

Camellia Recycling Centre - Flood Emergency Response Plan

PREPARED FOR: Veolia Environmental Services

DOCUMENT NO: 476707.D4.002

DATE: 7 September 2015

REVISION NO.: 0

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1 Introduction

This Flood Emergency Response Plan (FERP, the 'Plan') should be considered a "living" document. Information contained within this document will require revision, amendment and/or updating as the Camellia Recycling Centre (CRC) moves from the planning phase into the construction phase; and into the operational phase. In particular, amendments are likely to be required to Sections 3 and 4; including provision of the details concerning appropriate responsible persons and their contact details.

1.1 Purpose

The purpose of this Plan is to provide key information and instructions to manage flood risk during the construction and operational phases of the Camellia Recycling Centre.

Key elements of the plan include identification of local incident management procedures, safety requirements, commercial implications, training requirements and record keeping requirements.

1.2 Area covered by this plan

The area covered by this plan comprises 37 Grand Ave, Camellia, referred to as the 'Site' herein.

This need for this plan was identified by the Department of Planning and Environment (DoPE) during a meeting between Veolia, Parramatta Council and DoPI held on 22 June 2015.

1.3 Context

The CRC FERP is site-specific and should be read in conjunction with relating studies including:

- Camellia Recycling Centre – Alternative Design #1 Flood Model (CH2M HILL, 2015)
- Camellia Recycling Centre – Flood Study Rev 1, Response to Request for Additional Information (CH2M HILL, 2014)
- Camellia Recycling Centre – Flood Study, Revision 1 (CH2M HILL, 2013a)
- Camellia Recycling Centre – Response to Submissions Report (CH2M HILL, 2013b)
- Parramatta Local Disaster Plan (DISPLAN) (Parramatta City Council, 2010)
- Local Floodplain Risk Management Policy Parramatta City Council (2006)
- Lower Parramatta River: Floodplain Risk Management Study – Flood Study Review (SKM, 2005b)
- Lower Parramatta River: Floodplain Risk Management Study and Plan, Volume 1 – Main Report (SKM, 2005a)

The CRC will be constructed with a building floor level of RL 4.13m AHD which is 0.5m higher 100 year ARI flood level 3.63m AHD. The PMF extreme event flood level is 6.06m AHD.

Reliable access and safe refuge is available for pedestrians to a level above the PMF (RL 6.06m AHD), with the Finished Floor Level (FFL) of the second floor to be between 7.0 – 8.0m AHD. Vehicle refuge above the PMF is not possible as the entire Camellia Peninsula is inundated by the PMF.

During a major flood event (defined as flooding greater than the 10 year ARI), all on-Site vehicles will be directed to move inside the CRC which is constructed at a level above the 100 year ARI. No additional special traffic signage or instructions is required to direct traffic around the Site during flood events.

1.4 Review of this Flood Response Plan

This plan should be reviewed by periodically by Site management at key stages. Key stages when this plan should be reviewed are:

- **During detailed design** – to confirm all proposed flood mitigation measures and site features are incorporated into design as allowed for during conceptual design and submission for planning approval.
- **Following construction completion** – to confirm flood mitigation measures were constructed as designed. “Works as Executed” information should be documented.
- **Every 5-years or following a major flood event** – a major flood event is defined as an event greater than a 10 year ARI.

1.5 Key Contacts

Key contacts and their responsibility are shown in Table 1.

Table 1 Key contacts and responsibility

Responsibility	Name / contact no.	Warning provided / responsibility
Camellia Recycling Centre Project Manager	Promit Biswas - 02 9841 2927	Update of this Plan. Communication to all construction and operations staff. Responsibility for Site coordination.
Bureau of Meteorology (BOM)	http://www.bom.gov.au/nsw/warnings/	Specific warnings, including evacuation warnings to the community (as described in the DISPLAN)
NSW SES	13 25 00 http://www.ses.nsw.gov.au	Local flood advice, flood bulletins, flood heights and evacuation warnings to the Local Emergency Operations Controller and relevant emergency services and functional areas (as described in the DISPLAN).
Parramatta City Council	02 9806 5050	Regulate property development building construction through LEPs & DCPs Development of maintenance and flood mitigation works. Preparation of floodplain management plans. Preparation of mitigation schemes and Floodplain Risk Management Plans.
NSW Police	Emergency 000 Parramatta (02) 9633 0799	Evacuation warnings, public safety directions and warnings relating to spillages into waterways.
NSW Fire and Rescue	02 9265 2999	Assistance and rescue during flooding emergencies,
Ambulance	Emergency 000	Ambulance services.

2 Flood emergency response management

One way of reducing the flood risk is to develop and implement a FRP (this plan). The primary objective of a FRP is to reduce the threat that floods pose to the safety of people living and/or working on or adjacent to flood affected land.

2.1 Flood mechanisms

The site may be impacted by two flood mechanisms/types of flooding:

1. Fluvial flooding – flooding from Parramatta River (rising river waters); and
2. Pluvial flooding (overland flow) – flooding from rainfall within the local catchment on the Camellia peninsula that is conveyed as overland flow along Grand Avenue.

It is important to understand both types of flooding as they pose different risks, have different consequences and evacuation & refuge response.

Flooding at the Site is expected to persist at most for a few hours during the 100 year ARI when fluvial (river) flooding is expected to inundate the Site.

Flood maps (depth, velocity, hazard) for the 20 year ARI and 100 year ARI flood events are included as **Appendix A**.

2.2 Flood emergency response planning

2.2.1 Site planning and design features

The site has incorporated a number of planning and design features developed in accordance with Parramatta City Council's Local Floodplain Risk Management Policy (Parramatta City Council, 2006). Site planning and design features are summarised in Table 2.

Table 2 Planning and design features

Planning and design feature	Description of feature with reference to CH2M (2013a)
Floor Level	All proposed floor areas have a minimum finished floor level (FFL) of 0.5m greater than the 100 year ARI flood level in Parramatta River of 3.63m. The minimum FFL is therefore RL 4.13m AHD.
Building Components & Method	The proposed development will be constructed on imported fill that will ensure all FFLs are located 0.5m above the 100 year ARI. There are no proposed buildings that will be exposed to the 100 year ARI. All fence-lines will be flood compatible.
Structural Soundness	The proposed development will be constructed on imported fill that will ensure all FFLs are located 0.5m above the 100 year ARI. As the proposed development requires the installation of drainage related flood mitigation measures, drainage components will be suitably designed to be structurally sound for all events.
Flood Affection	The preparation of the CRC-Flood Study (CH2M HILL, 2013a) Camellia Recycling Centre – Alternative Design #1 Flood Model technical memorandum satisfactorily address Lower Parramatta River Floodplain

	Risk Management Study (LFRMP) requirements for an Engineers Report. As demonstrated by the modelling the reports, the fill necessary for construction of the proposed development will have little effect on the temporary storage of floodwaters. Cumulative impacts are also investigated. There is some local minor increase in flood levels in the range of 0.02 to 0.10 m immediately in front of the Site at Grand Avenue as described in (CH2M HILL, 2015)
Car Parking & Driveway Access	Vehicle refuge above the PMF is not possible as the entire Camellia Peninsula is inundated by the PMF. There are no garages proposed, however it is noted that the CRC materials recycling building will be set at a FFL of RL 4.13 m AHD. Under normal operating conditions, only trucks would access have access to the building with FFL at 4.13 m AHD. During a major flood event (defined as flooding greater than the 10 year ARI), all on-Site vehicles will be directed to move inside the CRC which is constructed with FFL at 4.13m AHD i.e. 0.5m above the 100 year ARI. No additional special traffic signage or instructions is required to direct traffic around the Site during flood events. Generally the levels of all driveways are higher than RL 3.43m AHD (0.2 m less than 100 year ARI level of 3.63mAHD as required by Council's LFRMP) with the exception of the entrance to the Site with the exception of the Site entry. At the Site entry, vehicular traffic will be required to drive over a "berm" which will be constructed to a top level of RL 3.76mAHD. In the 100 year ARI water will spill over the "berm" into the Site. The maximum depth on the top of the berm in the 100 year ARI is 0.06m. It is noted that in the 100 year ARI, the car park at the front of the Site could potentially have flood depths where a vehicle may float (at a depth of 0.2m). To avoid a scenario with floating cars at the location of the car park, all vehicles must follow this FERP.
Evacuation	Reliable access is available for pedestrians to a level above the PMF (6.06 mAHD), with second floor FFL between 7.0 to 8.0mAHD. Vehicle refuge above the PMF is not possible as the entire Camellia Peninsula is inundated by the PMF. Further information on flood evacuation and refuge can be found in Section 2.5.
Management and Design	The Site FERP (this Plan) will be updated once development approval is granted.

2.2.2 NSW OEH Floodplain Risk Management Guidelines

The NSW Office of Environment and Heritage (OEH) has released a range of standard documents to support the implementation of the NSW Government's Flood Prone Land Policy through the development and implementation of FRM plans by local government through the FRM process as outlined in the Floodplain Development Manual (2005).

Flood Emergency Response Planning (ERP) – Classification of Communities

Of relevance to the CRC FRP is the guideline *Flood Emergency Response Planning (ERP) – Classification of Communities*.

The guideline recommends that the ERP classification of the floodplain be undertaken for the probable maximum flood (PMF) and 20 and 100 year average recurrence interval (ARI) events. Classifications are to be provided for each event with reference back to the event.

The Site is classified according to NSW OEH definitions as shown in Table 3.

