maitland city council

PROPOSED FLOOD ACCESS ROUTE SCOBIES LANE, OAKHAMPTON HEIGHTS FLOOD IMPACT RISK ASSESSMENT

TABLE OF CONTENTS

REVISION HISTORY

REV	AUTHOR	DATE	DESCRIPTION OF CHANGES
A	C.P	1 December 2023	Original Issue

EXECUTIVE SUMMARY

A Flood Impact and Risk Assessment (FIRA) is required to analyse the flood related impacts on proposed development and the flood related impacts the development may have on the community and to identify how impacts can be managed to minimise the risk to the community.

The study area occurs within flood fringe and flood storage areas for the local catchment and within the defined floodway for the regional Hunter River catchment. As a result, observed flood depths and velocities are often high within the defined floodway area, particularly in proximity to the Powerhouse Control spillway.

The subject site has been identified for the development of a new road construction over Maitland City Council owned land at Lot 3, DP37838 & Lot 2, DP1049034, 53 Scobies Lane, Oakhampton.

Modelling has shown that for the Hunter River event, the subject site is inundated to varying levels dependant on the flood frequency with high velocities occurring in proximity to the Powerhouse Control as water discharges across the rock mattress levee. For the local catchment, modelling shows that the site is impacted by outlet control discharge and tailwater levels at the downstream outlet point to the Hunter River causing water to pond within the low-lying area of Scobies Lane.

Post-developed modelling considerations show that the preferred option is to have the new road construction in proximity to the Powerhouse Control as other options have greater flooding impacts on surrounding lands. The new road construction has also been nominated at a level to provide flood free access during a local flooding event.

Key considerations in accordance with the Floodplain Risk Management Manual Guidelines were assessed to determine the flooding impacts of development on the existing community and the flooding impacts on development and its users. The analysis concluded that most key considerations were identified as not significant with the exception of velocity changes during a Huner River flood event which were assessed as minor. The proposal has also been compared to the modification and management measures contained within the Hunter River Flood Risk Management Study and Plan to assess if the proposal aligns with the plan.

Through the identification of the relevant considerations and impacts with alignment to the Floodplain Risk Management Study, the following risks and their proposed mitigation management measures have been identified.

TABLE 1 – KEY RISKS AND MANAGEMENT MEASURES

NO.	RISK	MANAGEMENT MEASURE
1	Flood levels	Design new road construction to provide flood free access for known local catchment flooding events including freeboard to maintain appropriate pavement thicknesses against inundation.
2	Flood Velocities	Proposal to utilise suitable building materials to improve flood resistance including open type fencing in flood prone areas and scour resistant materials such as rock and gabion mattresses where scour velocities warrant such materials.
3	Flood Warning and Evacuation	Maintain existing evacuation and emergency management actions for the area including shelter in place and evacuation via Walka Water Works dam embankment which

		is cut off for events greater than the 2% AEP event.
4	Development Control Planning and Flood Planning Levels	Proposal to utilise suitable building materials to improve flood resistance including open type fencing in flood prone areas and scour resistant materials such as rock and gabion mattresses where scour velocities warrant such materials.
5	Site filling	Utilise site filling to raise the new road construction to levels that are considered appropriate for the associated level of flood risk.

By review of existing flood related information an assessment of the proposal has been carried out to determine the impact that the proposal has on flooding within the existing community and the impact that flooding may have on the proposal.

An analysis of risk associated with these impacts has then been carried out to establish key risks and appropriate management measures to be implemented to allow development of the proposal to proceed. It is recommended to consider implementation of these measures as the development proceeds through design, construction and operational phases.

BACKGROUND

OBJECTIVES

In accordance with flood risk management guideline: Flood Impact and Risk Assessment LU01 (part of the Floodplain Risk Management Manual toolkit suite), the purpose of this Flood Impact and Risk Assessment (FIRA) is to identify and analyse for a development proposal that may alter flood behaviour or introduce changes to flood risk:

- The impacts of the proposed development on the flood risk to the existing community,
- The impacts and risks of flooding on the development and its users,
- How any identified impacts can be managed to minimise the risk to the community due to the development.

STUDY AREA

The proposal focuses on the provision of road infrastructure associated with access to Oakhampton Heights off Oakhampton Road in proximity to the Hunter Valley Flood Mitigation Scheme infrastructure identified as the Powerhouse Control. The proposed road infrastructure is nominated to replace the existing low lying road corridor of Scobies Lane that becomes inundated during both local and regional flooding events thereby restricting access to and from Oakhampton Heights during periods of inundation.

The local contributing catchment includes residential land holdings throughout Oakhampton Heights, Oakhampton, Aberglasslyn and Rutherford including areas extending back to the New England Highway and Rutherford Shopping centre to the south and west. The catchment is bounded by the Hunter River and its levee banks to the north and east. Runoff within the catchment tends to occur from higher areas that support developed land uses before draining to low-lying flood prone areas of Oakhampton.

A local drainage depression extends from Aberglasslyn Road into low lying land that regularly holds water beneath the railway line and continues in a U-shape heading south into a defined drainage channel that drains into the box culvert outlet at the local catchment low point immediately north of Scobies Lane before discharging to the Hunter River.

The topography in the immediate vicinity of the subject site incorporates the Powerhouse Control at the top of the local undulating catchment with reduced levels of approx. R.L. 9.30m AHD and gradually grades down to the Scobies Lane outlet point with R.L. 2.50m AHD.

The study area is also subject to inundation from the regionally significant Hunter River located immediately to the east. Scobies Lane, the proposed new road and the Powerhouse Control are all located within the Oakhampton Floodway which forms part of the Hunter Valley Flood Mitigation Scheme infrastructure. The Hunter River flood often drowns out any other flood related impacts from the identified local catchments in the area due to identified flood levels and the magnitude of flooding events.

The local catchment drains into the Hunter River. Flood mitigation infrastructure including flood flaps are present along the Hunter River and the local catchment outlet culvert. As a result, the local catchment is influenced by downstream tailwater levels with minor elevations within the Hunter River likely to impact the ability for the local catchment to free drain during times of local catchment flooding.

Scobies Lane is subject to inundation and low velocity flood storage during a local catchment event whereas the proposed new road infrastructure is located above known local catchment flood levels.

However, Scobies Lane and the new road proposal are inundated from Hunter River flooding events within the defined floodway and are subject to varying depths and velocities within this critical flow area.

SUBJECT SITE

Maitland City Council is the owner of Lot 3, DP37838 & Lot 2, DP1049034, 53 Scobies Lane, Oakhampton. The combined 13.784 Hectare site forms the majority of part of a number of parcels that are bounded by Scobies Lane to the north, the eastern edge of Walka Water Works, Oakhampton Road to the west whilst the Hunter Valley Flood Mitigation Scheme infrastructure identified as the Powerhouse Control is present on land immediately adjacent to the south. The centre of the proposed road has recorded latitude and longitude co-ordinates of -32.715717 & 151.556290. The subject site is shown in Attachment 1.

Land slopes downwards generally from the Powerhouse Control in a northerly direction towards Scobies Lane from all sides.

The existing site comprises of a grassed area that was previously used for grazing. The immediate area contains some dwellings but the flood prone nature of the area does not support larger scale residential development. The large lot residential area of Oakhampton Heights is located to the north-west with dwellings positioned above known flood impacts. Whilst the subject site contains RU1 Primary Production lands, a mix of land zoning is present nearby including the R5 large lot residential lands of Oakhampton Heights and the RE1 Public Recreation Walka Waer Works site.

PROPOSED DEVELOPMENT

The current route of Scobies Lane experiences flooding during extensive periods of rainfall cutting access to Oakhampton Heights for the residents. There is a need to improve the existing level of flood resilience associated with Scobies Lane to allow for access to Oakhampton Heights during times of flood.

The site has been identified for the development of new road construction as part of Maitland City Council's Capital Works Program 2023/24. The project involves the construction of a new section of road across land owned by Maitland City Council approximately 740m long that will run parallel to the existing flood mitigation infrastructure Powerhouse Control starting at Oakhampton Road and continuing west towards Walka Water Works before turning north and joining into the existingroad network at the intersection of Scobies Lane and South Willards Lane.

The road construction works are proposed to provide an access into Oakhampton Heights that is not affected by local flooding. A new embankment and road pavement will be constructed adjacent to the existing powerhouse flood control with the road pavement being 12m wide and consist of 2 x 3.5m travel lanes with a 2.5m wide shoulder on each side. A 5.5m wide verge will also be included on the northern/eastern side of the realigned road to allow for a future shared path. The existing Oakhampton Road will be widened in the location of the proposed intersection with the new road in accordance with Austroads requirements. The new road will have a minimum level of RL8.30m AHD which is higher than the identified 0.2% AEP local catchment flood height of RL7.88m AHD.

The amount of fill required to be imported to construct the embankment will be approximately 11,500m3 with an additional 6,700m3 of pavement materials to construct the road pavement which includes crushed gravels, asphalt and concrete.

The proposed construction of the road will include the following.

- Site establishment - Set up site compound, set down area and toilets.
- Service locations and non-destructive digging.
- Service relocations – raising water main hydrants.
- Stripping of topsoil and removal of vegetation.
- Earthworks.
- Importation of material and installation.
- Demolition of existing buildings, sheds and fences.
- Relocation of existing power poles and powerlines along Oakhampton Rd & Scobies Lane.
- Relocation of existing NBN & Telstra cables along South Willards Lane.
- Construction of road embankment adjacent to existing Powerhouse flood control.
- Pavement construction 12.0m wide.
- Installation of new Kerb and guttering.
- Application of two coat bitumen seal and asphalt wearing course.
- Installation of signage, guideposts, line marking and reflective pavement markers.
- Hydromulching the constructed batters and re-turfing of footway.
- Fence relocation works.

An extract of plans showing the conceptual layout of the proposed road is shown in Attachment 2.

FLOOD RELATED CONSIDERATIONS

NEED FOR FLOOD IMPACT RISK ASSESSMENT

The Proposal seeks to provide new road infrastructure that will result in filling of floodway land which may have an impact on flooding characteristics in the vicinity of the subject site. In line with the proposed objectives, an assessment is required to assess the flood risk and impacts that the proposal may have on the existing community, the proposal itself and to identify suitable mitigation management measures to minimise risks to the community. The assessment will be utilised to inform the development of a Review of Environmental Factors for the project.

RELEVANT LEGISLATION

Development for the purpose of a road or road infrastructure facilities is permissible as Development permitted without Consent (general) under Clause 2.109 of the State Environmental Planning Policy (Transport & Infrastructure) 2021.

To facilitate the approval of such works, an assessment is required to be undertaken in accordance with Part 5 of the Environmental Planning & Assessment Act 1979. In accordance with Section 5.5 and 5.6 of the EP&A Act the environmental impact assessment is required to consider, to the fullest extent possible all matters likely to impact the environment by reason of the activity including but not limited to those aspects identified within Clause 171 of the Environmental Planning & Assessment Regulation 2021.

For this proposal, Maitland City Council is both a public authority proponent (EP&A Act s.5.3) and the determining authority (EP&A Act s.5.1).

SCALE OF ASSESSMENT

The scale of the development tends to lead towards a requirement to prepare a detailed flood impact and risk assessment (per Section 2.9 of the guideline). However due to the availability of flood related information, this assessment seeks to follow the simple assessment process. Where further investigation is warranted as a result of any preliminary findings, more detailed investigation has been undertaken.

PRE-DEVELOPED MODELLING AND ANALYSIS

HUNTER RIVER FLOODING (REGIONAL FLOODING)

The Hunter River is the major riverine catchment that contributes to flooding across the subject site. The magnitude of the flooding associated with the Hunter River governs the establishment of peak flood levels for the subject site with this flood event "drowning out" local catchment floods.

As the proposal is positioned within the defined floodway and in the immediate vicinity of the Hunter River and the Powerhouse Control, there are significant variations in observed flood depths, levels and velocities across the extents of the Proposal.

Modelled flood data has been obtained from the Hunter River Branxton to Green Rocks Flood Study (2010) which were obtained from Councils WaterRide software. Observed flood levels across the subject site are listed as follows. Figures showing flood levels and depths across the subject site are shown in Attachment 3.

TABLE 2 – PEAK HUNTER RIVER FLOOD LEVELS ACROSS SUBJECT SITE

AEP (%)	HUNTER RIVER IN BANK R.L. (m AHD)	UPSTREAM OF POWERHOUSE CONTROL R.L. (m AHD)		DOWNSTREAM OF POWERHOUSE CONTROL R.L. (m AHD)	
		PROPOSED ROAD EASTERN EXTENT	PROPOSED ROAD WESTERN EXTENT	EASTERN EXTENT	WESTERN EXTENT
20	10.28	N/A	N/A	N/A	N/A
10	11.54	9.34	9.34	8.43	7.40
5	11.92	10.24	10.22	10.12	9.88
2	12.28	11.06	10.93	10.99	10.62
1	12.48	12.20	12.00	12.16	11.91
0.5	12.82	12.84	12.59	12.77	12.53
0.2	13.55	13.63	13.34	13.57	13.31
PMF	14.62	14.67	14.36	14.55	14.35

The Powerhouse Control serves as a detention and discharge device across the Oakhampton Spillway. As such, velocities are highly variable and tend to peak as flows discharge over the control. Observed peak velocities across the Powerhouse Control are recorded below. Figures showing velocity profiles across the site as derived from Councils WaterRide program are shown in Attachment 4.

TABLE 3 – PEAK HUNTER RIVER FLOOD VELOCITIES ACROSS SUBJECT SITE

AEP (%)	PEAK OBSERVED VELOCITIES (m/s)
20	N/A
10	1.2
5	3.8
2	4.1
1	4.6
0.5	4.5
0.2	4.6
PMF	5.5

LOCAL CATCHMENT FLOODING

The local drainage catchment was considered as part of a vehicle access feasibility investigation for Oakhampton Heights in times of flood. The local catchment drains to an existing flood flap-controlled outlet to the Hunter River south-east of the local catchment low point outlet at Scobies Lane. The catchment was modelled for a range of events from the 100% AEP event up to the 1% AEP event. The local catchment was also modelled using rainfall data associated with the April 2015 superstorm which was considered to be representative of a 0.2% AEP event. The catchment was modelled with both a free draining and a high downstream tailwater (flood flap closed) arrangement. Results as copied from the investigation are as follows.

TABLE 4 – LOCAL CATCHMENT MODELLED PEAK WATER LEVELS

ANNUAL EXCEEDANCE PROBABILITY (%)	PEAK WATER LEVEL UNDER FREE DRAINING CONDITIONS (m)	TIME OF CONCENTRATION FOR PEAK WATER LEVEL (Hours)	PEAK WATER LEVEL WITH FLOOD GATE CLOSED (m)
100%	4.45	36hr	5.00
50%	4.91	36hr	5.45
20%	5.48	36hr	6.07
10%	5.80	36hr	6.38
5%	6.20	36hr	6.71
2%	6.57	36hr	7.05
1%	6.85	36hr	7.30
0.2%*	7.53	24hr*	7.88

* Estimated annual exceedance probability. Actual rainfall data was used from 21 April 2015 as part of this assessment. This data however contains rainfall only for a 24 hour period.

