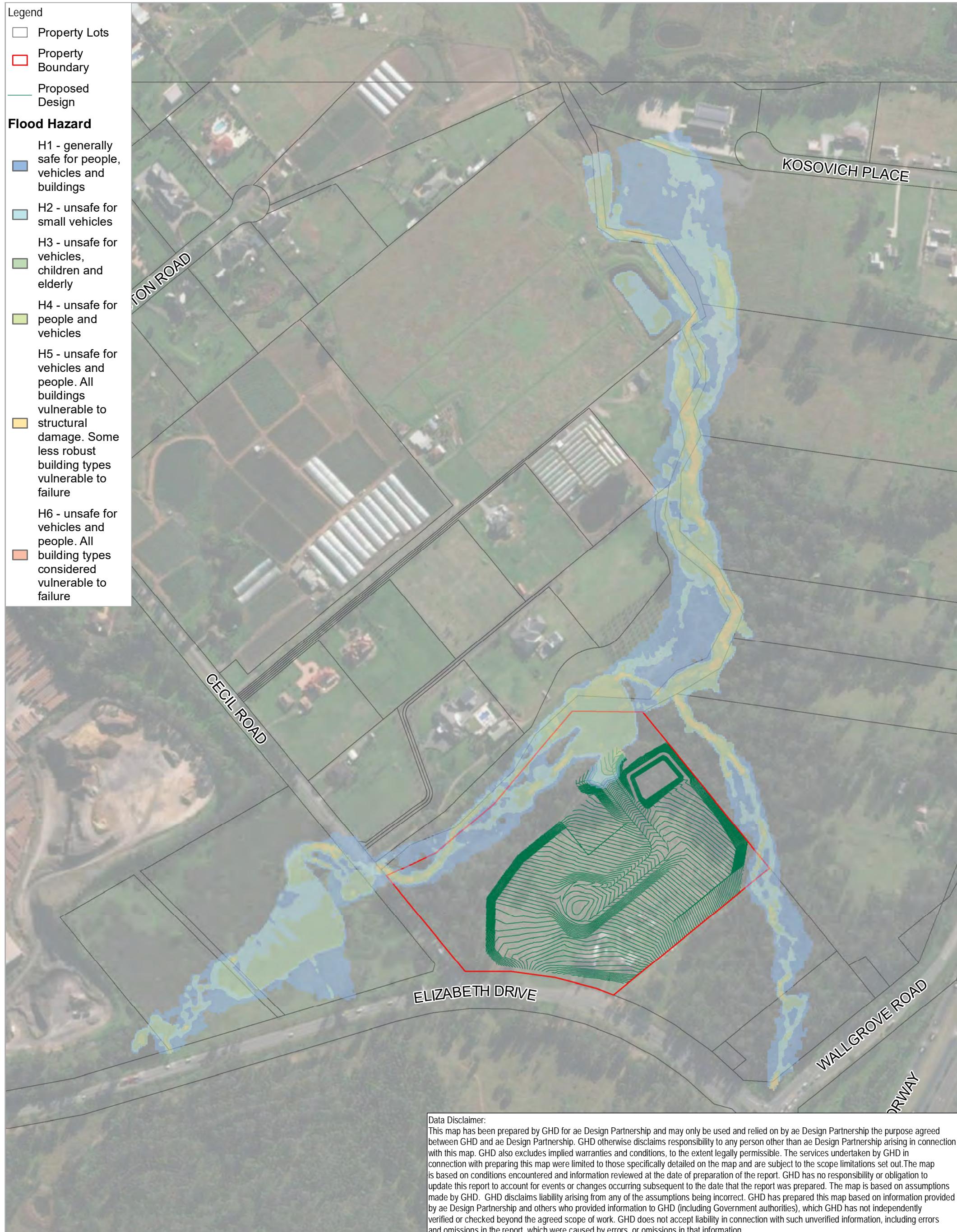

 Paper Size ISO A3
 0 0.025 0.05 0.075 0.1
 Kilometers

 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

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Figure 17