Table 3 NSW OEH definitions – flood emergency response planning

ARI	NSW OEH classification	NSW OEH definition
20 year ARI – Fluvial (River) Flood	Area with Rising Road Accessible (RRA)	<i>Areas with Rising Road Access (RRA) are those areas where access roads rising steadily uphill and away from the rising floodwaters. The community cannot be completely isolated before inundation reaches its maximum extent, even in the PMF. Evacuation can take place by vehicle or on foot along the road as floodwater advances. People should not be trapped unless they delay their evacuation from their homes. For example people living in two storey homes may initially decide to stay but reconsider after water surrounds them.</i>
20 year ARI – Pluvial flood (overland flow)	High Flood Island (HFI)	<i>High Flood Island (HFI). The flood island includes enough land higher than the limit of flooding (i.e. above the PMF) to cope with the number of people in the area. During a flood event the area is surrounded by floodwater and property may be inundated.</i>
100 year ARI		<i>However, there is an opportunity for people to retreat to higher ground above the PMF within the island and therefore the direct risk to life is limited. The area will require resupply by boat or air if not evacuated before the road is cut. If it will not be possible to provide adequate support during the period of isolation, evacuation will have to take place before isolation occurs.</i>
PMF		

State Emergency Services Requirements from the Floodplain Risk Management Process

Also of relevance to the CRC FERP is the State Emergency Services Requirements from the Floodplain Risk Management Process which describes how the FRM process assists State Emergency Service (SES) in effective emergency response planning (ERP).

For HFI's, the key considerations are:

- External access cut, area becomes isolated;
- Transport infrastructure shutdown (railways/airports);
- Risk Of Flooding Of Key Public Utilities (Water/Sewage/Gas/Power) Starts; and
- Whole area flooded or max flood extents occur.

2.3 Flood levels

Fluvial (river) flooding

Fluvial flood waters may potentially impact the Site. Peak fluvial flood levels at the Site are:

- PMF RL 6.06m AHD
- 100 year ARI RL 3.63m AHD
- 20 year ARI RL 3.09m AHD

20 and 100 year ARI fluvial flows do not overtop the existing river bank and enter the site along the northern boundary (river frontage). There is an existing kerb at the edge of the carpark along the northern boundary in that is RL 3.70m AHD.

The 100 year ARI climate change water levels in 2050 will reach RL 3.63mAHD + 0.25m i.e. RL 3.88mAHD.

Pluvial flooding (overland flow)

Pluvial flooding (overland flow) may potentially impact the Site. The berm along the Grand Avenue street frontage (southern boundary) is proposed at RL 3.76m AHD¹.

Peak pluvial (overland flow) flood levels at the Site are:

- PMF Not modelled, in this event, the Site is likely to be flooded by fluvial flood flows.
- 100 year ARI RL 3.55m AHD
- 20 year ARI Site is not impacted

In the 100 year ARI² water conveyed eastward along Grand Avenue flowing in a direction towards the Parramatta River spills over the “berm” at the front of the Site and enters the Site. Flood waters that enter the Site from Grand Avenue are temporarily contained around the building footprint, before draining to the Parramatta River (via the Site drainage system). In this scenario, the Site effectively behaves as a shallow detention basin which reaches a maximum water level of RL 3.55m AHD. Similar to previous design runs described in CH2M (2013a), the “berm” located at the rear of the Site precludes river flood waters from entering the Site via the rear boundary.

In the 20 year ARI³, water conveyed eastward along Grand Avenue directed towards the Parramatta River does not spill over the “berm” (at the front of the Site) and enter the Site. River water levels do not reach a level high enough to enter the Site.

2.4 Flood warning time

Fluvial (river) flooding

The rate of rise of pluvial (river) flood waters in the PMF is 1.3 m/hour (0.022m/min) at the Site.

The rate of rise of pluvial (river) flood waters in the 100 year ARI is 0.9 m/hour (0.015 m/minute) at the Site.

Refer Figure 1 for more information.

¹ Refer to CH2M HILL (2015) *Camellia Recycling Centre – Alternative Design #1 Flood Model* for more information.

² Results based on the peak local catchment/subcatchment flow event.

³ Ibid.

Typically, SES, Police or other emergency services via radio, phone and other telecommunications would provide sufficient flood warning. However, if this does not occur, the following flood warning is possible.

Visual observation of floodwaters nearing the kerb on the northern boundary of the Site (rising floodwaters with:

- 0.5m depth until overtopping the kerb on the northern boundary (RL 3.7m AHD), would provide 33 minutes for vehicles and pedestrians to evacuate in the 100 year ARI and 22 minutes for evacuation in PMF); and
- 1.0m depth until overtopping the kerb on the northern boundary (RL 3.7m AHD), would provide 66 minutes for vehicles and pedestrians to evacuate in the 100 year ARI and 44 minutes for evacuation in PMF).

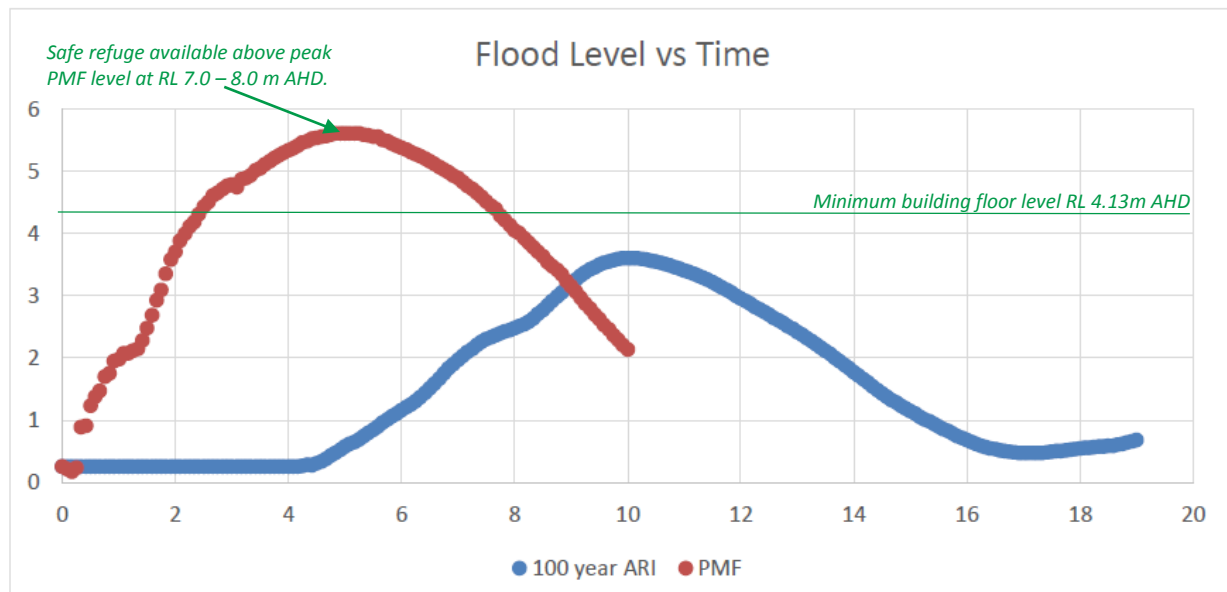


Figure 1 Flood level vs time: Critical 100 year ARI and PMF events

Pluvial flooding (overland flow)

There is limited warning time available for pluvial flooding (overland flow events). The critical flood duration is 25 minutes for all fluvial storms for all storm events up to the 100 year ARI. Warning time may therefore be less than 25 minutes. Flood depths will subside quickly following peaks to depths that would be trafficable with pedestrians and Vehicles.

Typically, SES, Police or other emergency services via radio, phone and other telecommunications would provide sufficient flood warning. Should this not be possible, any flood waters unable to be contained within the road kerb and guttering on Grand Avenue (approx. RL 3.09 – 3.41 m AHD at front of the Site), is considered warning for an imminent local pluvial (overland flow flood).

Close monitoring of predicted rainfall, radar rainfall and actual rainfall should be undertaken by monitoring nearby active BOM rainfall stations, pluviograph data and weather radar. If rainfall exceeds the 10 year ARI (refer Figure 2), preparations should be made to seek safe refuge.