Scobies Lane has a current low point level of approximately R.L. 5.70m AHD. With reference to the previous table it can be seen that this allows for flood free access up to a 20% AEP flood under free draining conditions and a 50% AEP flood when downstream levels in the Hunter River are elevated.

As the local catchment inundation is controlled by the outlet discharge, an assessment of velocities was not undertaken in proximity to Scobies Lane.

The new road will have a minimum level of RL8.30m AHD which is higher than the identified 0.2% AEP local catchment flood height of RL7.88m AHD (with high tailwater).

POST-DEVELOPED MODELLING AND ANALYSIS

HUNTER RIVER FLOODING (REGIONAL FLOODING)

An assessment to determine the potential differential outcomes for flood depths and velocities associated with the Proposal was undertaken for the 1% AEP event only. However, two (2) options were modelled for the proposed road construction being:

- Construction of the new road adjacent to the Powerhouse Control (Option 1)
- Construction of the road with a separation distance of 10m off the Powerhouse Control (Option 2)

Attachment 5 shows the differential flood depth and velocity impacts for both options. The images show for Option 1 that there are some decreases in peak flood levels across the Powerhouse Control which are offset by isolated increases of up to 0.05m only in the immediate upstream and downstream vicinity of the Powerhouse Control. Whereas Option 2 noted decreases to peak flood levels downstream of the Powerhouse Control but had minor increases of up to 0.02m over extensive land holdings upstream of the control.

Changes to flood velocities were similar for both options with increases of up to 0.5m/s observed at the western extent of the Powerhouse Control.

With the proposed road construction adjacent to the Powerhouse Control having less differential impacts, this scenario was adopted for further development as the Proposal.

LOCAL CATCHMENT

The Proposal seeks to install a road at a level of no less than R.L. 8.30m AHD. With the 0.2% AEP local event identified as R.L. 7.88m AHD, the Proposal will maintain road throughfare outside of any local catchment flooding impacts. Existing ground levels in proximity to the Proposal are observed to be as low as R.L. 5.68 meaning that the embankment to support the road will be impacted by local catchment flooding for events beyond the 20% AEP for the free draining event and the 50% AEP for the elevated Hunter River tailwater event. Therefore some displacement of local catchment flood storage may occur. However, the minimal footprint of the Proposal compared to the large storage surface area associated with the local catchment is expected to have negligible impact with regards to the displacement of runoff volumes.

As previously noted, the catchment is susceptible to inundation due to outlet controls resulting in ponding water with low flow velocities. Therefore impacts associated with changes to flood velocities are also expected to be negligible.

PROPOSED DEVELOPMENT FLOOD IMPACTS

Table 6 of the flood risk management guideline: Understanding and Managing Flood Risk FB01 and Table 3 of the flood risk management guideline: Flood Impact and Risk Assessment LU01 (both part of the Floodplain Risk Management Manual toolkit suite), have been used to assess the key considerations associated with assessing cumulative flooding impacts.

The assessment of significance has adopted the level of consequence rating established by the flood risk management guideline: Flood Risk Management Measures MM01 being Insignificant (Not Significant), Minor, Moderate, Major and Catastrophic.

IMPACTS OF DEVELOPMENT ON EXISTING COMMUNITY

Key factors have been identified to allow discussion on their relevance to the subject site and an assessment of significance to be determined for the flooding impacts of development on the existing community. These are shown in Table 5.

IMPACTS ON DEVELOPMENT AND ITS USERS

Key factors have been identified to allow discussion on their relevance to the subject site and an assessment of significance to be determined for the flooding impacts on development and its users. These are shown in Table 6.

TABLE 5 – ASSESSMENT OF SIGNIFICANCE FOR IMPACT OF DEVELOPMENT ON EXISTING COMMUNITY

KEY CONSIDERATION	FACTORS TO CONSIDER	DISCUSSION ON RELEVANCE TO SUBJECT SITE	ASSESSMENT OF SIGNIFICANCE
Flood Level Change	May Increase Inundation and Damage to Existing Development May Inundate additional existing development May create new or larger floodways or flow paths May isolate new areas	Negligible differences in flood afflux levels were observed for the modelled 1%AEP Hunter River flood event. With the footprint of the Proposal located within flood fringe/storage space for the local catchment, negligible impacts on local flood afflux are also expected although it is noted that displacement of flood storage will occur as part of site filling.	Not Significant
Change in Flooding Duration	May increase damage May increase duration of isolation	The impacted areas of flood inundation consists primarily of non-habitable flood prone grazing lands. The displacement of flood waters due to site filling modelled with the Hunter River flood has minimal differential level changes and therefore is also expected to have minimal change in inundation duration and time. Expectations are similar for local catchment flooding.	Not Significant
Velocity Change	May increase scour potential and/or damage of structures	Velocity changes were recorded as being up to 0.5m/s higher during the 1% AEP Hunte River flooding event. However, this was in proximity to the Powerhouse Control which consists of a rock filled gabion structure. The minor increases in velocity are expected to be able to be handled by the Powerhouse Control. With flood storage occurring within the local catchment, changes to velocities are expected to be negligible.	Minor
Change in Warning and Evacuation Time	May decrease available warning time and time available for evacuation	With little to no changes observed in flood afflux and isolated changes to flood velocities, there is expected to be little to no changes to flooding timeframes that may impact warning and evacuation timeframes.	Not Significant

KEY CONSIDERATION	FACTORS TO CONSIDER	DISCUSSION ON RELEVANCE TO SUBJECT SITE	ASSESSMENT OF SIGNIFICANCE
Change in Frequency of Inundation	Properties may become flood affected in more frequent events Access may be cut more frequently Areas may be isolated more frequently	Flooding durations for both the local and Hunter River catchment show extensive periods of inundation. The placement of fill and the displacement of flood water volumes that may lead to changes in inundation time is not expected to be significant with consideration to the overall duration of flooding.	Not Significant
Flood Function Categorisation Change	May change categorisation (e.g. flood storage to floodway) and change impacts on flooding on existing development	The local catchment is classified as flood storage with works occurring on flood fringes. No change to this categorisation is expected. The Oakhampton Spillway serves as a floodway for the Hunter River catchment. The Proposal does not change this classification or the classification of any other impacted lands associated with the Proposal.	Not Significant
Hazard Categorisation Change	May reduce safety to vehicles, people or buildings.	Whilst filling forms part of the proposal, the depth of inundation associated with the Hunter River flooding events means that changes to the Hazard categorisation are unlikely. Due to the proposed filling of the subject site, changes to correctly demarcate the altered hazard categorisation are expected to occur as part of the local catchment flooding. However, this is expected to be concentrated along the new flood free access edge of any filling rather than significant changes to overall hazard categorisations across the area.	Not Significant

TABLE 6 – ASSESSMENT OF SIGNIFICANCE FOR IMPACT ON DEVELOPMENT AND ITS USERS

KEY CONSIDERATION	FACTORS TO CONSIDER	DISCUSSION ON RELEVANCE TO SUBJECT SITE	ASSESSMENT OF SIGNIFICANCE
Flood Level Change	May Increase Inundation and Damage to Existing Development May Inundate additional existing development May create new or larger floodways or flow paths May isolate new areas	Negligible differences in flood afflux levels were observed for the modelled 1%AEP Hunter River flood event. With the footprint of the Proposal located within flood fringe/storage space for the local catchment, negligible impacts on local flood afflux are also expected although it is noted that displacement of flood storage will occur as part of site filling. The Proposal is being designed to provide flood free access for local catchment events. The road is to be constructed to R.L. 8.30m AHD which is higher than the modelled 0.2% AEP flood event with high tailwater which was recorded at R.L. 7.88m AHD. This is an improvement over existing flooding egress which is inundated for events as low as 50% AEP (high tailwater) event.	Not Significant
Change in Flooding Duration	May increase damage May increase duration of isolation	The displacement of flood waters due to site filling modelled with the Hunter River flood has minimal differential level changes and therefore is also expected to have minimal change in inundation duration and time. Expectations are similar for local catchment flooding. Per above, the provision of a local catchment flood free access is expected to provide a beneficial impact for the residents of Oakhampton Heights by maintaining access and reducing the potential for isolation as part of local catchment flooding.	Not Significant
Velocity Change	May increase scour potential and/or damage of structures	Velocity changes were recorded as being up to 0.5m/s higher during the 1% AEP Hunte River flooding event. However, this was in proximity to the Powerhouse Control which consists of a rock filled gabion structure. The minor increases in velocity are expected to be able to be handled by the Powerhouse Control. With flood storage occurring within the local catchment, changes to velocities are expected to be negligible.	Minor

Change in Warning and Evacuation Time	May decrease available warning time and time available for evacuation	With little to no changes observed in flood afflux and isolated changes to flood velocities, there is expected to be little to no changes to Hunter River flooding timeframes that may impact warning and evacuation timeframes. Improvements are expected for local catchment flooding which will no longer require earnings and evacuation due to the Proposal providing flood free access for the local catchment event.	Not Significant
Change in Frequency of Inundation	Properties may become flood affected in more frequent events Access may be cut more frequently Areas may be isolated more frequently	The Proposal is being designed to provide flood free access for local catchment events. The road is to be constructed to R.L. 8.30m AHD which is higher than the modelled 0.2% AEP flood event with high tailwater which was recorded at R.L. 7.88m AHD. This is an improvement over existing flooding egress which is inundated for events as lows as 50% AEP (high tailwater) event. No change is expected to be observed for the Hunter River events where water discharges over the Powerhouse Control for all activated events including and greater than the 10% AEP event as currently occurs.	Not Significant
Flood Function Categorisation Change	May change categorisation (e.g. flood storage to floodway) and change impacts on flooding on existing development	The local catchment is classified as flood storage with works occurring on flood fringes. No change to this categorisation is expected. The Oakhampton Spillway serves as a floodway for the Hunter River catchment. The Proposal does not change this classification or the classification of any other impacted lands associated with the Proposal.	Not Significant
Hazard Categorisation Change	May reduce safety to vehicles, people or buildings.	Whilst filling forms part of the proposal, the depth of inundation associated with the Hunter River flooding events means that changes to the Hazard categorisation are unlikely. Due to the proposed filling of the subject site, changes to correctly demarcate the altered hazard categorisation are expected to occur as part of the local catchment flooding. However, this is expected to be concentrated along the new flood free access edge of any filling rather than significant changes to overall hazard categorisations across the area.	Not Significant

ALIGNMENT TO EXISTING FLOODPLAIN RISK MANAGEMENT STUDY

The Hunter River Floodplain Risk Management Study and Plan (2015) is the current flood risk management strategy applicable to the subject site. The HRFRMSP identified three broad categories for floodplain risk management measures being:

- Flood modification measures
- Property modification measures
- Response modification measures

The proposal has been compared to the modification and management measures contained within the HRFRMSP to assess if the proposal aligns with the plan.

TABLE 7 – PROPOSAL ALIGNMENT WITH RISK MANAGEMENT MODIFICATION MEASURES

MODIFICATION CATEGORY	MEASURE	YES / NO	PROPOSAL ALIGNMENT TO PLAN
Response	Evacuation Routes	Yes	The site maintains rising access to high ground above Hunter River PMF level for the residents of Oakhampton Heights. Whilst the dwellings are above the PMF level, residents must shelter in place unless they evacuate via the nominated route across the Walka Water Works dam embankment which is cut off for events greater than the 2% AEP flood event.
Response	Flood Warning and Evacuation Planning	Yes	Flood modelling shows that for major events, there is little change in flood afflux and duration meaning there is no need for changes to flood warning and evacuation planning. Filling of the site is proposed to improve resilience to flood impacts for local catchment events.
Response	Public Information and Raising Flood Awareness	N/A	The measures discussed relate more to community awareness. Flood related signage (or similar) is not proposed as part of this project but could be implemented as part of a wider program roll out.
Flood	New Levee Banks	N/A	The HRFRMSP has identified a number of proposals with respect to new levee embankments in proximity to the subject site including an embankment that would seek to protect Oakhampton residents located between The Long Bridge and Mount Pleasant Street. Whilst these proposed levee banks are in proximity to the subject site, the Proposal does not affect the ability to implement new levee banks and vice versa.
Flood	Alterations to	N/A	The HRFRMSP has identified a number of proposals

MODIFICATION CATEGORY	MEASURE	YES / NO	PROPOSAL ALIGNMENT TO PLAN
	Existing Levees/Spillways		with respect to augmentation of existing levee embankments in proximity to the subject site including adjustments to the Oakhampton Spillways. Whilst these proposed augmentation works are in proximity to the subject site, the Proposal does not affect the ability to undertake these works and vice versa.
Property		Yes	Proposal will: • Provide flood free access for the local catchment event. • Whilst the works are located immediately adjacent to the existing Powerhouse Control, this is considered to be the most appropriate location as based on modelled outcomes. • Utilise fill to improve flood resistance • Use suitable building materials including open type fencing in flood prone areas. • Adopt appropriate flood related development requirements.
Property	House Raising and Flood Proofing	N/A	This measure is more applicable to existing flood prone properties and development.
Property	Amphibious Housing	N/A	Applications associated with amphibious housing are not proposed as part of this proposal
Property	Rezoning	Yes	The subject site is considered appropriately zoned with RU1 Primary Production land. The proposal is permitted in accordance with the State Environment Planning Policy (Transport & Infrastructure) which does not require consideration of zoning.
Property	Voluntary Purchase	N/A	This measure is not considered to apply to the subject site as it is already under Council ownership.
Property	Importation of Fill	Yes	A key component of the proposal is the importation of fill to raise the new road construction to levels that are considered appropriate for the associated level of flood risk.

KEY RISKS TO BE MANAGED

Through the identification of the previous impacts and consideration for alignment to the Floodplain Risk Management Study, the following risks and their proposed mitigation management measures have been identified.

TABLE 8 – KEY RISKS AND MANAGEMENT MEASURES

NO.	RISK	MANAGEMENT MEASURE
1	Flood levels	Design new road construction to provide flood free access for known local catchment flooding events including freeboard to maintain appropriate pavement thicknesses against inundation.
2	Flood Velocities	Proposal to utilise suitable building materials to improve flood resistance including open type fencing in flood prone areas and scour resistant materials such as rock and gabion mattresses where scour velocities warrant such materials.
3	Flood Warning and Evacuation	Maintain existing evacuation and emergency management actions for the area including shelter in place and evacuation via Walka Water Works dam embankment which is cut off for events greater than the 2% AEP event.
4	Development Control Planning and Flood Planning Levels	Proposal to utilise suitable building materials to improve flood resistance including open type fencing in flood prone areas and scour resistant materials such as rock and gabion mattresses where scour velocities warrant such materials.
5	Site filling	Utilise site filling to raise the new road construction to levels that are considered appropriate for the associated level of flood risk.