Data Source: Jacobs & Aeronetex 2016. Created by Syntex



Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Figure 18

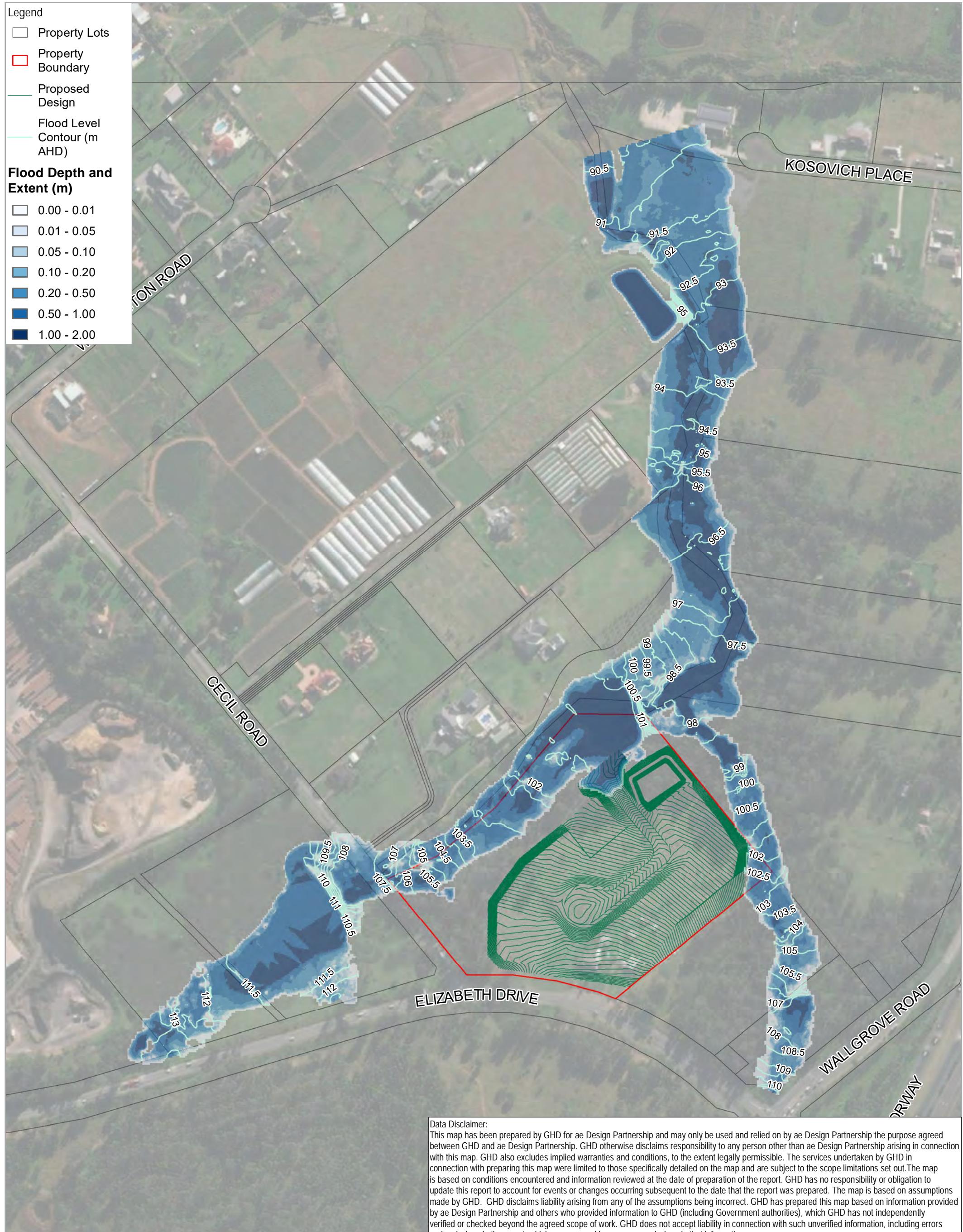
Data Source: Jacobs & Aeronetrex 2016. Created by Syntex