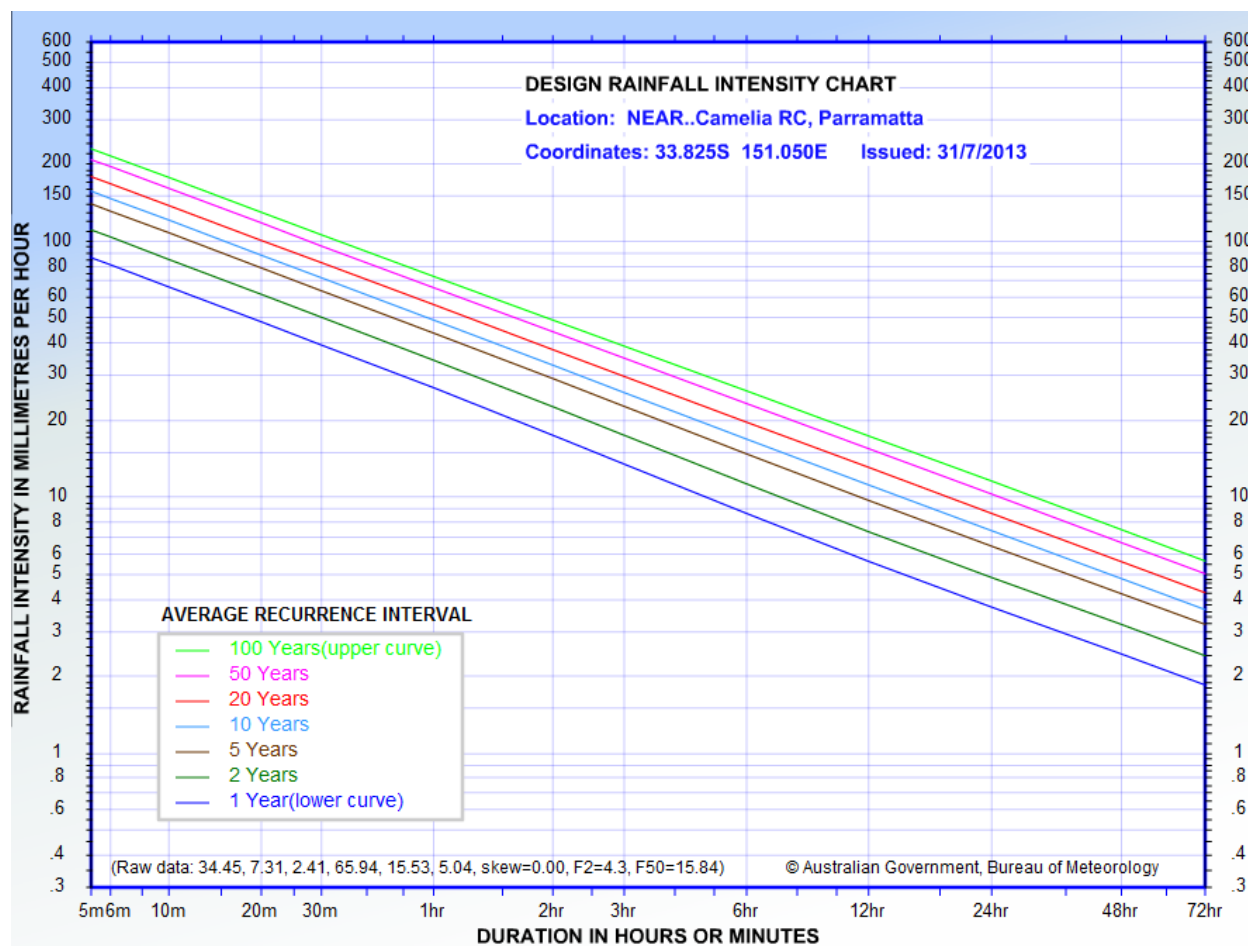


Figure 2 Design Rainfall IFD Curve at CRC Site

Box 1 How to determine if rainfall may exceed 10 year ARI

How to determine if rainfall may exceed 10 year ARI

To determine whether rainfall may result in a flood equal to a greater than the 10 year ARI, compare predicted / actual rainfall intensity with the time predicted / elapsed on Figure 2.

Example:

1. Actual rainfall is measured to be 25 mm in 10 minutes.
 - a. Rainfall intensity = $25 \text{ mm} / (10\text{min}/60\text{min}) = 150 \text{ mm/hr}$.
 - b. Estimated 10 year ARI rainfall intensity at time $t=10$ minutes from Figure 2 = 125 mm/hr
 - c. Actual rainfall intensity 150 mm/hr exceeds estimated 10 year ARI at time $t=10$ minutes
 - d. Action: seek refuge.
2. Actual rainfall is measured to be 40 mm over a period of 60 minutes.
 - a. Rainfall intensity = $40 \text{ mm} / 60\text{min} = 40 \text{ mm/hr}$.
 - b. Estimated 10 year ARI rainfall intensity at time $t=60$ minutes from Figure 2 = 50 mm/hr

- c. Actual rainfall intensity 40 mm/hr is less than estimated 10 year ARI at time t=60 minutes.
- d. Action: Continue to monitor rainfall, prepare staff for possible evacuation / refuge.
- 3. Predicted rainfall is 150 mm over 4 hours.
 - a. Rainfall intensity = 150 mm / 120 minutes = 37.5 mm/hr
 - b. Estimated 10 year ARI rainfall intensity at time t=4 hours from Figure 2 = 22.5 mm/hr
 - c. Actual rainfall intensity 37.5 mm/hr exceeds estimated 10 year ARI at time t=4 hours
 - d. Action: seek refuge.

More information on New South Wales weather warnings can be found at the Australian Government Bureau of Meteorology website.

- Current warnings <http://www.bom.gov.au/nsw/warnings/>
- Forecasts and observations <http://www.bom.gov.au/nsw/>

2.5 Flood Evacuation and refuge

2.5.1 Potential evacuation routes

If a flood warning is issued for the Parramatta River, sufficient warning time is available for fluvial (river) flooding to evacuate the Site, however, this does prevent staff from being placed at risk for any potential flooding at the Site.

When a major flood warning for Parramatta River is issued by BOM or the SES, staff should not enter the Site. Staff must be made aware that they are not to enter the Site if:

- A major flood warning has been issued for Parramatta River;
- Ponding of water on Grand Avenue reaching top of Kerb;
- Rainfall in excess of 10 year ARI is measured or predicted (refer Box 1); or
- They have been advised not to enter the Site.

If staff are unable to enter the Site, they should avoid the Camellia Peninsula. If they are already approaching the Site along Grand Avenue, then they should return to higher ground by following Grand Avenue to James Ruse Drive.

2.5.2 Refuge

As the Site has the potential to become a High Flood Island (HFI), adequate flood warning is available at the Site to enable refuge to a level above the PMF for pedestrians and above the 100 year ARI for vehicles. The decision to seek refuge would occur based on any of the following triggers:

- Recommendations made by SES, Police or other emergency services via radio, phone and other telecommunications;
- Visual observation of floodwaters nearing the kerb on the northern boundary of the Site (rising floodwaters with 0.5m depth until overtopping the northern curve, would provide 33 minutes for vehicles and pedestrians to evacuate in the 100 year ARI and 22 minutes for evacuation in PMF); and

- Water ponding in Grand Avenue (above road kerb and guttering) causing the Site to become isolated.

2.5.3 Evacuation timing

The time to peak before the onset of fluvial flooding is approximately 10 hours in the 100 year ARI and 5 hours in the PMF (for critical storm durations) – refer Figure 1. Although other duration events may also impact the Site, they would have additional evacuation timing available.

It is expected that warnings would be issued by the BOM in advance of rainfall causing major flooding, the ability to evacuate would be evaluated based on BOM warnings. If evacuation does not occur and there is visual observations of flood waters within 0.5m (depth) of the northern boundary (top of kerb level), then all staff should immediately seek refuge at the nominated location above the PMF.

For pluvial rainfall driven events, evacuation timing is more difficult to predict as a localised storm cell may result in brief flooding occurring for 25 min or less. If ponding in Grand Avenue is observed, staff should remain at the building floor level (RL 4.13 m AHD) in an area that will provide safe passage to refuge above the PMF level should river flood waters rise.

2.6 Suggested emergency response measures

Flood education and emergency response training will be undertaken with all Site staff.

It will be the Site owners' responsibility to:

- Identify and nominate flood wardens and staff responsible for relocating vehicles and equipment to the building floor (RL 4.13 m AHD) so that it is not damaged during a major flood.
- Conduct Flood awareness workshops for employees at regular 6 monthly intervals to allow for staff turnover.
- Formalise pathways for distributing flood intelligence during the onset of a major flood so that they can take advantage of the warning time that is available. This can occur through interpretation of Bureau of Meteorology Flood Bulletins and SES flood warnings.

3 Construction phase

This section of the FERP will be updated following planning approval, nomination of a Site contractor and once construction methodology is established.

3.1 Site coordination

During the construction phase, Veolia and the nominated contractor will hold project coordination meetings in addition to formal and informal consultation to arrange how evacuation would be coordinated during the construction phase – with an emphasis on evacuation and safe refuge when refuge above the PMF is not available.

Following Site planning approval, and nomination of a Site contractor, a project organisational chart will be prepared and inserted into this document when a detailed construction plan is developed and a contractor has been nominated to complete the work.

It is important that BOM and SES advance flood warnings are monitored, appropriately understood so that the Site project manager is engaged to make the appropriate decisions.

3.2 Responsible persons

Following Site planning approval, and nomination of a Site contractor, key personnel involved in Site coordination will be identified, with their role described in this plan.

3.3 Procedures for reducing impacts

Following Site planning approval, nomination of a Site contractor and once construction methodology is fully understood, considerations for flooding will be incorporated into Site risk assessments and the Site Construction Environmental Management Plan (where appropriate).

All construction flood related risks will be documented within this FERP, with mitigation and response measures identified.

3.4 Recovery Plan

A Site recovery will be finalised once planning approval is received and a contractor is nominated. Generally during recovery the following should be observed:

1. **Road and surface structural damage.** Water damage to the subsurface layer could lead to instability. Drive slowly and carefully. Advise the Site project manager of any potentially hazardous areas and do not enter these.
2. **Power.** Site power should remain off until a qualified electrician checks any inundated or water effected power boxes and electrical equipment.
3. **Impacted or damaged equipment.** Equipment should be moved to safe positions.
4. **Erosion and sedimentation.** River banks, stockpiles, trenches, excavations, walls, bunds, berms and any other structures or construction areas (whether temporary or permanent) should be checked to ensure contents are stable and are functioning as per the sediment and erosion control plan.
5. **Water and wastewater systems.** These should be checked for damage and serviced immediately if required. Portable toilets should be serviced.

6. **Flood report.** If a flood greater than the year ARI occurs, a flood report would be prepared by a suitably qualified person(s). Contents of the report should include:
- a. identification of the properties surrounding the Site and infrastructure (located on-Site) affected by flooding during the reportable event;
 - b. a comparison of the actual extent, level and duration of the flooding event against the impacts predicted in the flood study;
 - c. where the actual extent and level of flooding exceeds the predicted level with the consequent effect of adversely impacting on property, structures and infrastructure, identification of the measures to be implemented to reduce future impacts of flooding including the timing and responsibilities for implementation.
 - d. Flood mitigation measures would be developed in consultation with the Veolia and Parramatta City Council.

Further information on Site infrastructure that will require inspection during recovery can be found in the Construction Waste Management Plan and Erosion and Sediment Control Plan.

4 Operational Phase

This section of the FERP will be updated prior to construction completion.

4.1 Site coordination

If a flood event is anticipated or advance warning been given by the SES or BOM all vehicles parked at the front of the Site are to be relocated to designated areas inside the facility building with a floor level equal to greater than RL 4.13 m AHD (0.5m above the 100 year ARI).

It is important that BOM and SES advance flood warnings are monitored, appropriately understood so that the Site operations manager is engaged to make the appropriate decisions.