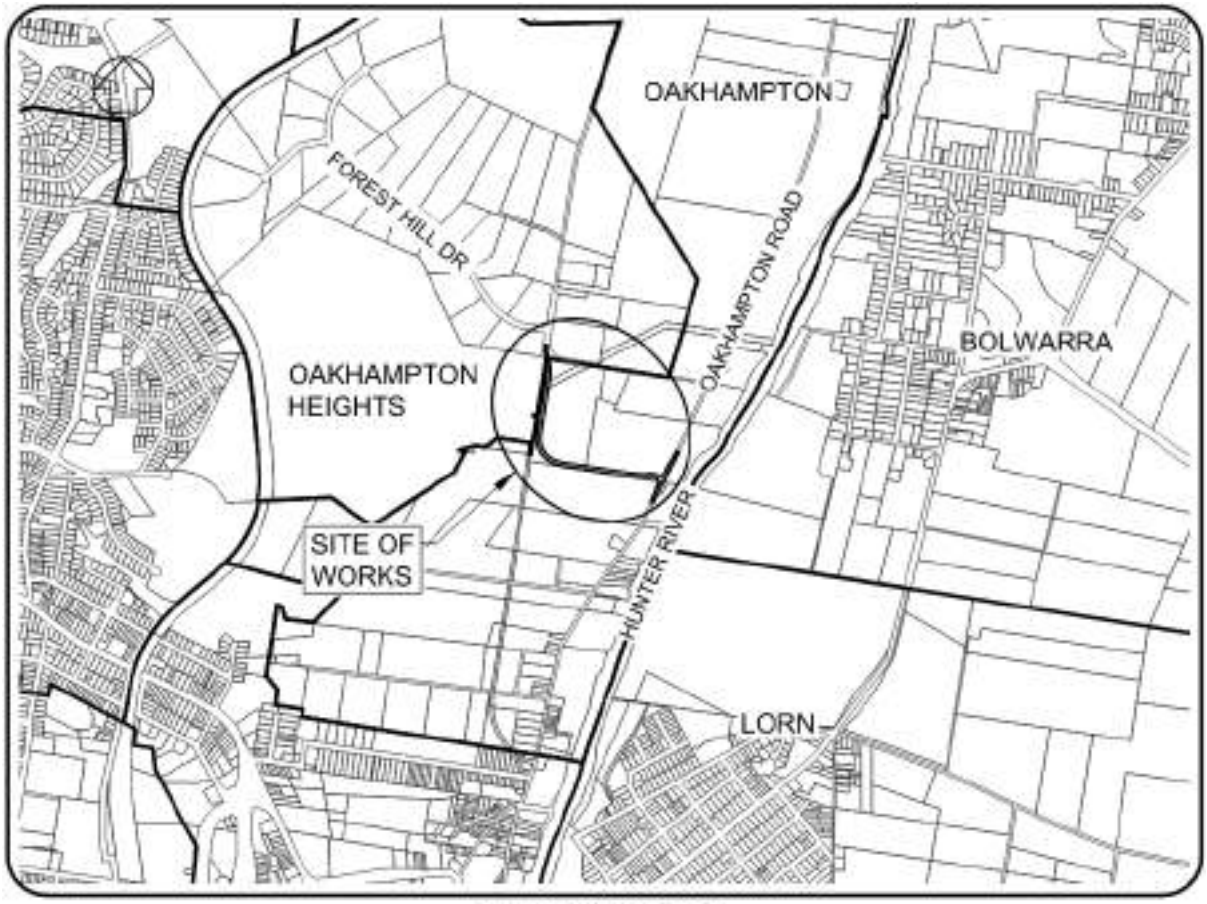
The identified risks and their management measures are considered to be sufficient for the purposes of allowing the development to proceed.

CONCLUSIONS & RECOMMENDATIONS

By review of existing flood related information an assessment of the proposal has been carried out to determine the impact that the proposal has on flooding within the existing community and the impact that flooding may have on the proposal. The analysis concluded that most key considerations were identified as not significant with the exception of velocity changes during a Huner River flood event which were assessed as minor.

An analysis of risk associated with these impacts has then been carried out to establish key risks and appropriate management measures to be implemented to allow development of the proposal to proceed. It is recommended to consider implementation of these measures as the development proceeds through design, construction and operational phases.

ATTACHMENT 1 – SUBJECT SITE



LOCALITY PLAN

ATTACHMENT 2 – CONCEPTUAL ROAD LAYOUT


650.00
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
256.19
250.00
200.00
150.00
100.00
50.00