Legend

- Property Lots
- Property Boundary
- Proposed Design
- Flood Level Contour (m AHD)

Flood Depth and Extent (m)

- 0.00 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00

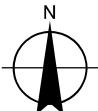


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

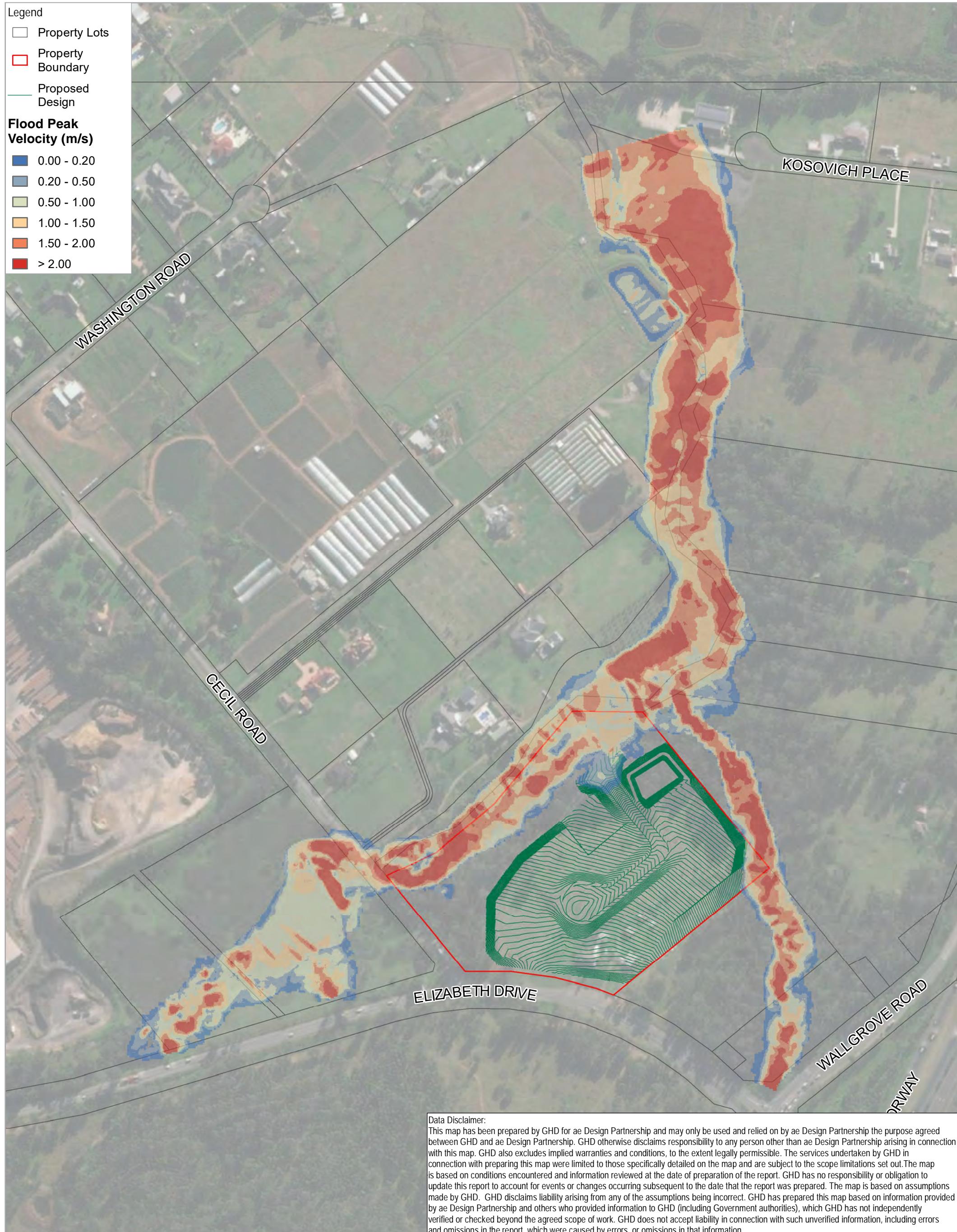