4.2 Responsible persons

Prior to Site operations commencing, key personnel involved in Site coordination will be identified, with their role described in this plan.

4.3 Procedures for reducing impacts

Prior to Site operations commencing, considerations for flooding will be incorporated into Site risk assessments and management plans.

All operational related flood related risks should be documented within this FERP, with mitigation and response measures identified.

Training and educational material will be provided for all employees outlining roles, responsibilities and what to do during a flood event.

4.4 Recovery Plan

A Site recovery will be finalised prior to Site operation.

Generally during recovery steps outlined in Section 3.4 should be adhered to. Steps will be refined prior to Site operation.

5 References

Australian Water Resources Council (1992) Floodplain Management in Australia, AWRC Management Series, No.21, Department of Primary Industries and Energy.

CH2M HILL (2015), Camellia Recycling Centre – Alternative Design #1 Flood Model, prepared for Veolia Environmental Services.

CH2M HILL (2013a), Camellia Recycling Centre – Flood Study, Revision 1, prepared for Veolia Environmental Services.

CH2M HILL (2013b), Camellia Recycling Centre – Response to Submissions Report, Prepared for Veolia Environmental Services, December 2013.

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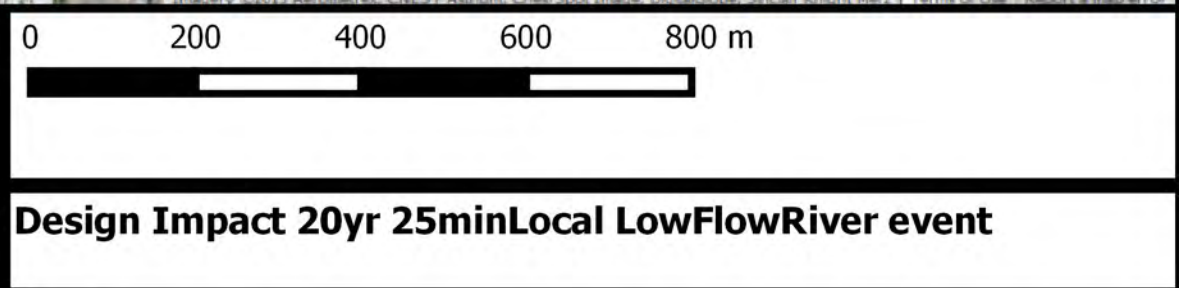
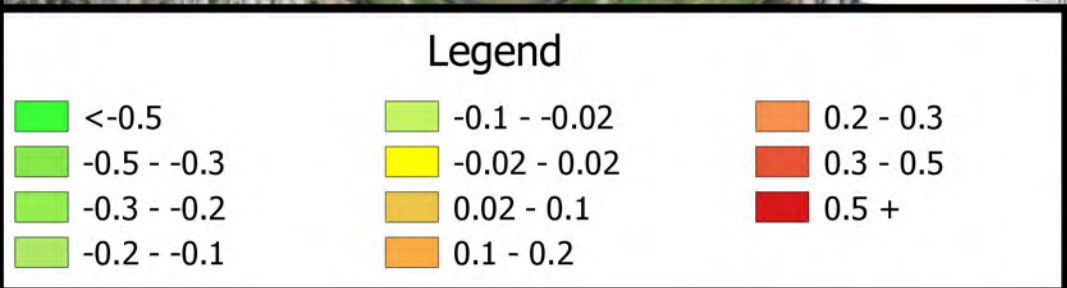
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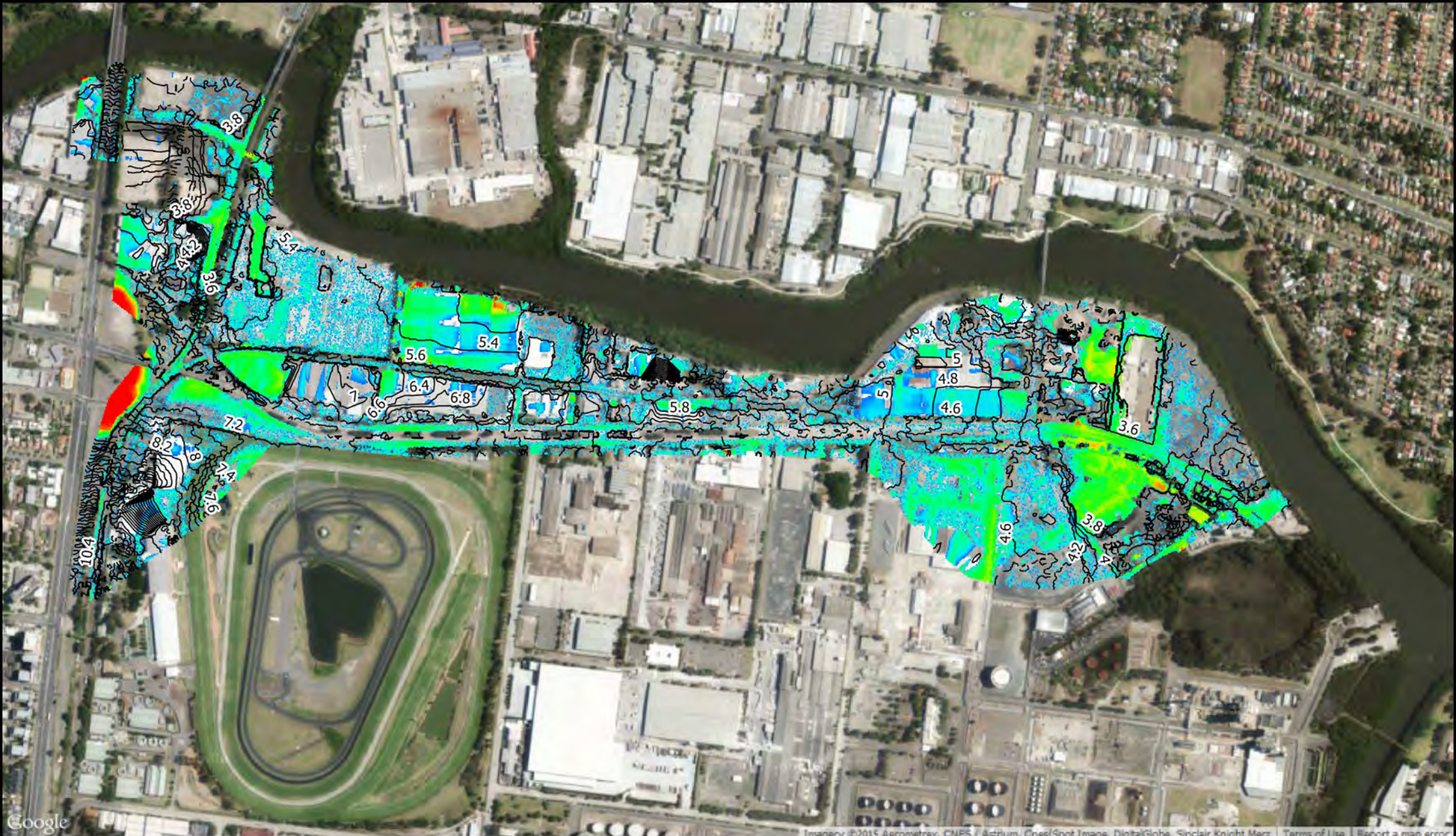
SKM (2005b), Lower Parramatta River: Floodplain Risk Management Study – Flood Study Review, Final, May 2005.