ATTACHMENT 3 – HUNTER RIVER FLOOD LEVEL AND DEPTH MAPS

Hunter River Flooding Levels & Depths - Powerhouse Control

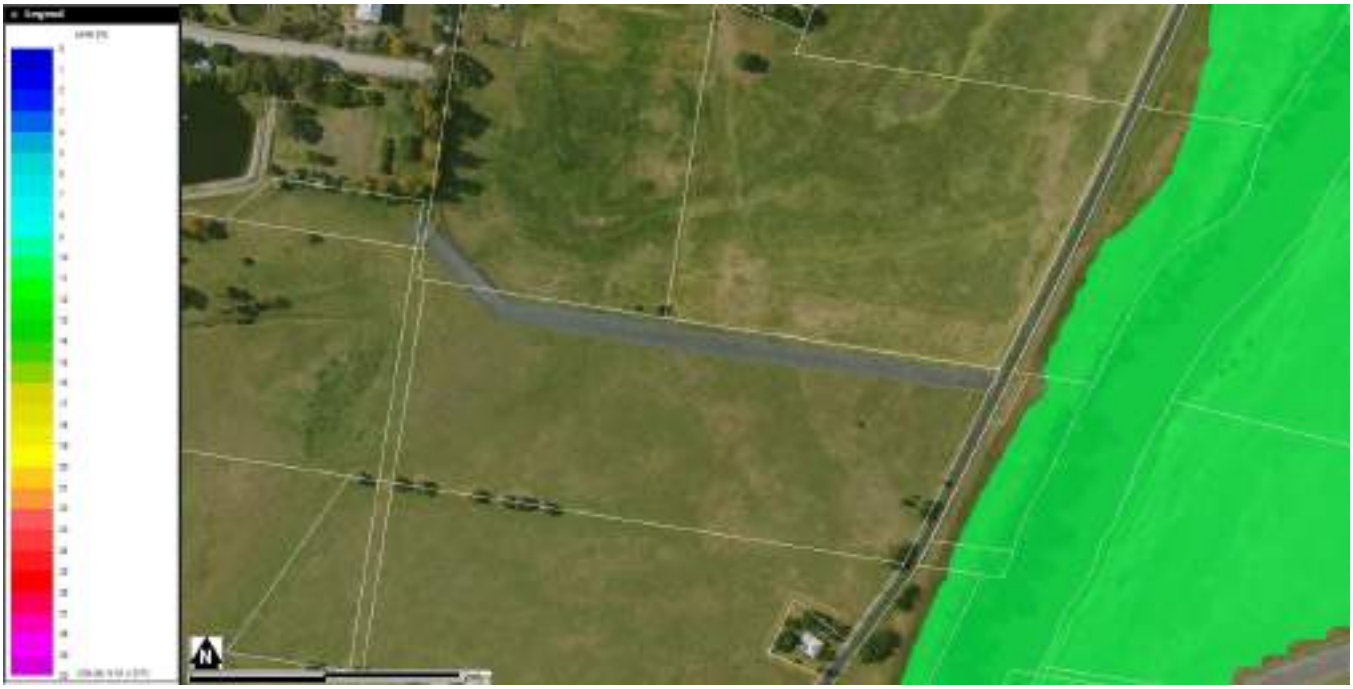


Figure: Hunter River 20% AEP Flood Level

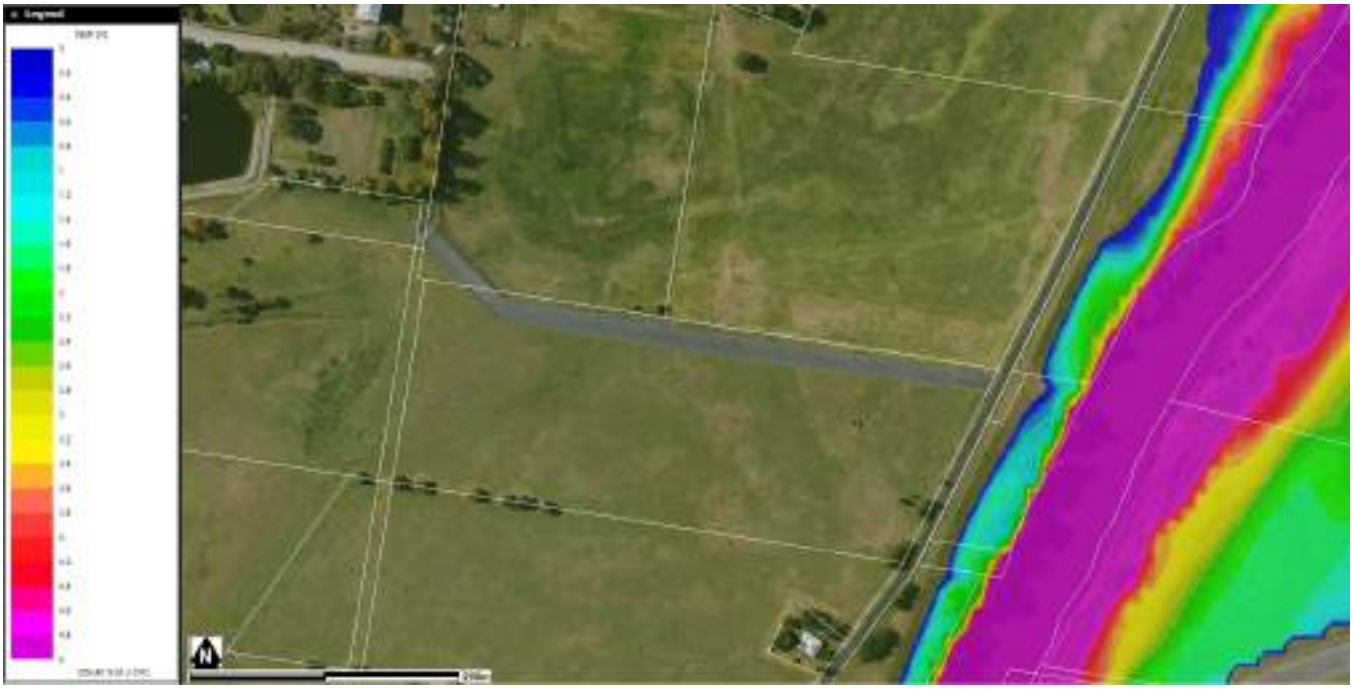


Figure: Hunter River 20% AEP Flood Depth

Figure: Hunter River 10% AEP Flood Level

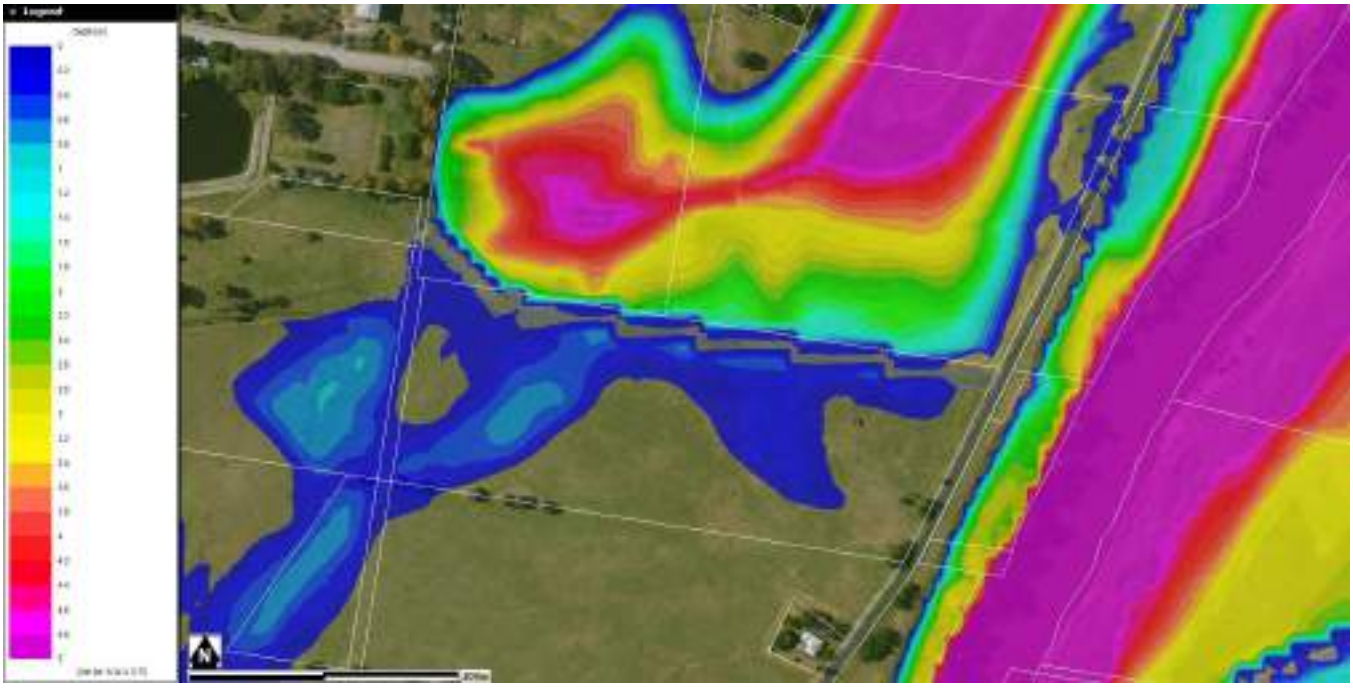


Figure: Hunter River 10% AEP Flood Depth

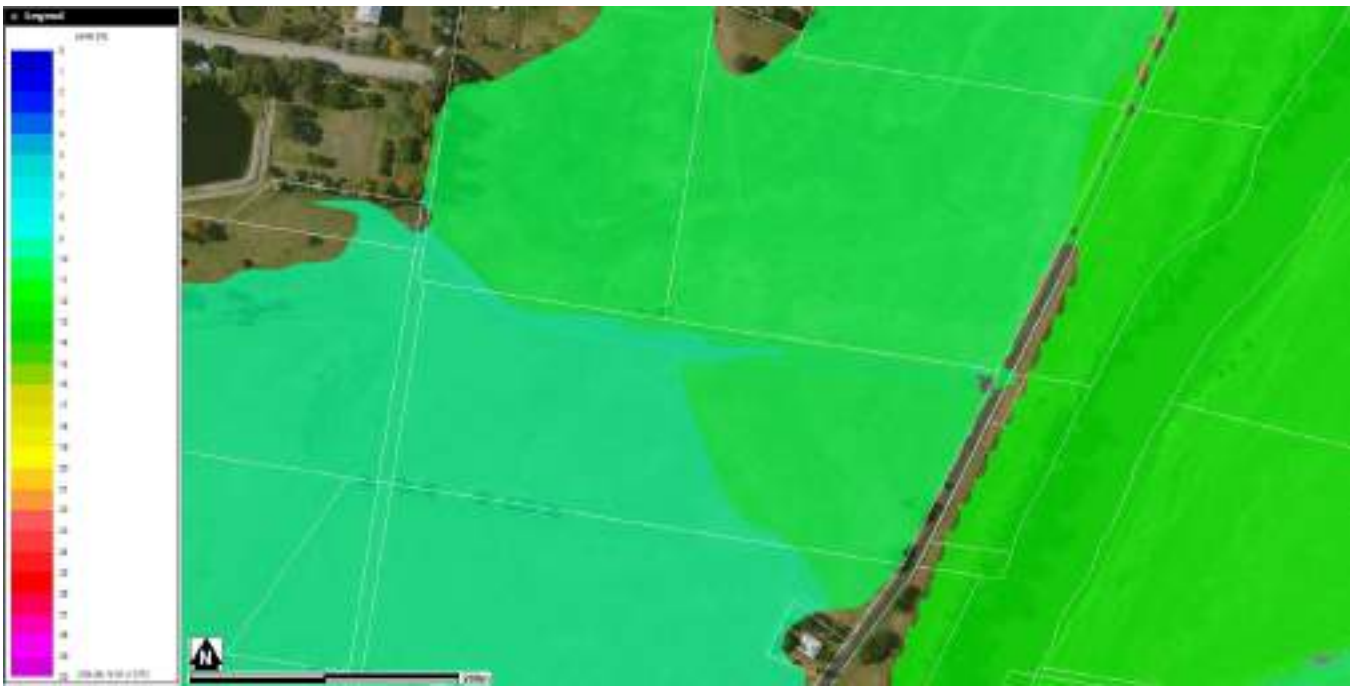


Figure: Hunter River 5% AEP Flood Level

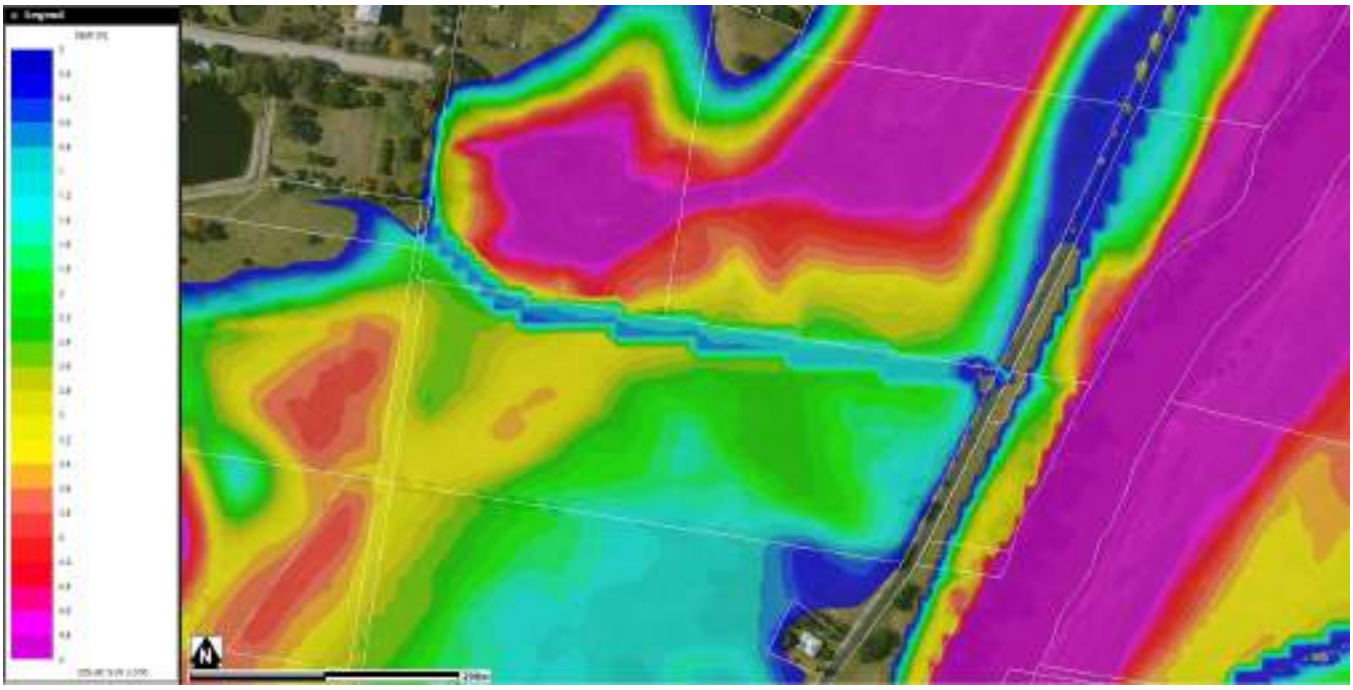


Figure: Hunter River 5% AEP Flood Depth

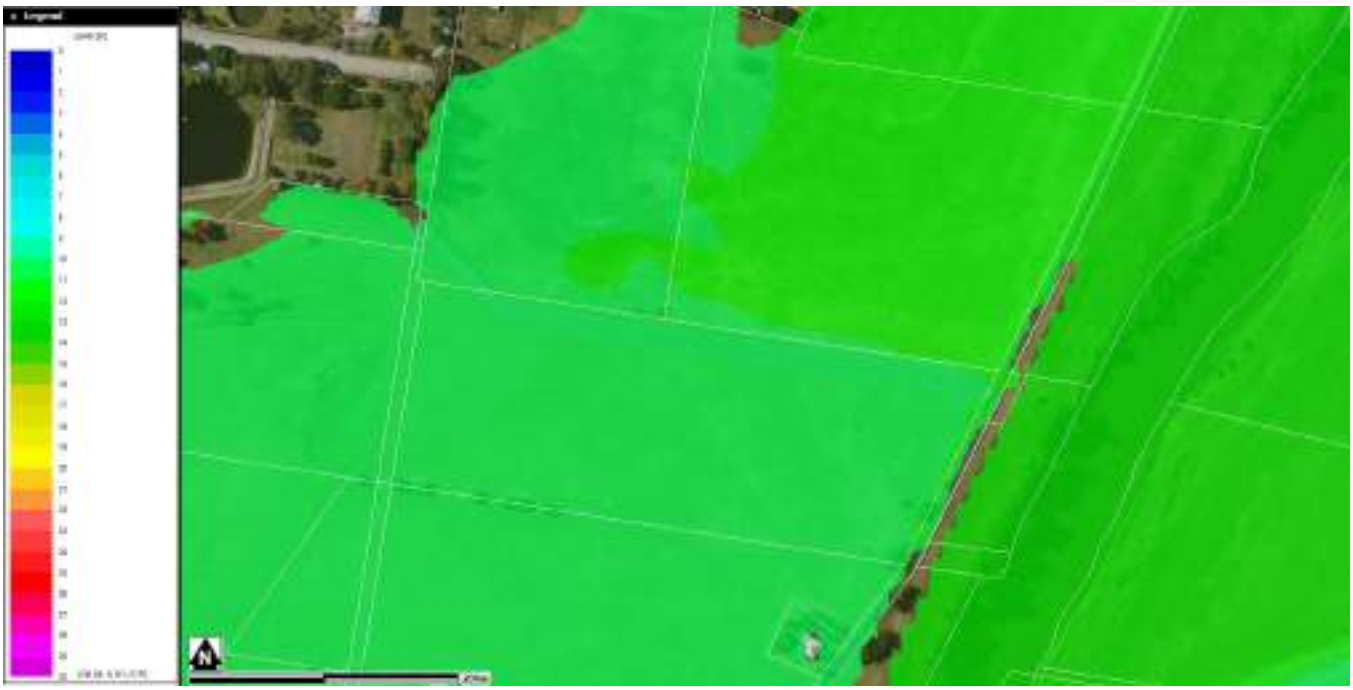


Figure: Hunter River 2% AEP Flood Level

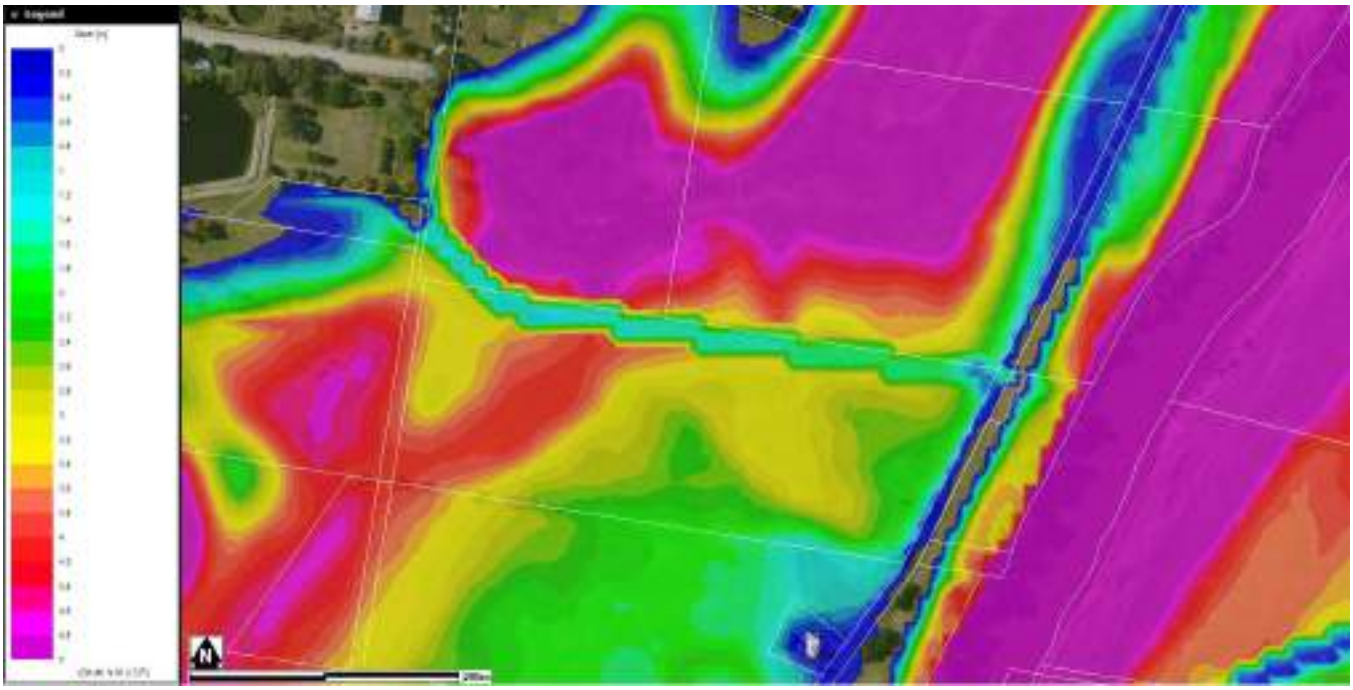


Figure: Hunter River 2% AEP Flood Depth

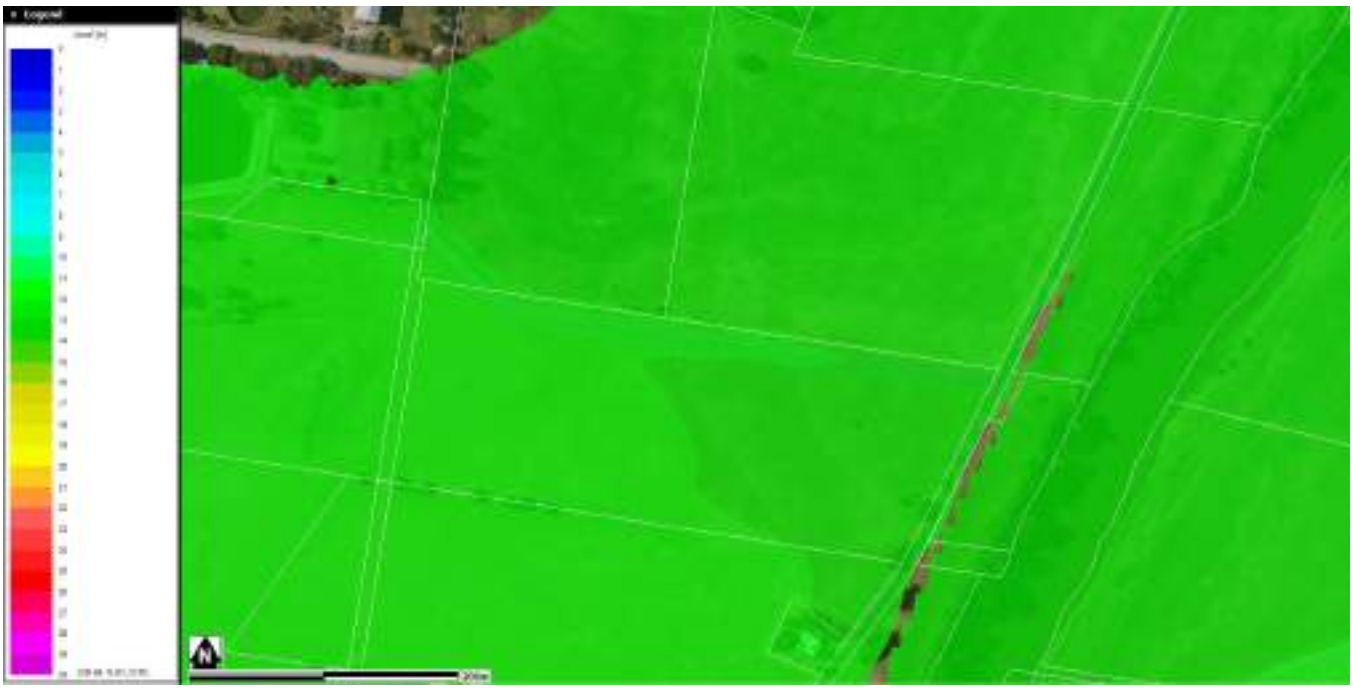


Figure: Hunter River 1% AEP Flood Level