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Figure 19

Data Source: Jacobs & Aeronetex 2016. Created by Syntex

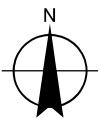


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



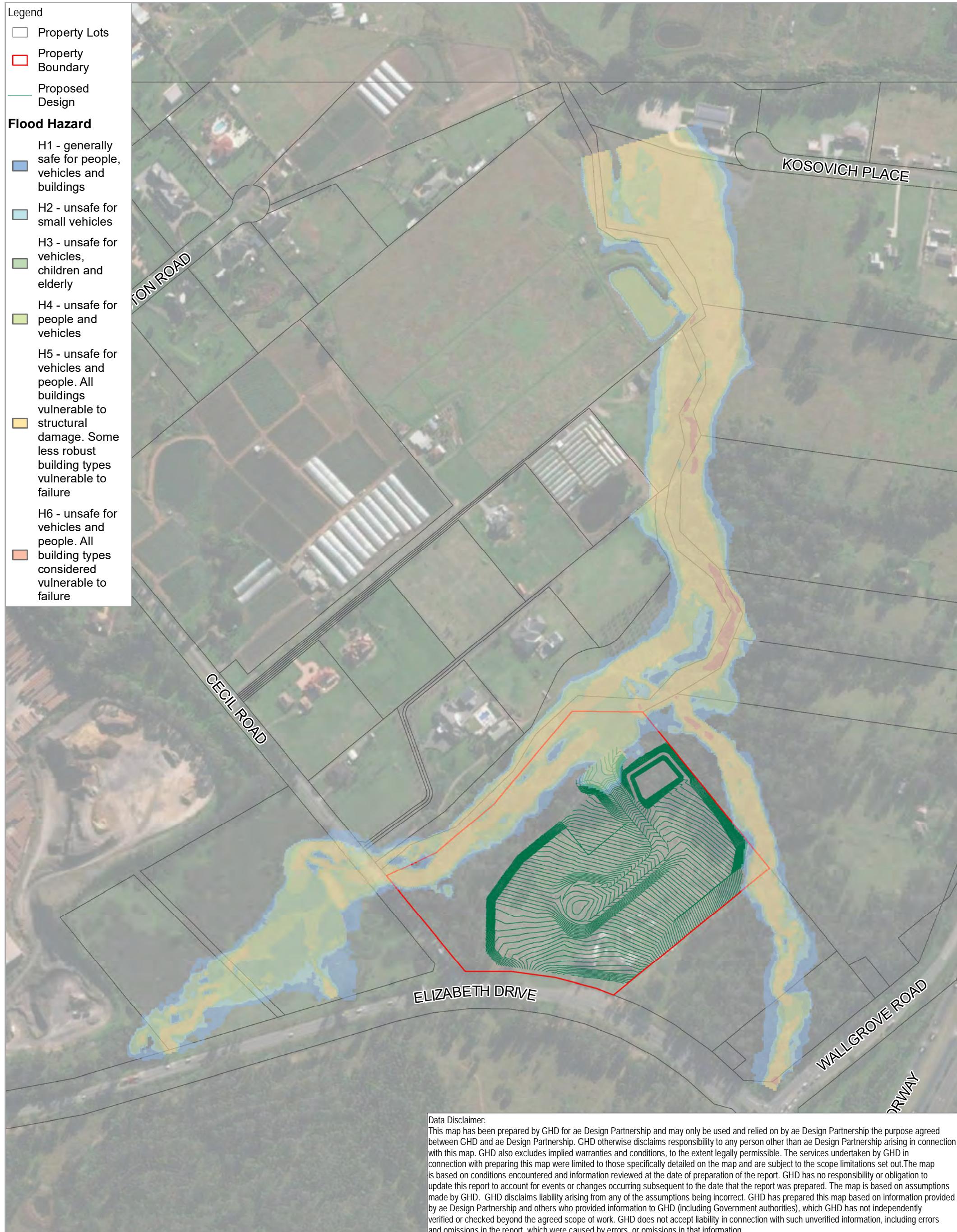
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Figure 20