Appendix A

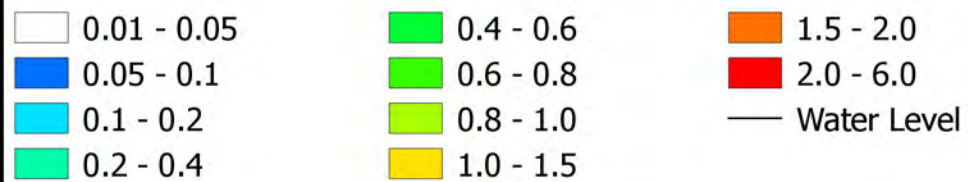
Flood Maps

20 year ARI





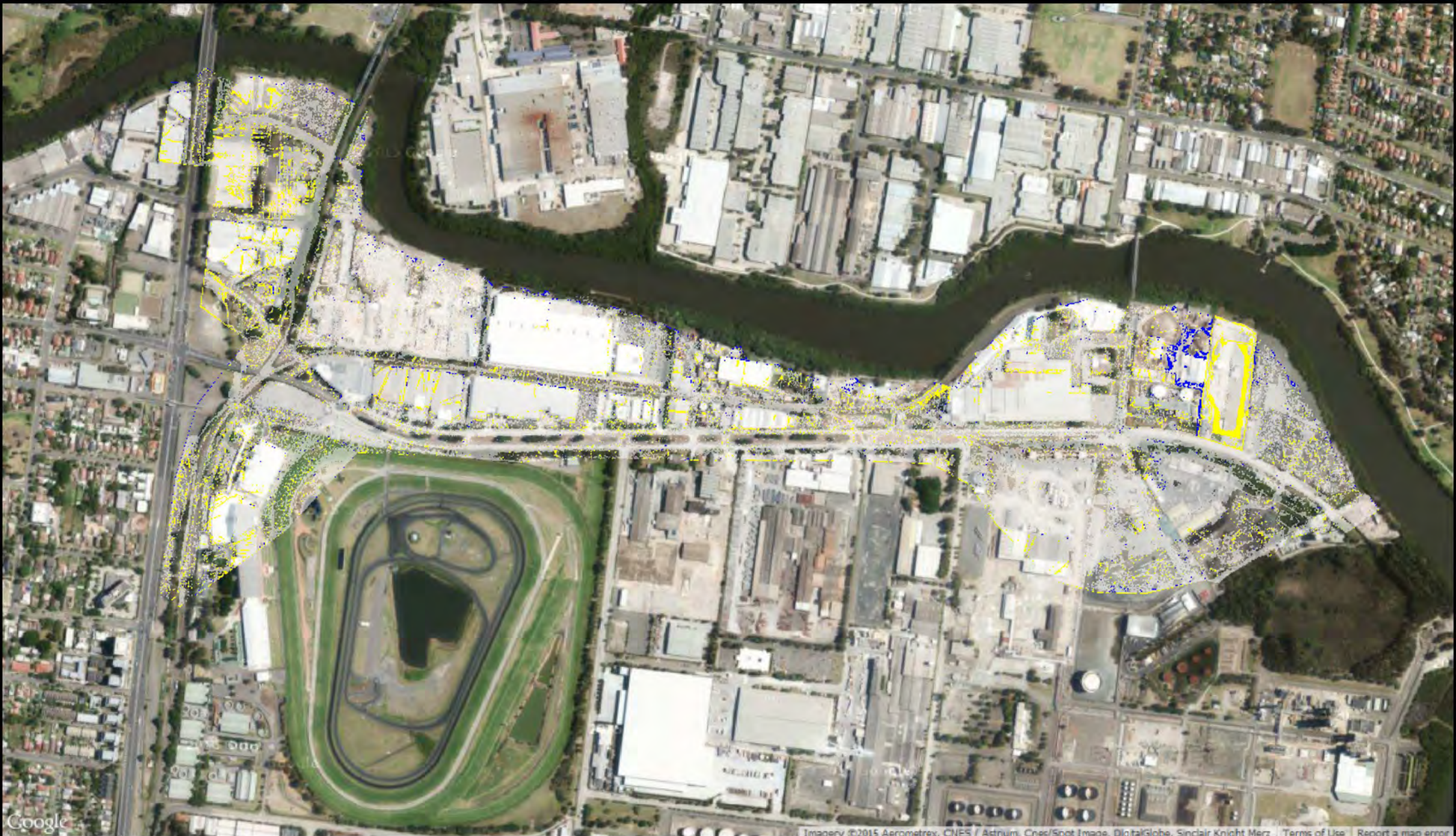
Legend



0 200 400 600 800 m



Maximum Depth (m) Design_20yr_25min_LowFlow



Legend

Once Wet now Dry

Once Dry now Wet

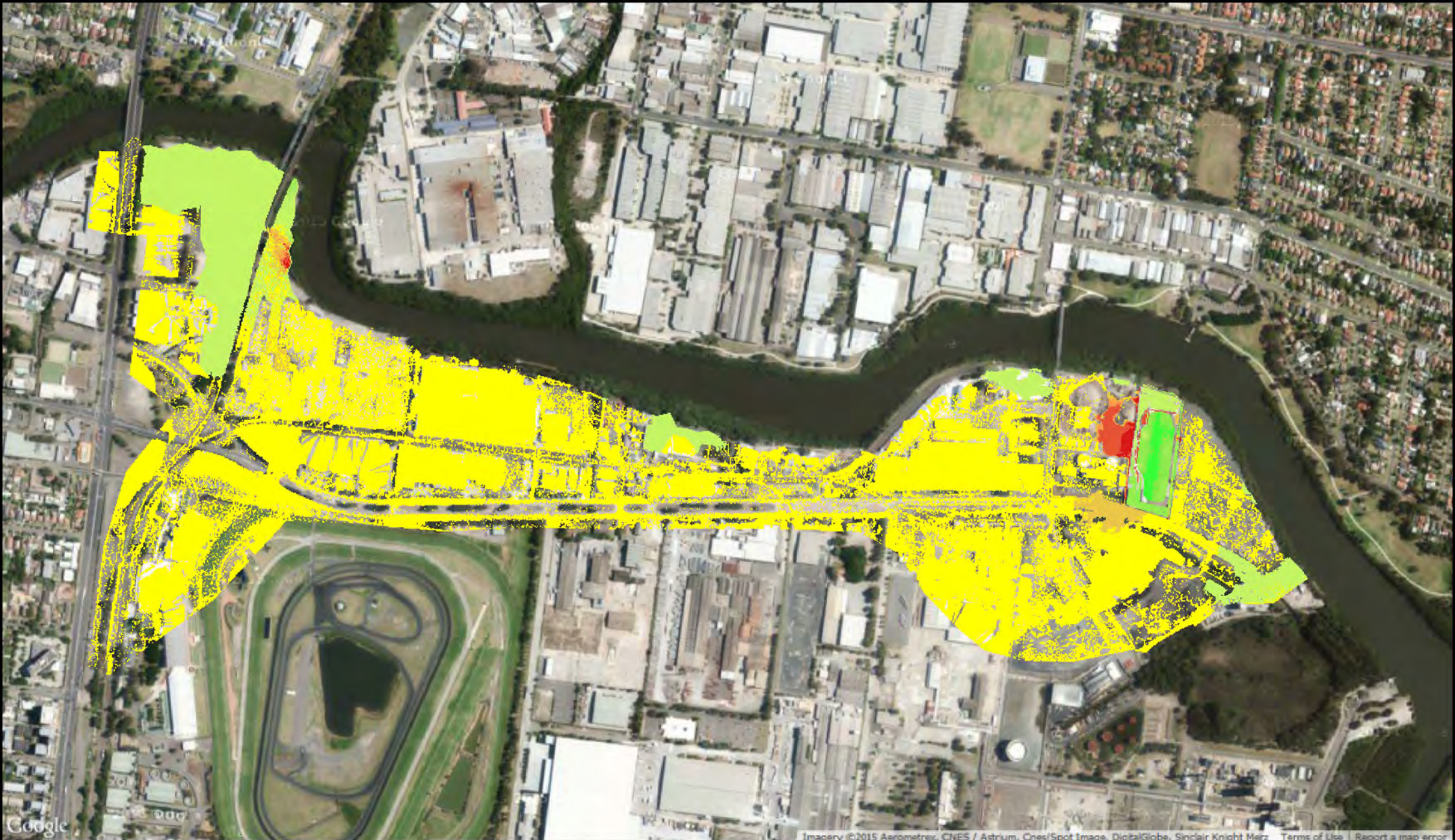
Extent of maximum basecase flooding

0 200 400 600 800 m

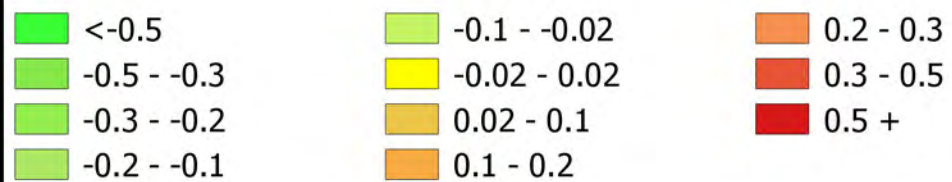


Comparison of Wet and Dry Cells
20yr_25min_LowFlow

100 year ARI

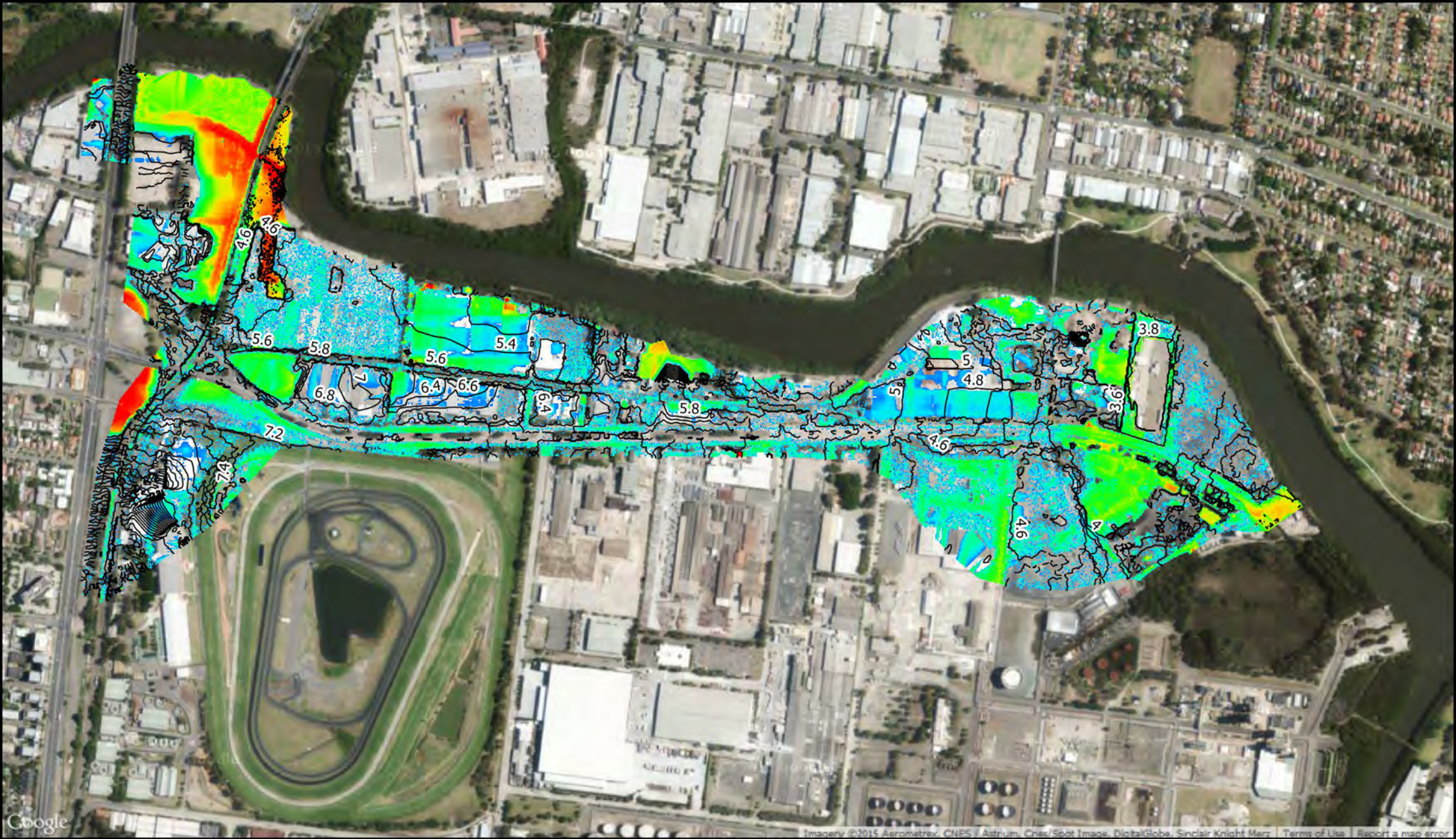


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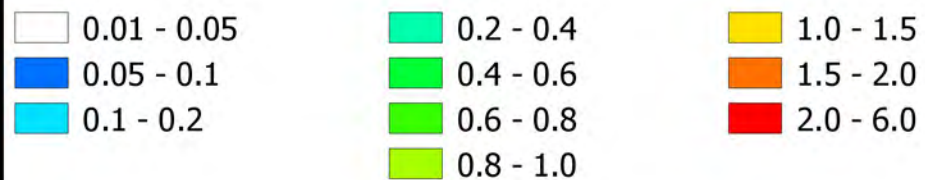