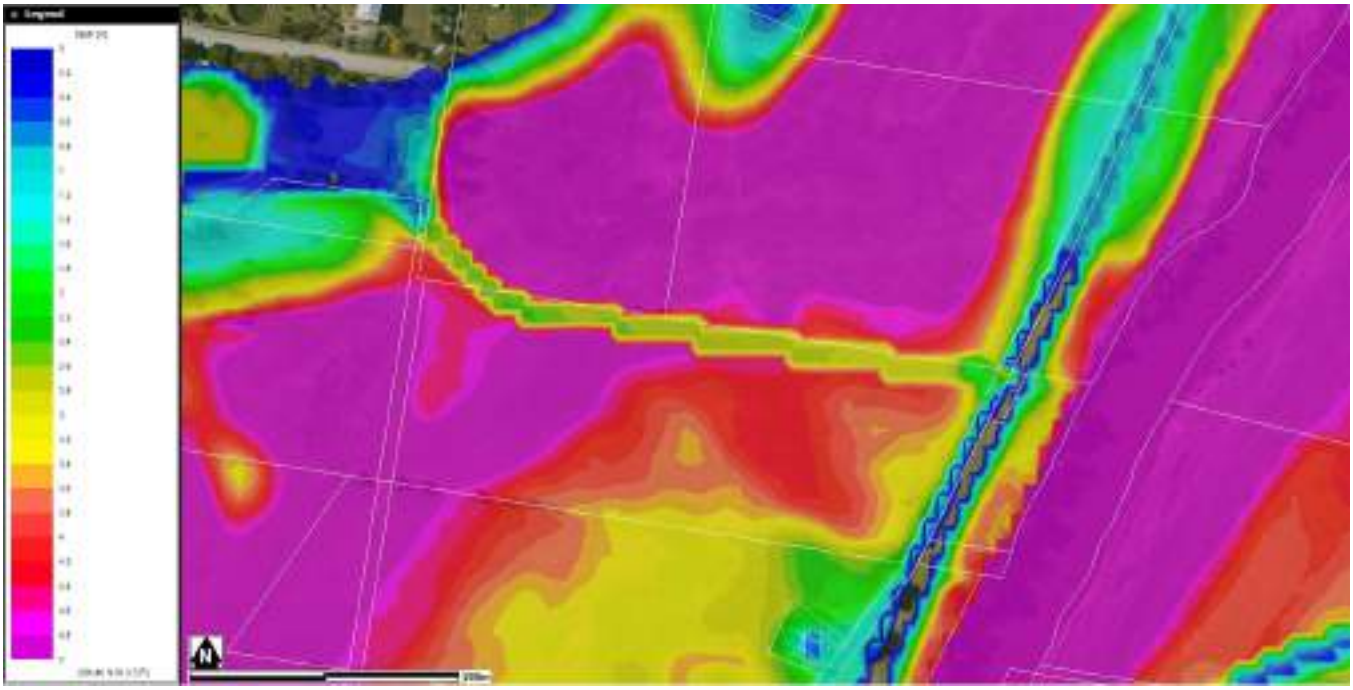


Figure: Hunter River 1% AEP Flood Depth

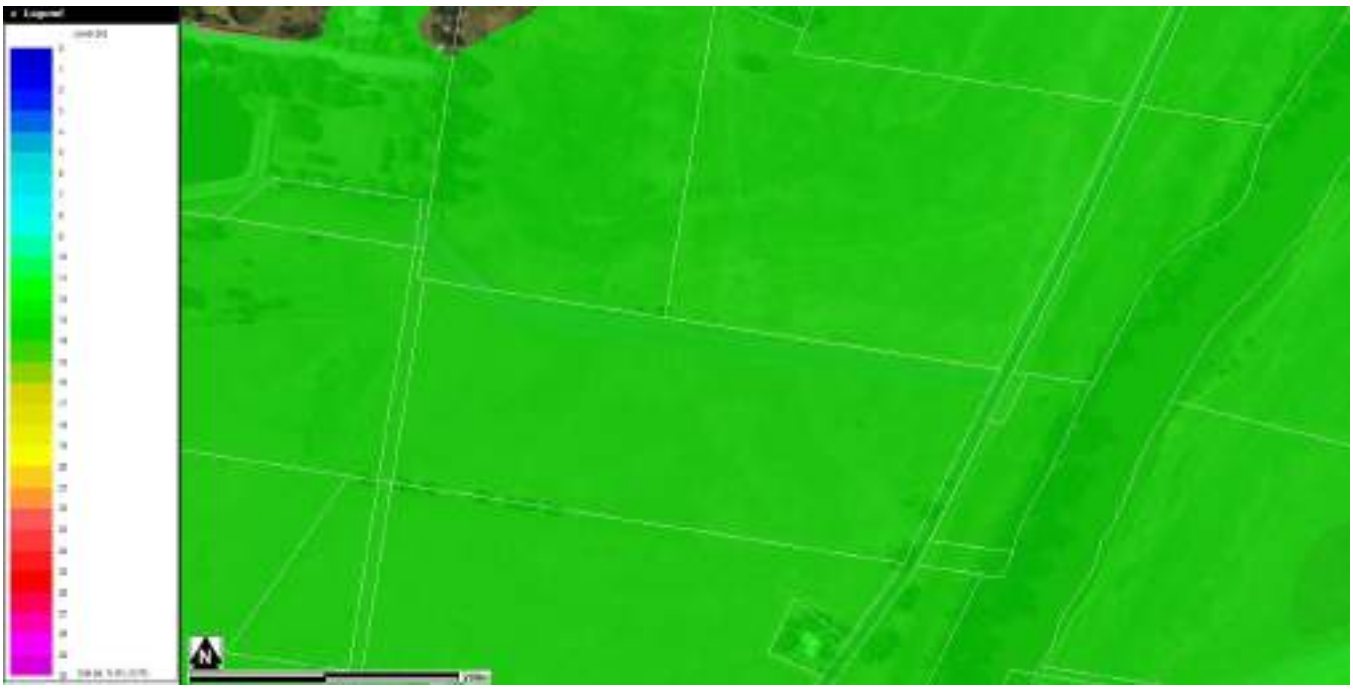


Figure: Hunter River 0.5% AEP Flood Level

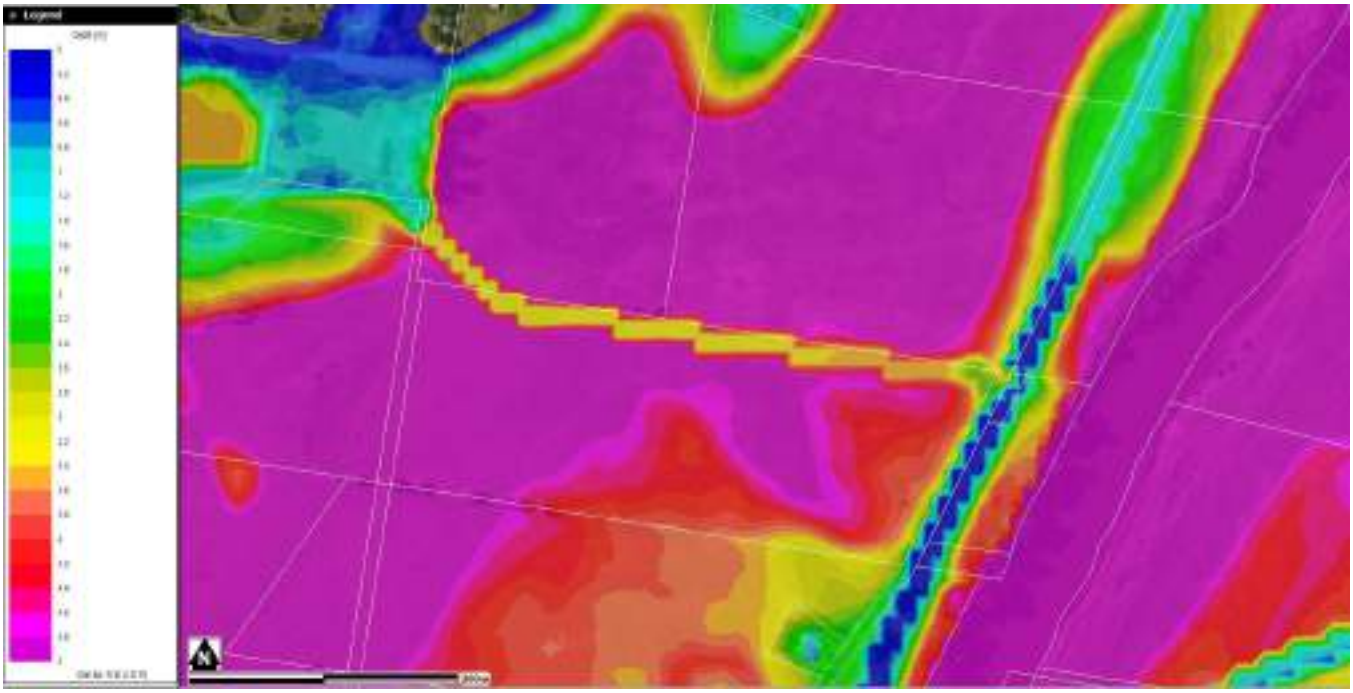


Figure: Hunter River 0.5% AEP Flood Depth

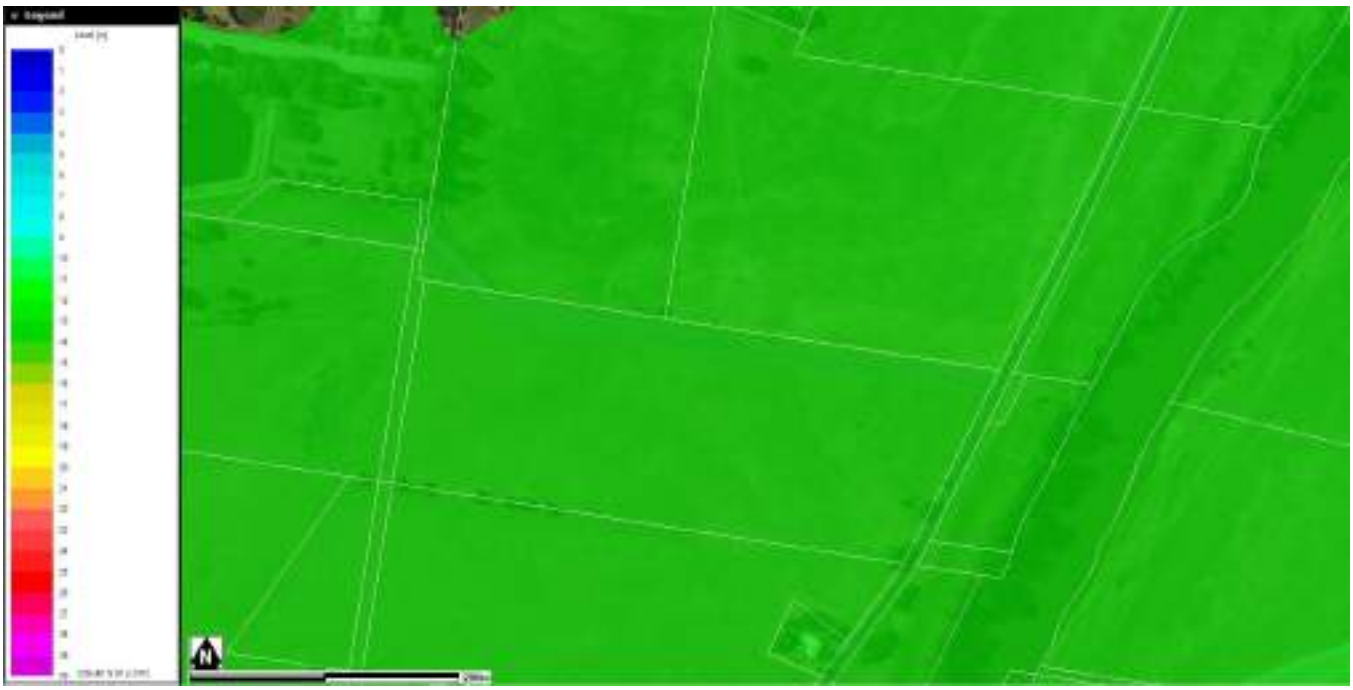


Figure: Hunter River 0.2% AEP Flood Level

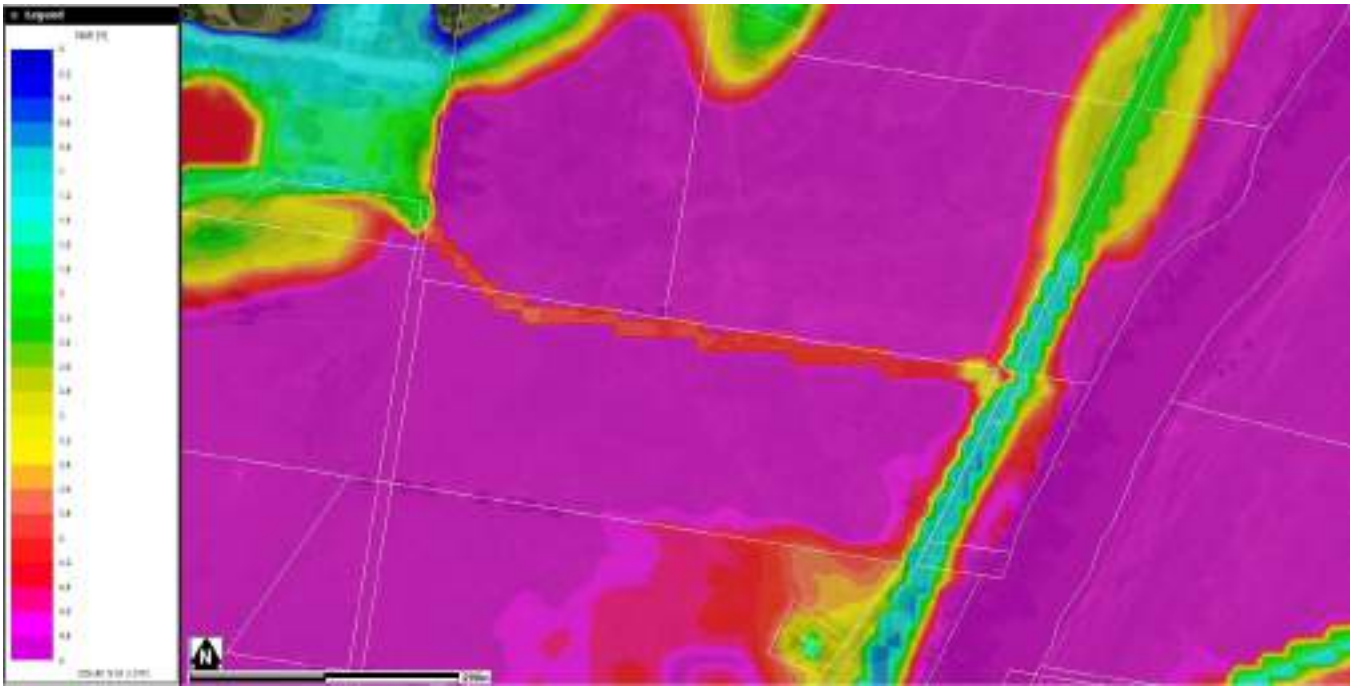


Figure: Hunter River 0.2% AEP Flood Depth

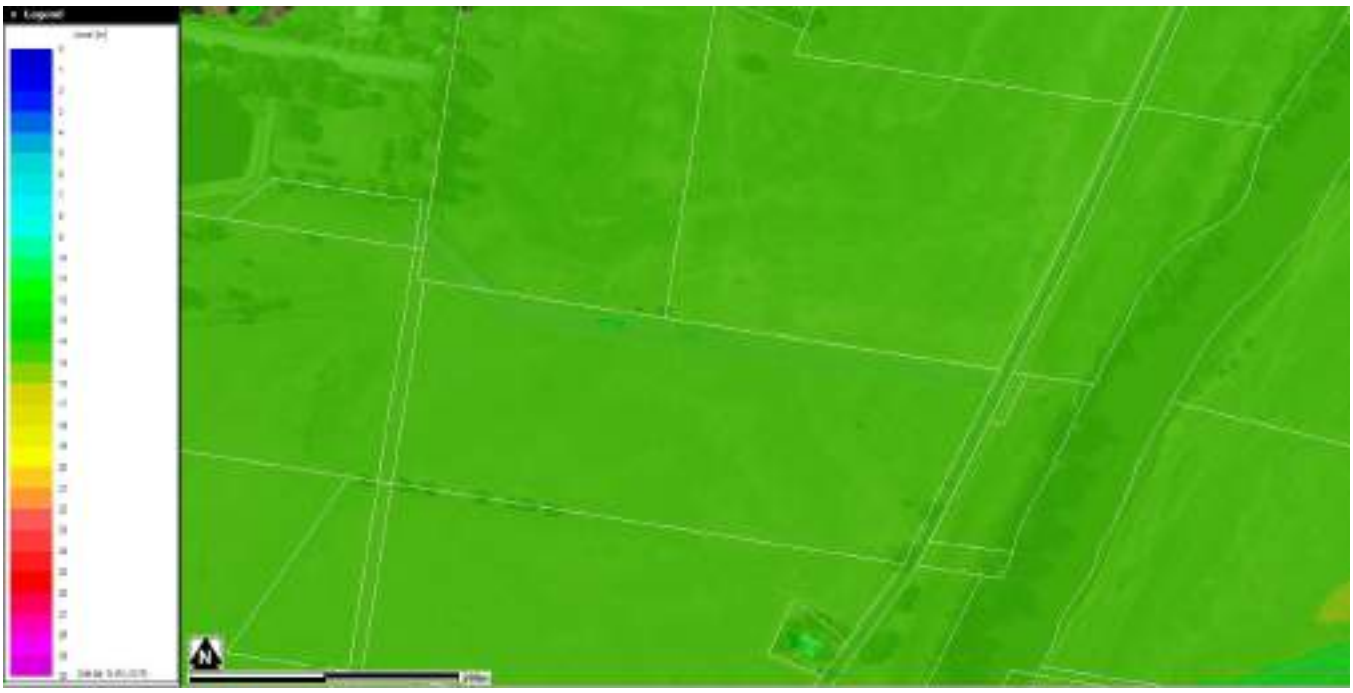


Figure: Hunter River PMF Flood Level

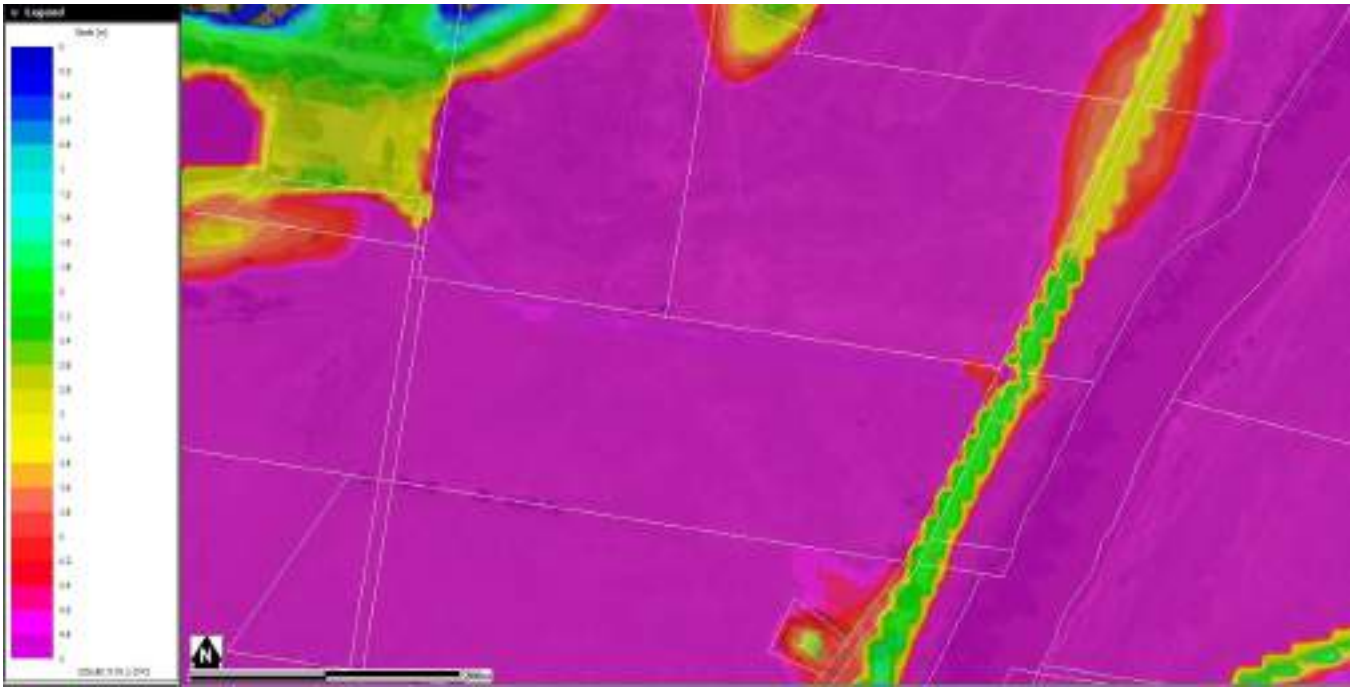


Figure: Hunter River PMF Flood Depth

ATTACHMENT 4 – HUNTER RIVER VELOCITY MAPS

Hunter River Flooding Velocities - Powerhouse Control

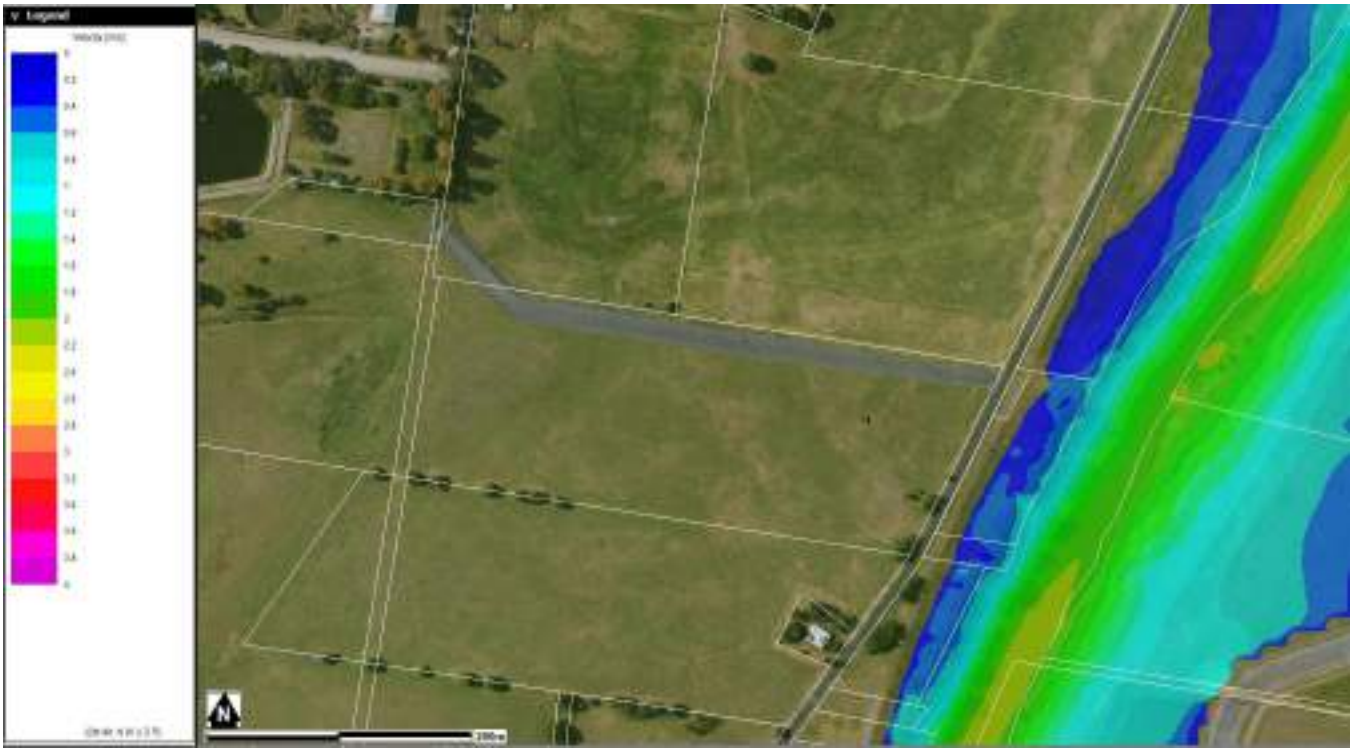


Figure: Hunter River 20% AEP Flood Velocities

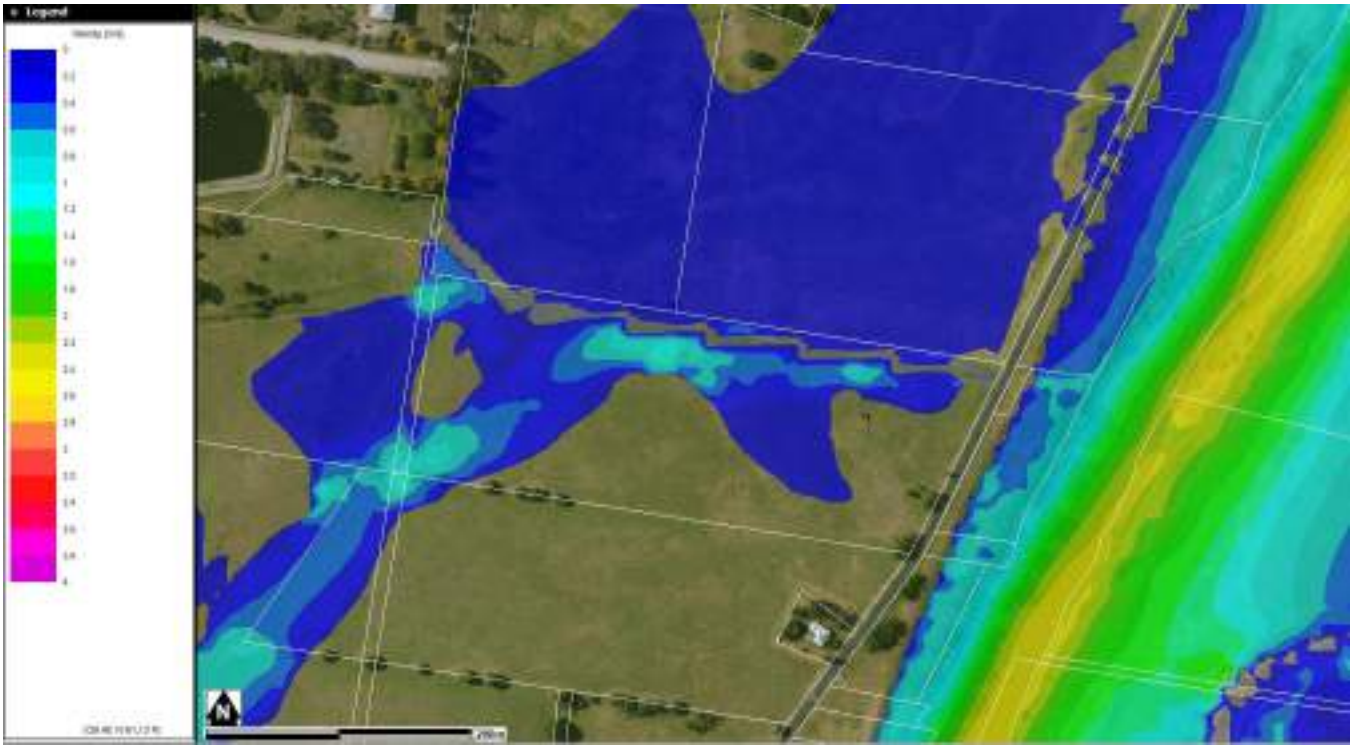