Data Source: Jacobs & Aeronetex 2016. Created by Syntex



Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

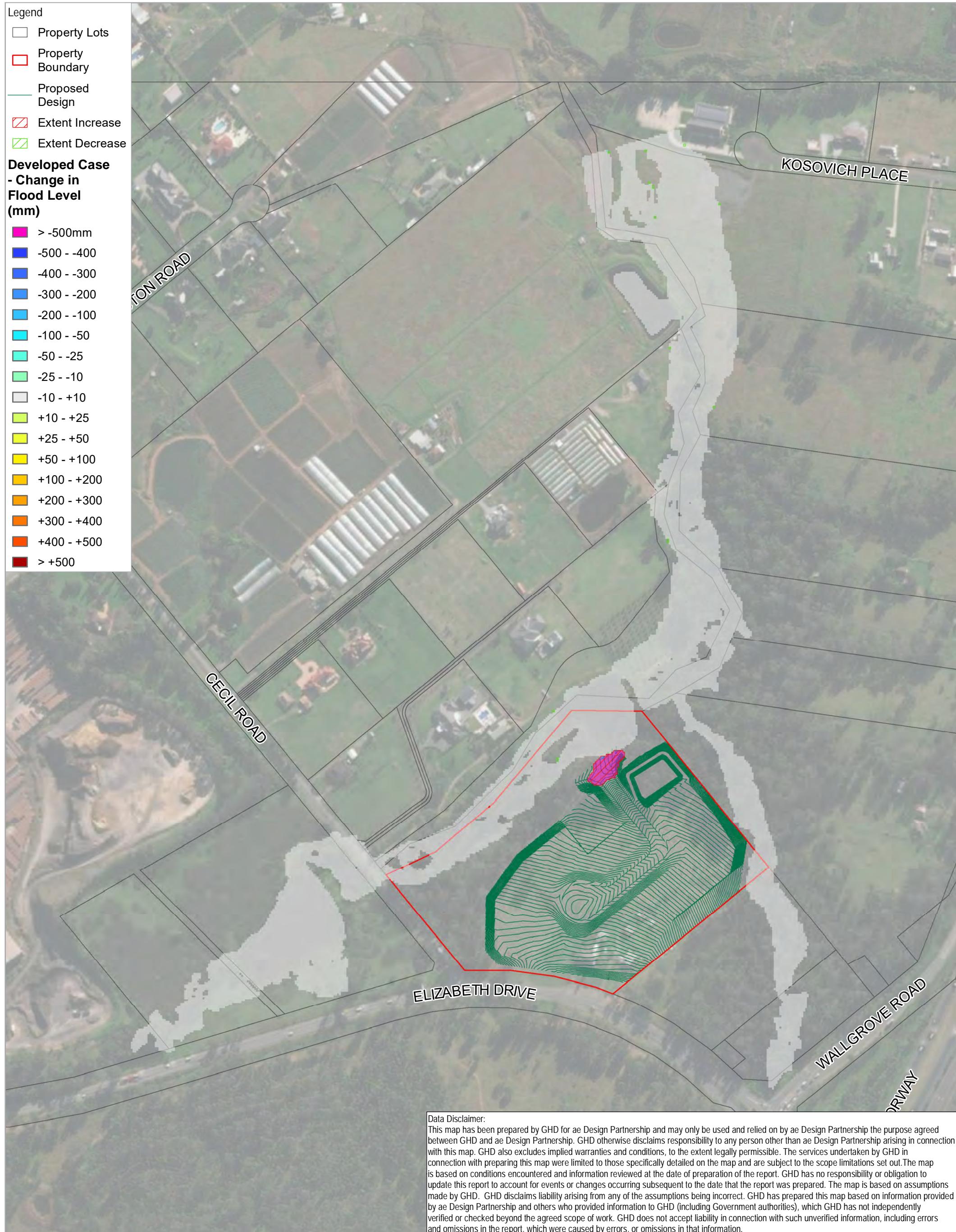


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Figure 21