0 200 400 600 800 m

Design Impact 100yr 12hrLocal 9hrRiver event

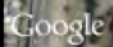


Legend

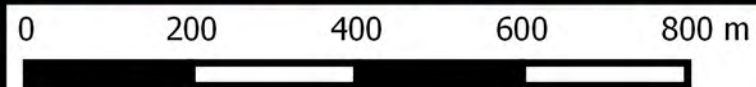
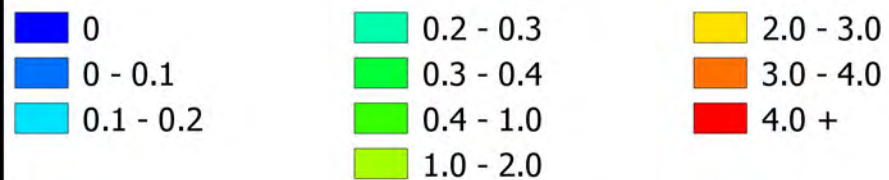


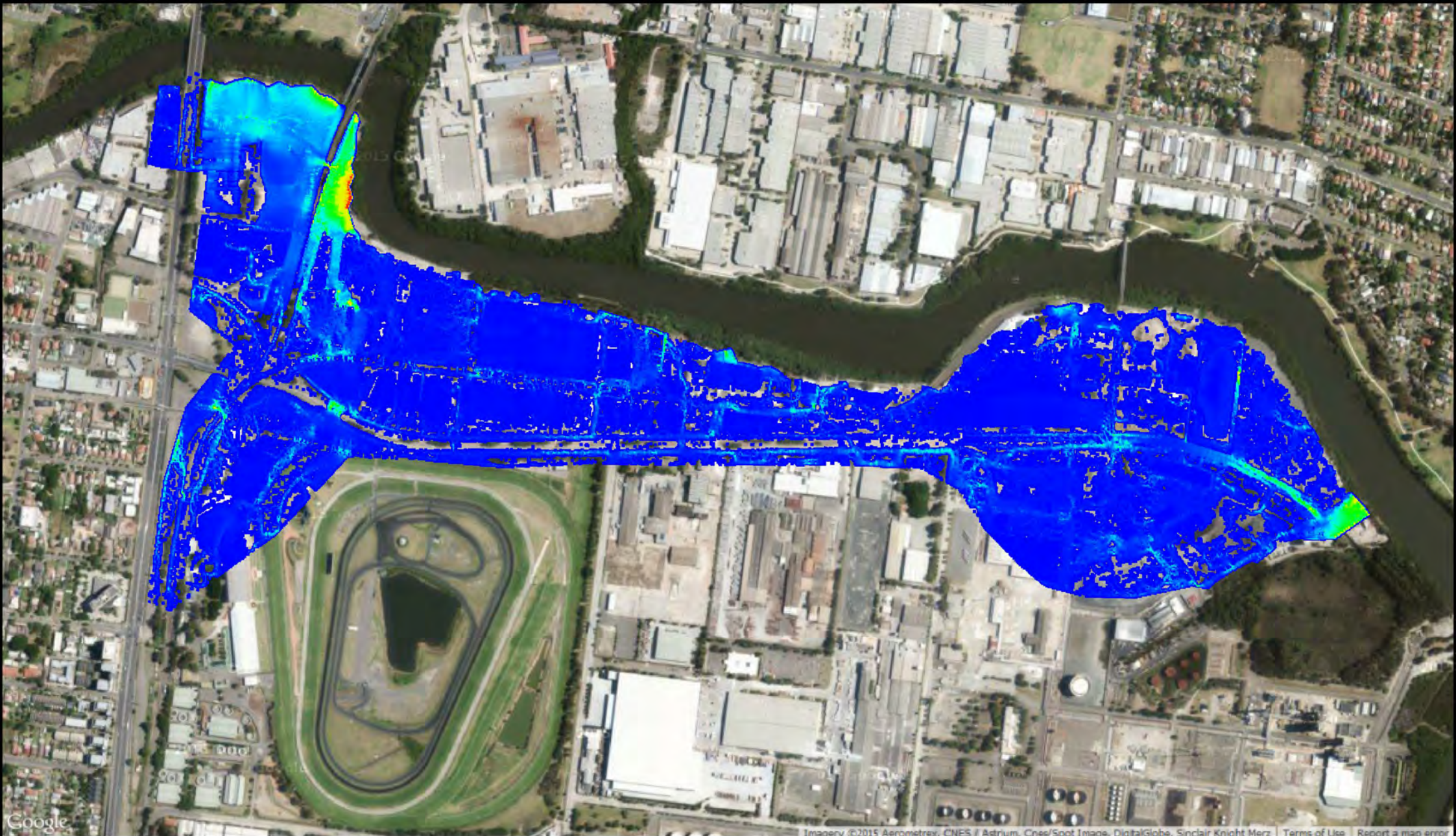
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Maximum Depth (m) Design_100yr_12hr_9hr

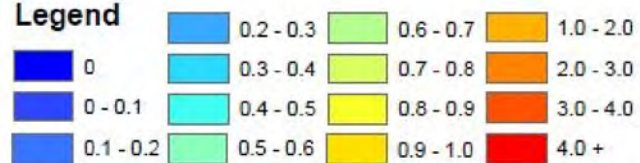
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Legend