Figure: Hunter River 10% AEP Flood Velocities

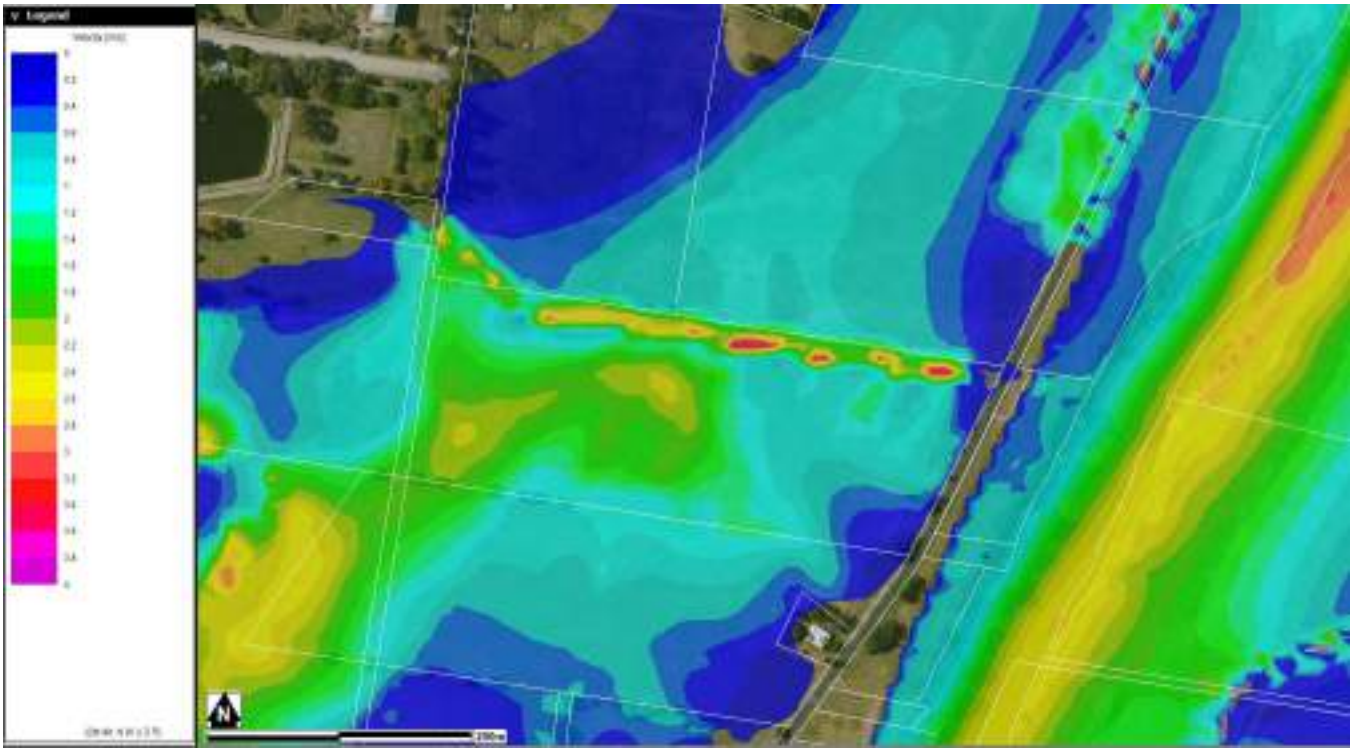


Figure: Hunter River 5% AEP Flood Velocities

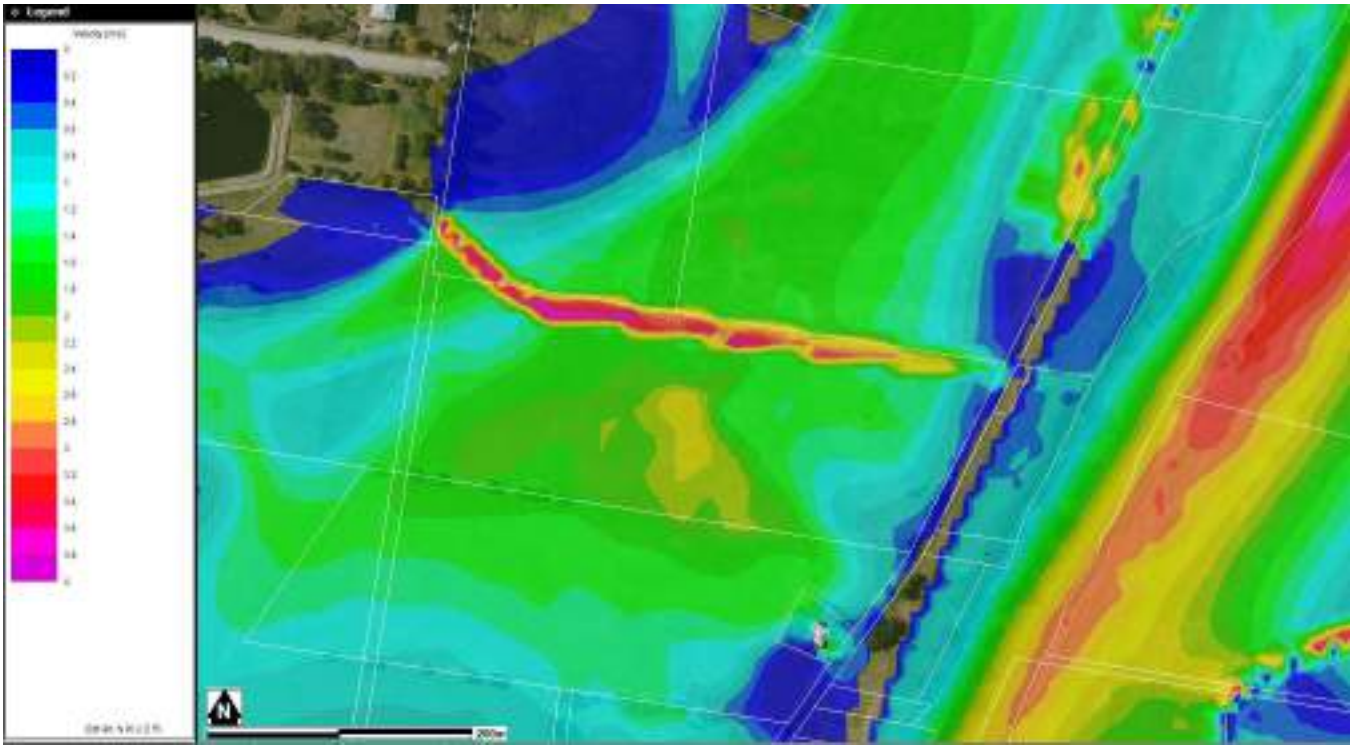


Figure: Hunter River 2% AEP Flood Velocities

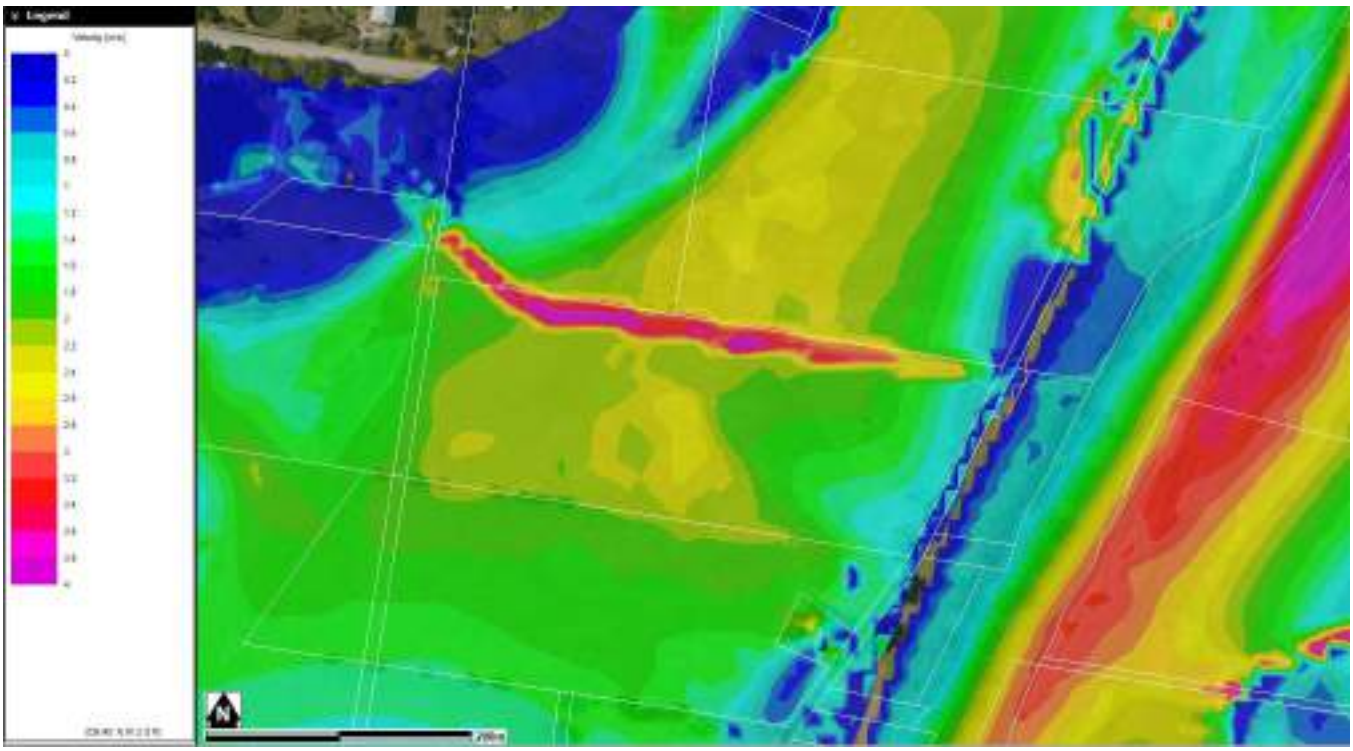


Figure: Hunter River 1% AEP Flood Velocities

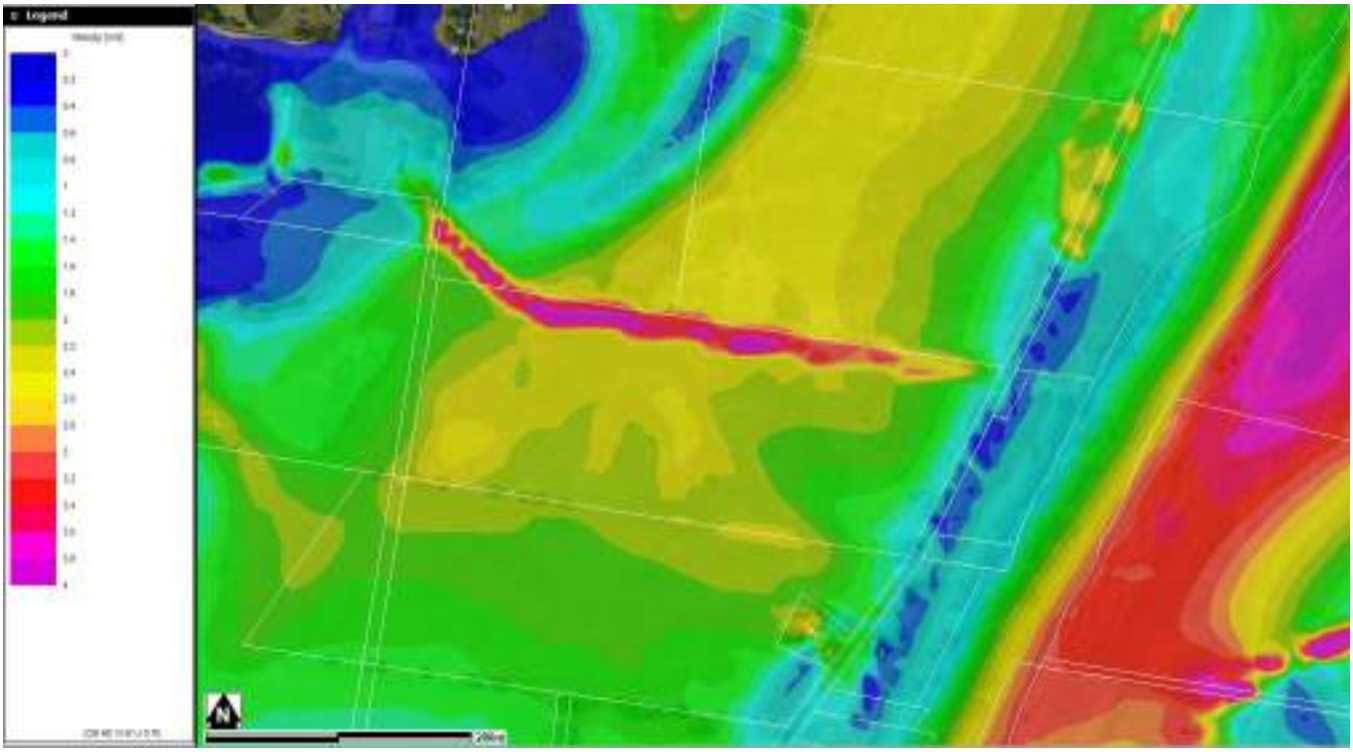


Figure: Hunter River 0.5% AEP Flood Velocities

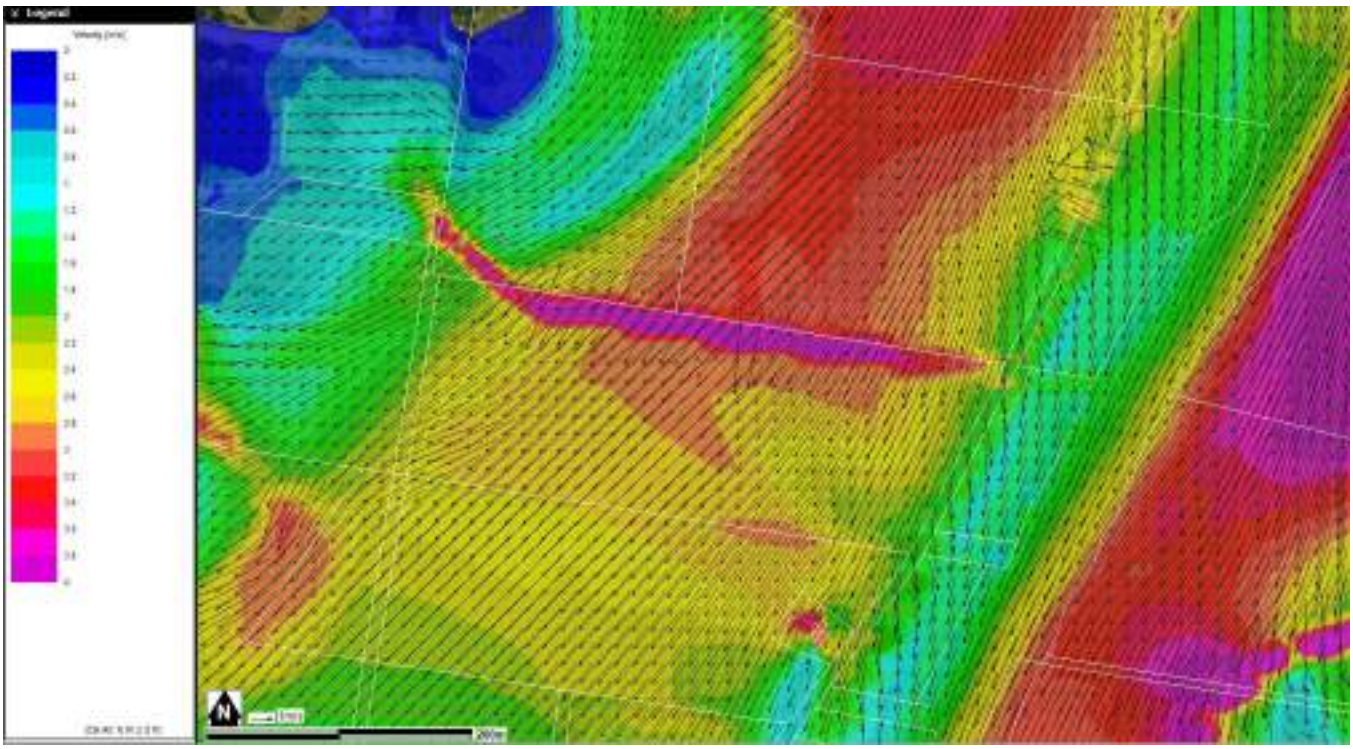


Figure: Hunter River 0.2% AEP Flood Velocities

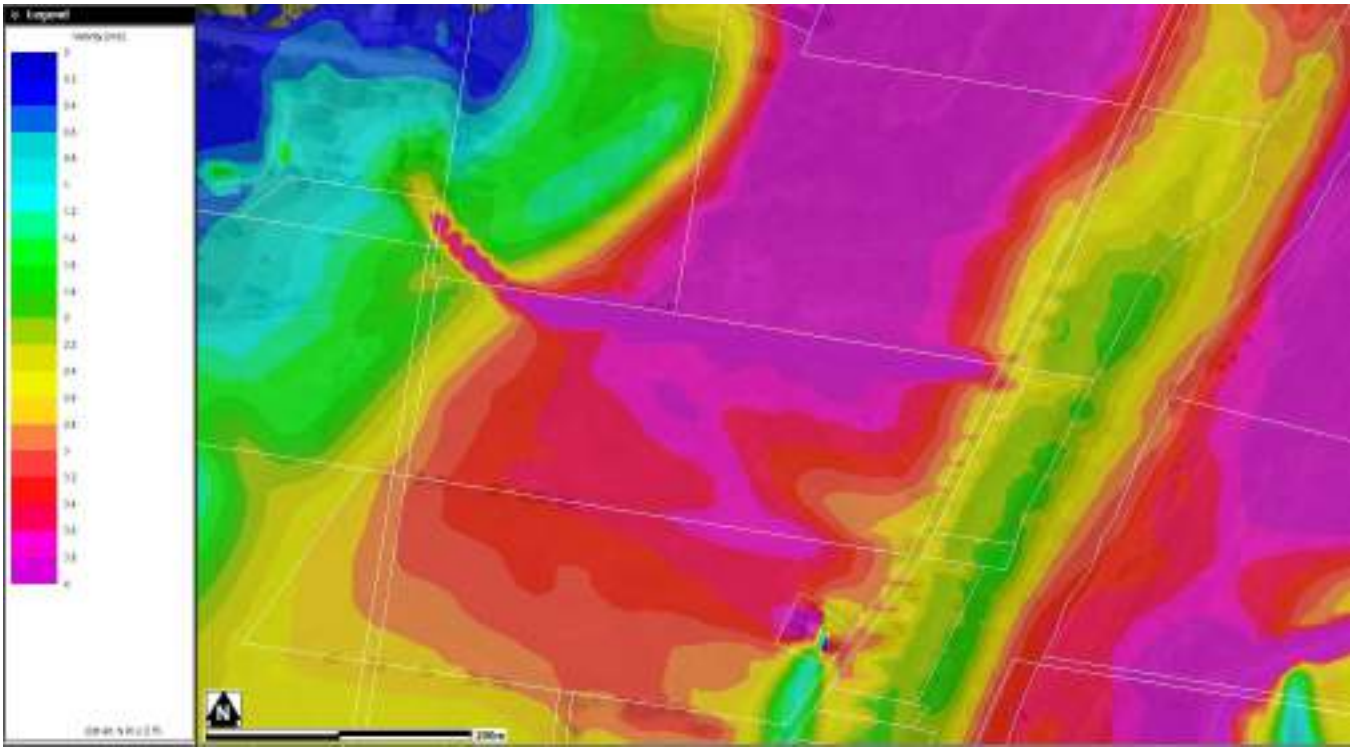
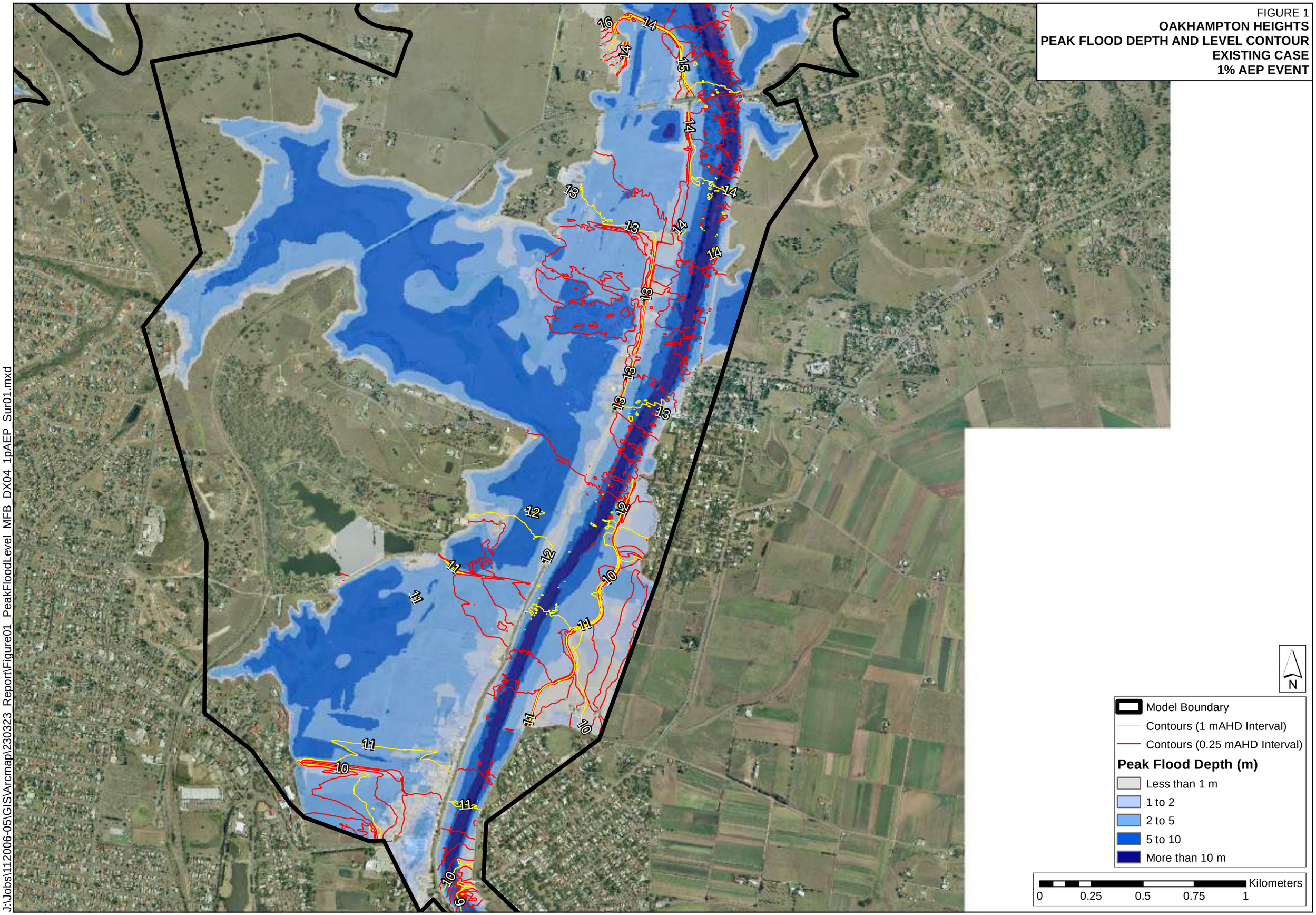


Figure: Hunter River PMF AEP Flood Velocities

ATTACHMENT 5 – DIFFERENTIAL 1% AEP HUNTER RIVER FLOODING IMPACTS FOR NEW ROAD OPTIONS

FIGURE 1
OAKHAMPTON HEIGHTS
PEAK FLOOD DEPTH AND LEVEL CONTOUR
EXISTING CASE
1% AEP EVENT