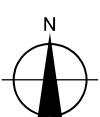


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



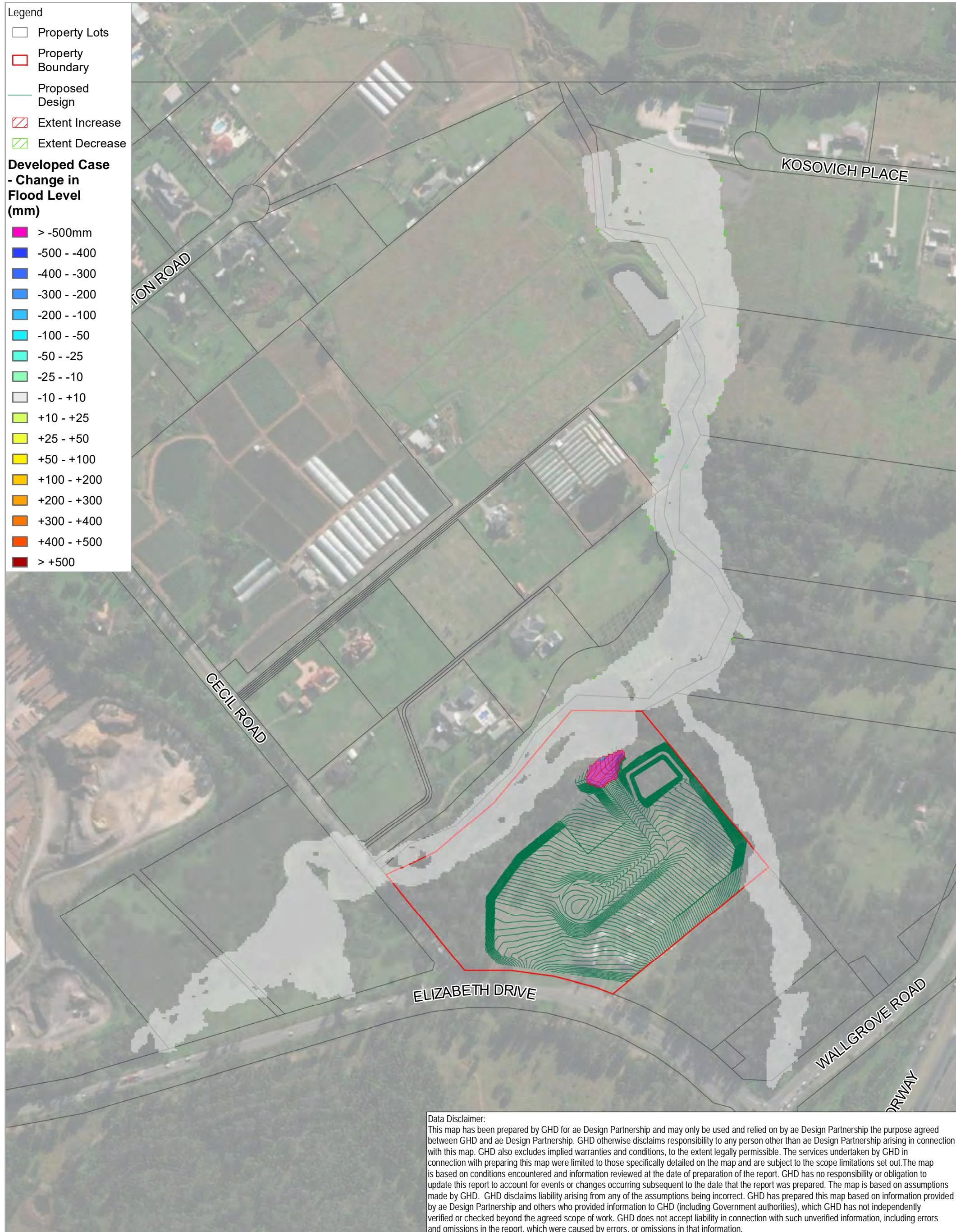
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Figure 22