**Hazard Design_100yr_12hr_9hr**

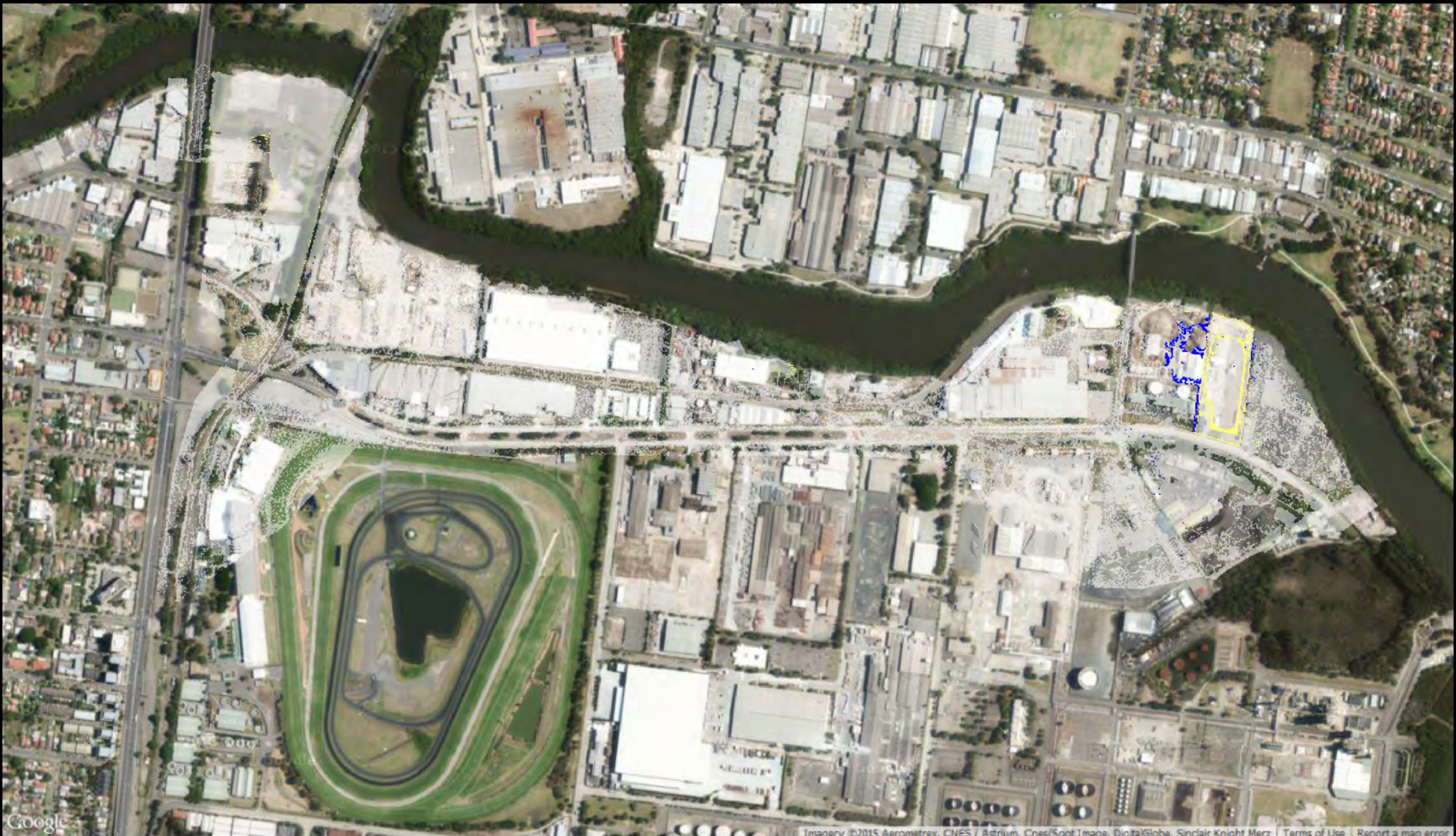


Legend



0 200 400 600 800 m

Maximum Velocity (m/s) Design_100yr_12hr_9hr



Legend

Once Wet now Dry

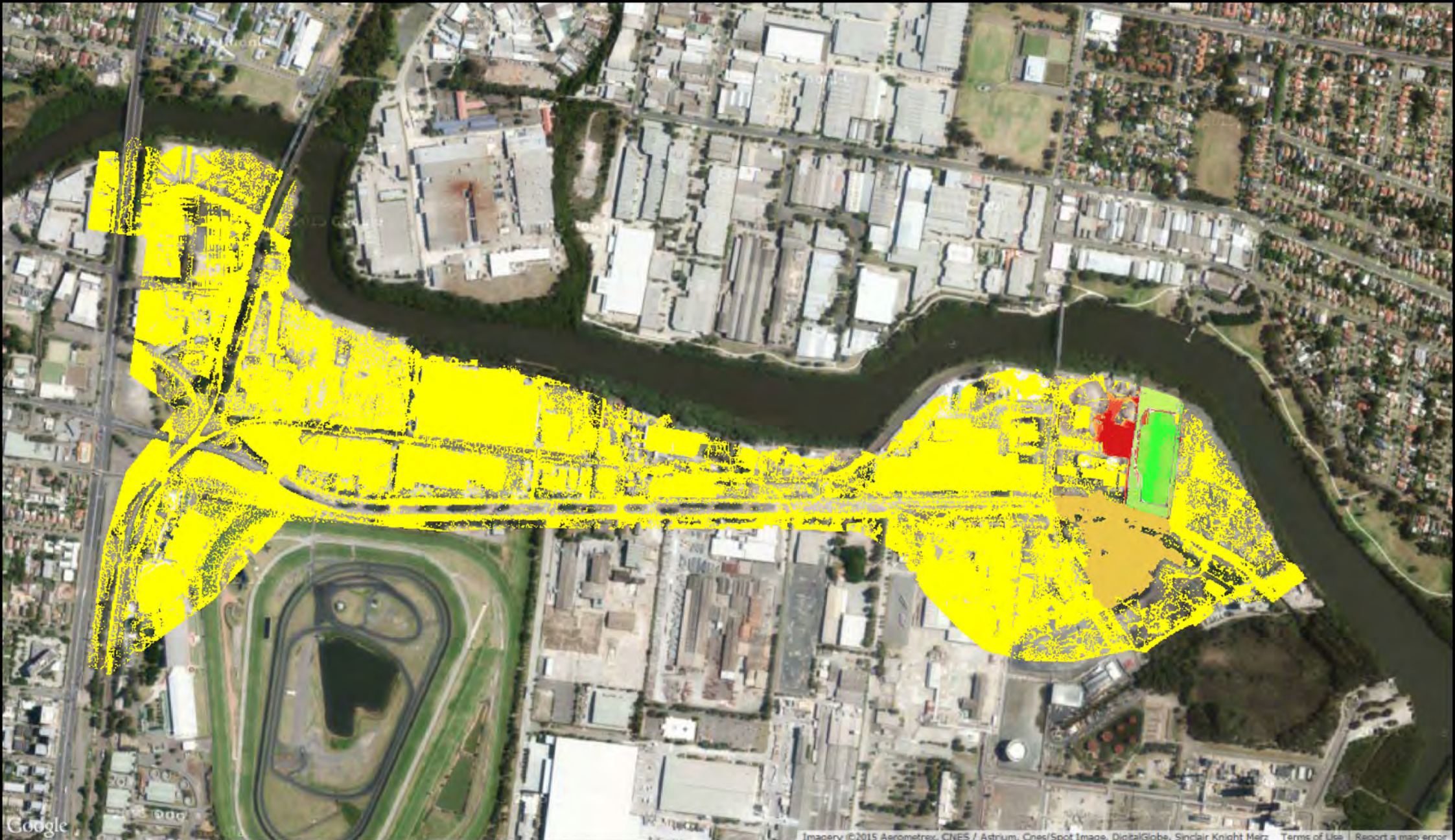
Once Dry now Wet

Extent of maximum basecase flooding

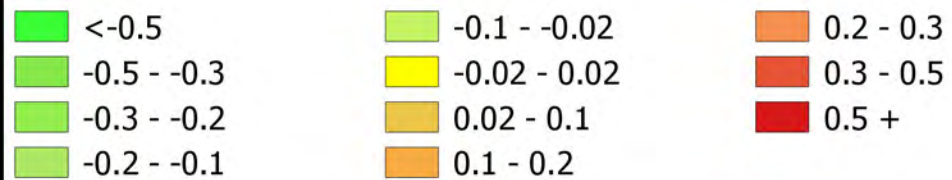
0 200 400 600 800 m



Comparison of Wet and Dry Cells
100yr_12hr_9hr



Legend



0 200 400 600 800 m

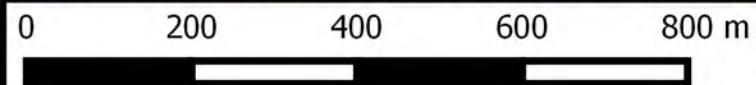
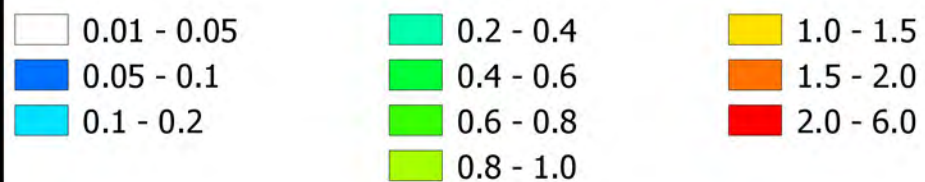


Design Impact 100yr 25minLocal LowFlowRiver event

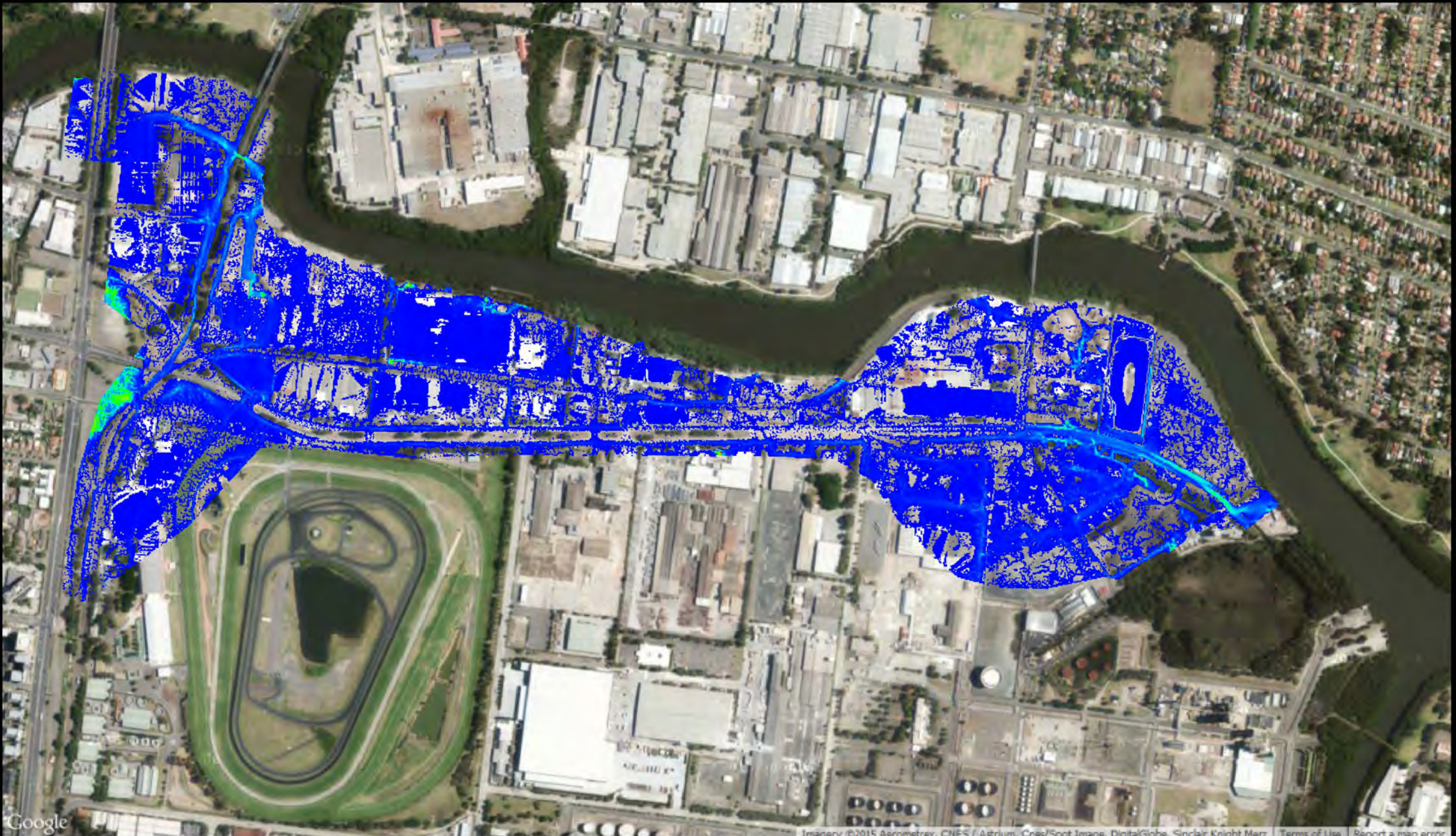


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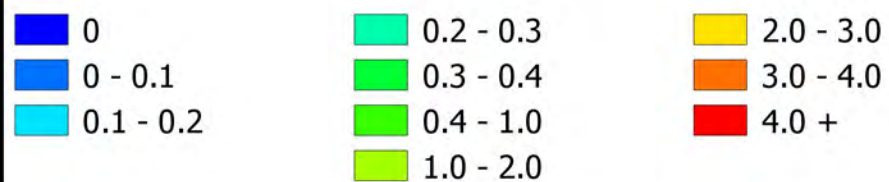
Legend