J:\Jobs\112006-05\GIS\Arcmap\230323_ReportFigure01_PeakFloodLevel_MFB_DX04_1pAEP_Sur01.mxd

FIGURE 2
OAKHAMPTON HEIGHTS
PEAK FLOOD VELOCITY
EXISTING CASE
1% AEP EVENT

N

Model Boundary
Velocity Vector

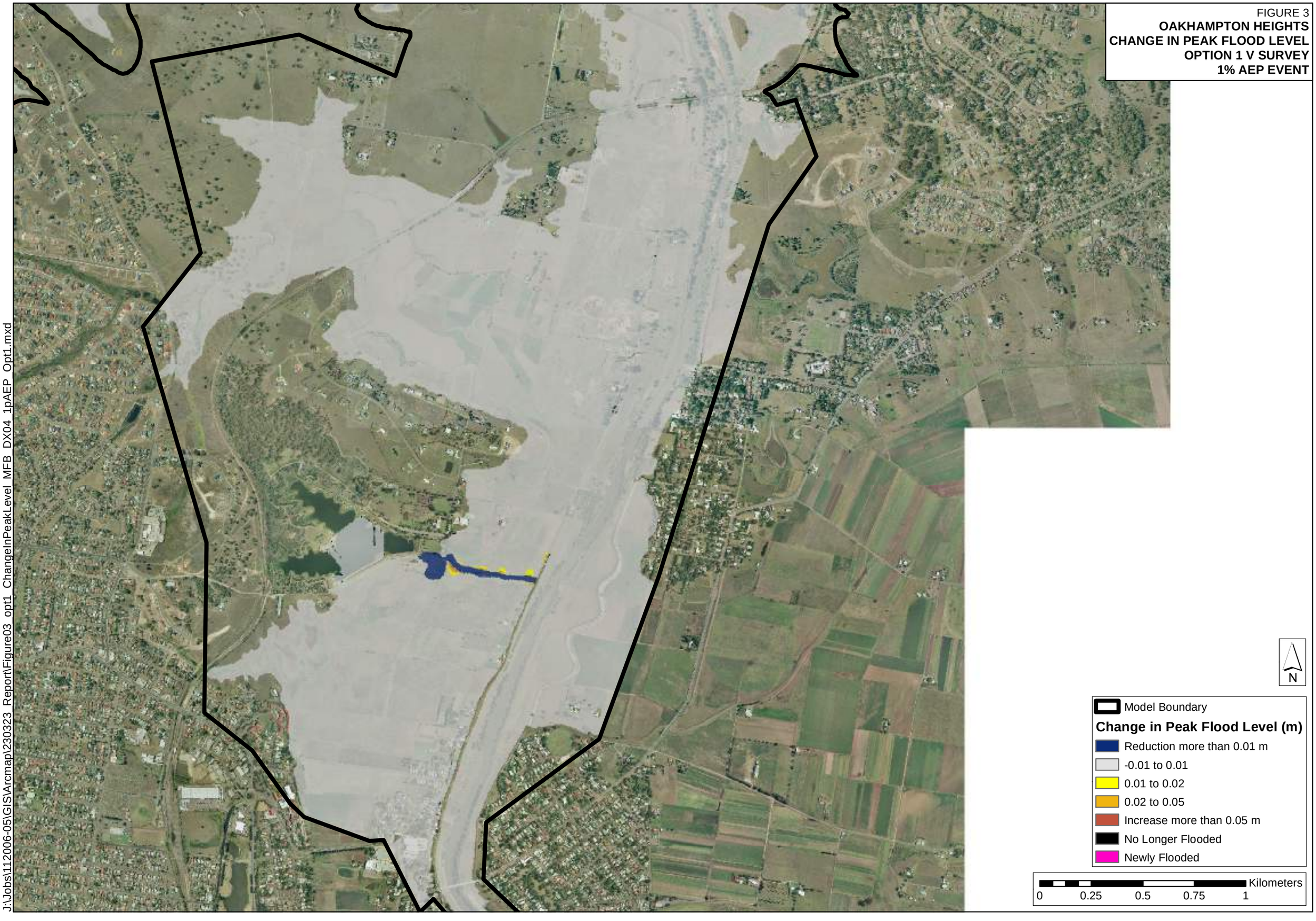
Peak Flood Velocity (m/s)

Less than 1 m/s
1 to 2
2 to 3
3 to 4
Over 4 m/s

0 0.25 0.5 0.75 1 Kilometers

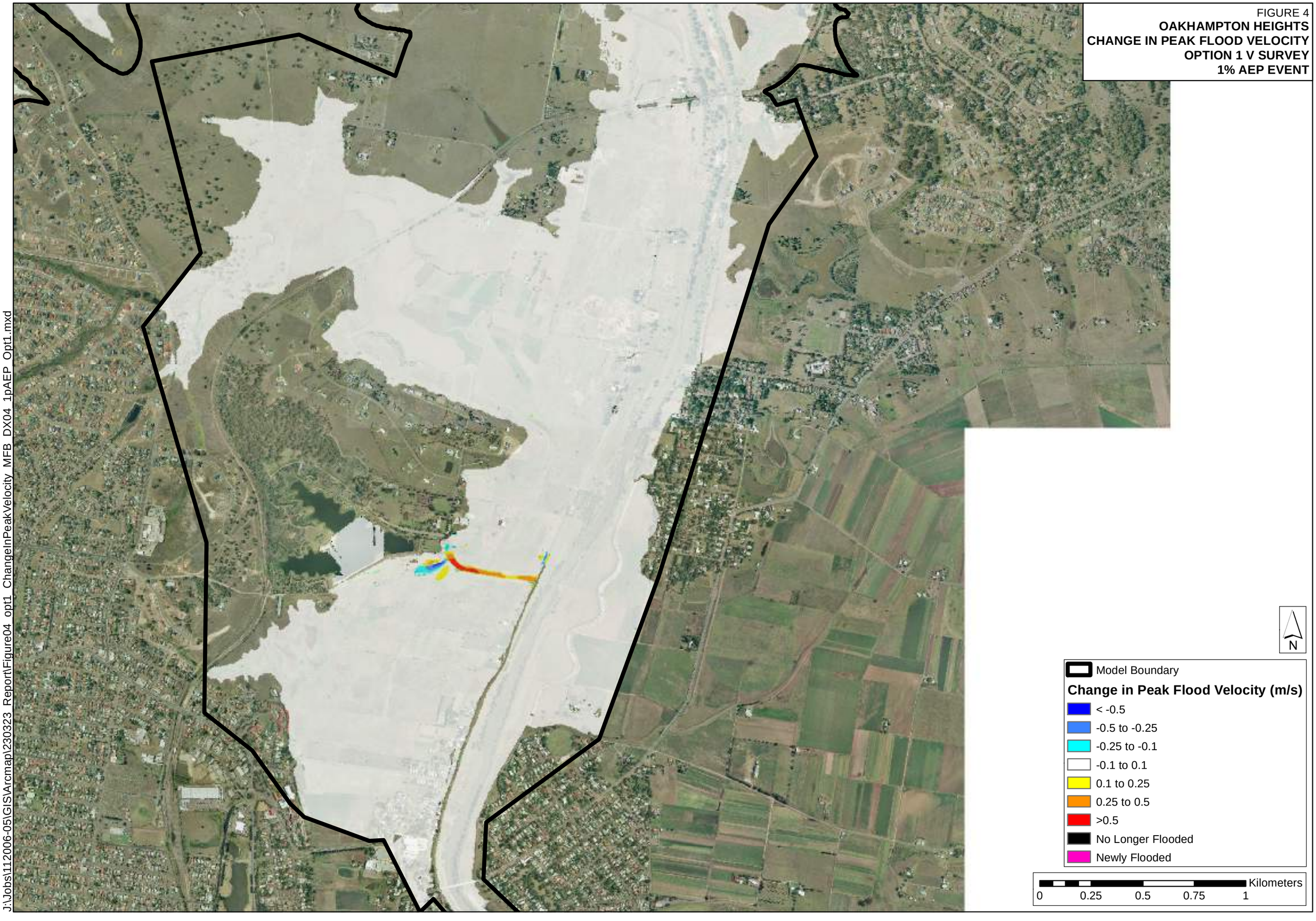
J:\Jobs\112006-05\GIS\Arcmap\230323_Report\Figure02_PeakFloodVelocity_MFB_DX04_1pAEP_Sur01.mxd

FIGURE 3
OAKHAMPTON HEIGHTS
CHANGE IN PEAK FLOOD LEVEL
OPTION 1 V SURVEY
1% AEP EVENT



J:\Jobs\112006-05\GIS\Arcmap\230323 Report\Figure03 opt1 ChangeInPeakLevel MFB DX04 1pAEP Opt1.mxd

FIGURE 4
OAKHAMPTON HEIGHTS
CHANGE IN PEAK FLOOD VELOCITY
OPTION 1 V SURVEY
1% AEP EVENT



J:\Jobs\112006-05\GIS\Arcmap\230323 Report\Figure04 opt1 ChangeInPeakVelocity MFB DX04 1pAEP Opt1.mxd

FIGURE 5
OAKHAMPTON HEIGHTS
CHANGE IN PEAK FLOOD LEVEL
OPTION 2 V SURVEY
1% AEP EVENT

N

Model Boundary

Change in Peak Flood Level (m)

- Reduction more than 0.01 m
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- Increase more than 0.05 m
- No Longer Flooded
- Newly Flooded

0 0.25 0.5 0.75 1 Kilometers

J:\Jobs\112006-05\GIS\Arcmap\230323 Report\Figure05 opt2 ChangeInPeakLevel MFB DX04 1pAEP.mxd

FIGURE 6
OAKHAMPTON HEIGHTS
CHANGE IN PEAK VELOCITY
OPTION 2 V SURVEY
1% AEP EVENT

N

Model Boundary

Change in Peak Flood Velocity (m/s)

- < -0.5
- -0.5 to -0.25
- -0.25 to -0.1
- -0.1 to 0.1
- 0.1 to 0.25
- 0.25 to 0.5
- >0.5
- No Longer Flooded
- Newly Flooded

0 0.25 0.5 0.75 1 Kilometers

J:\Jobs\112006-05\GIS\Arcmap\230323 Report\Figure06 opt2 ChangeInPeakVelocity MFB DX04 1pAEP.mxd