Data Source: Jacobs & Aeronetex 2016. Created by Syntex

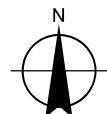


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



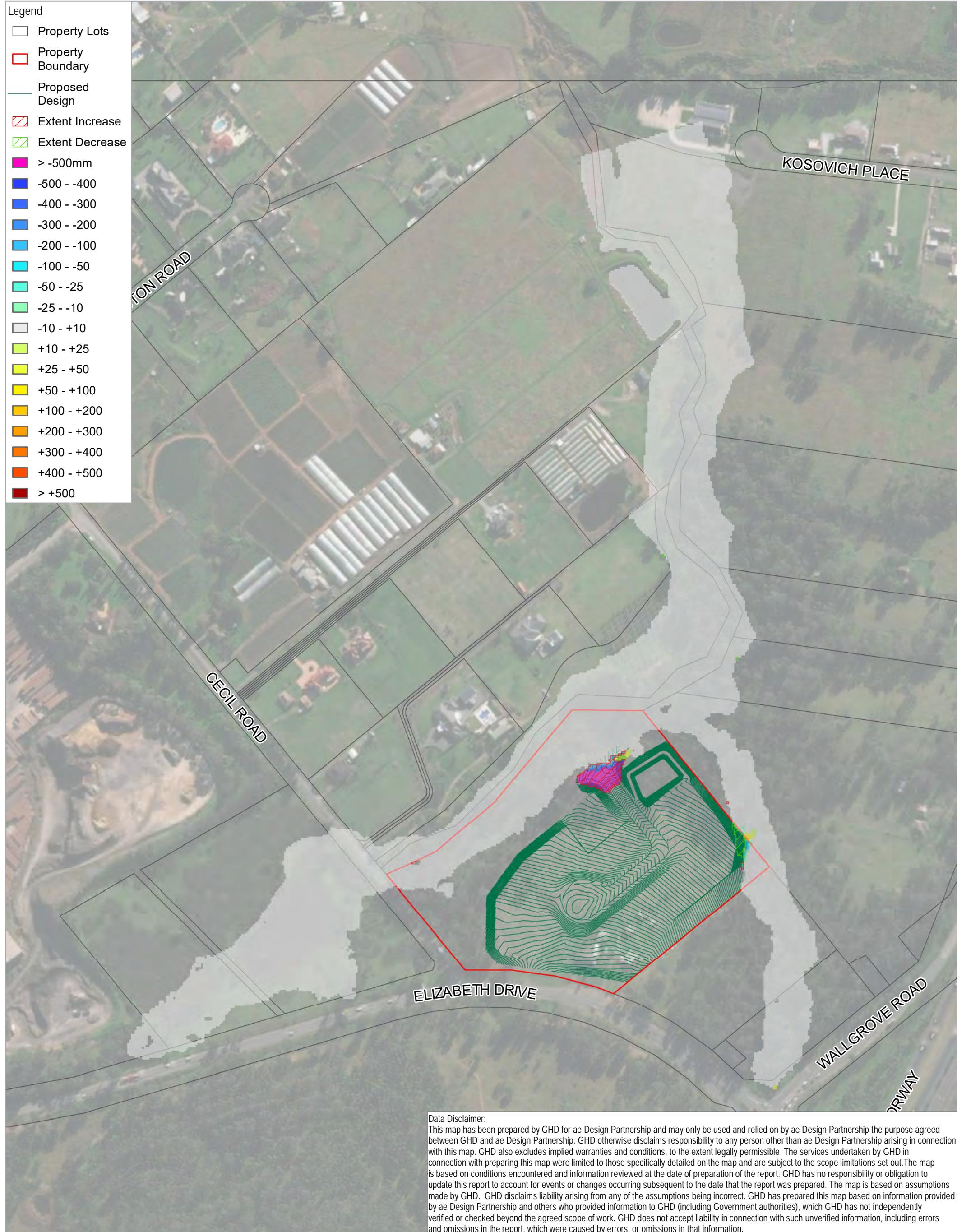
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 Flood Level Impact
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Figure 23

Data Source: © Jacobs & Aeronetrex 2016. Created by Syntex

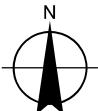


Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Figure 24