Maximum Depth (m) Design_100yr_25min_LowFlow	
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00
16	0.00
17	0.00
18	0.00
19	0.00
20	0.00
21	0.00
22	0.00
23	0.00
24	0.00
25	0.00
26	0.00
27	0.00
28	0.00
29	0.00
30	0.00
31	0.00
32	0.00
33	0.00
34	0.00
35	0.00
36	0.00
37	0.00
38	0.00
39	0.00
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41	0.00
42	0.00
43	0.00
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46	0.00
47	0.00
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84	0.00
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87	0.00
88	0.00
89	0.00
90	0.00
91	0.00
92	0.00
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95	0.00
96	0.00
97	0.00
98	0.00
99	0.00
100	0.00

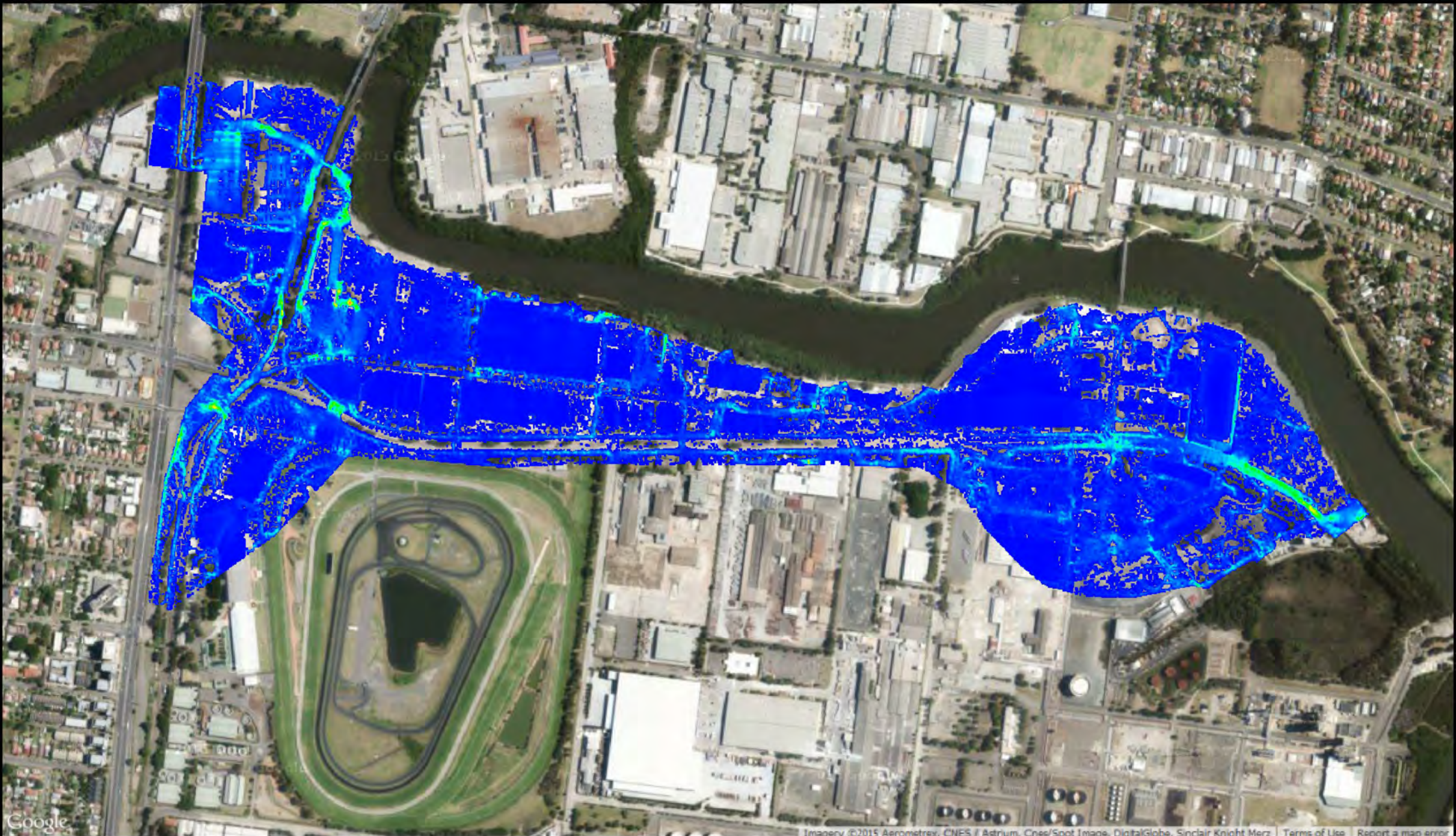


Legend

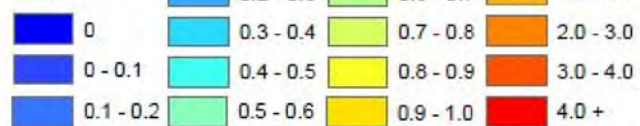


0 200 400 600 800 m

Hazard Design_100yr_25min_LowFlow

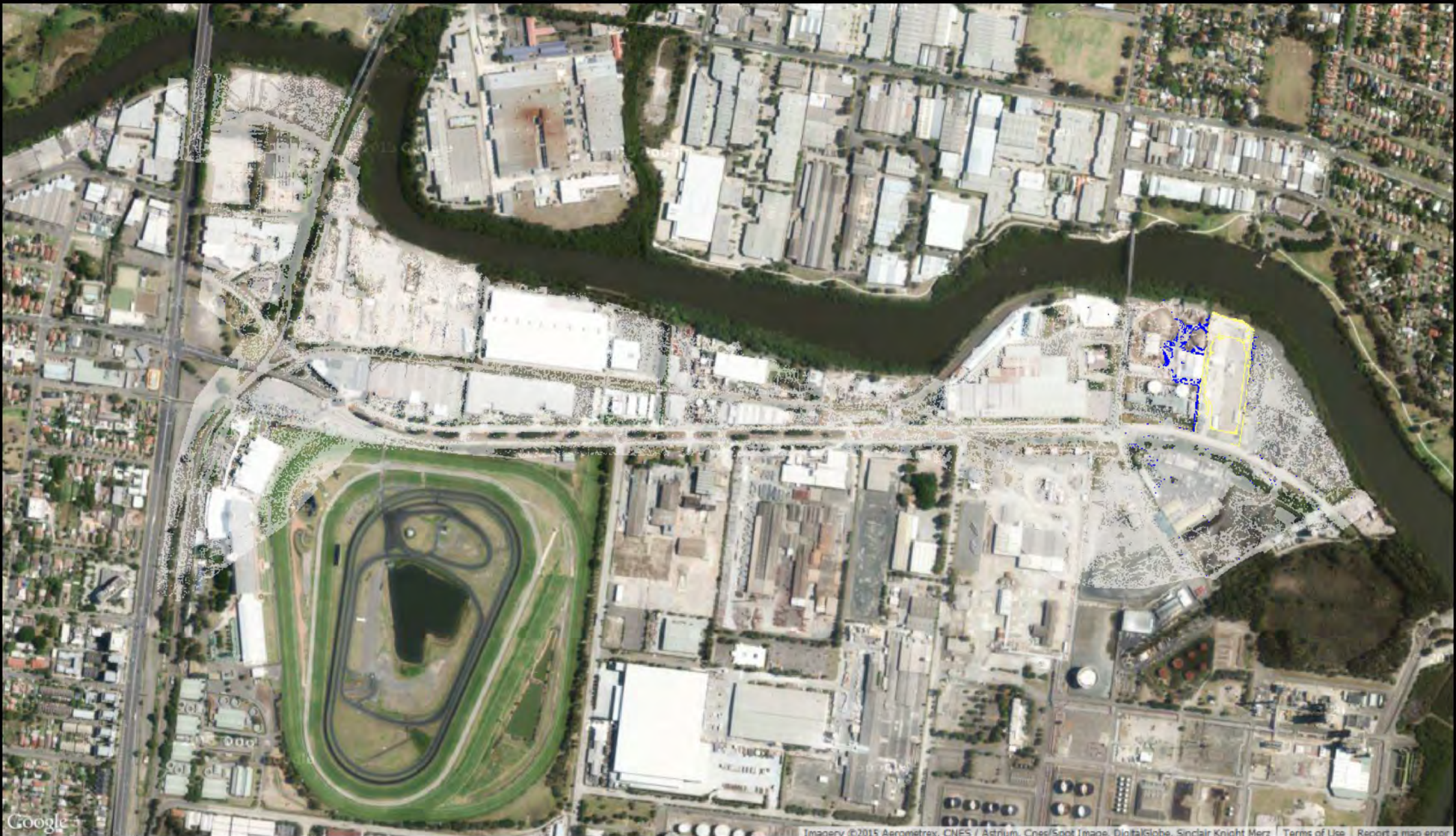


Legend



0 200 400 600 800 m

Maximum Velocity (m/s) Design_100yr_25min_LowFlow



Legend

Once Wet now Dry

Once Dry now Wet

Extent of maximum basecase flooding

0 200 400 600 800 m



Comparison of Wet and Dry Cells
100yr_25min_LowFlow