



7 Stormwater harvesting and reuse

An existing recycled water reticulation network within the Whyalla city area currently provides recycled water to a variety of users. The scheme was established in 2005 when a second waste water treatment plant (WWTP), incorporating a reuse component was commissioned. Decanted treated wastewater from the second plant is discharged into two lined balancing storage basins. The Golf Club purchases the water and pumps it from the Racecourse Road treatment plant to a dam near the intersection of McBryde Terrace and Lincoln Highway.

In 2011, Council received funding from the Commonwealth as part of the Water for the Future Strategy to construct a reclaimed water scheme to provide up to 350 ML/year for irrigation of parks, reserves and median strips. A prudential review of the scheme (Mc Donald 2011) concluded that the use of reclaimed water would lead to improved amenity value within the city. The financial analysis determined that the cost of the recycled water would be significantly less than the cost of using mains water. Construction of **the scheme would also reduce Council's reliance on water from the River Murray.**

The recycled water network was constructed in 2012 by Council, supplying Class B recycled water to a range of end users throughout the city. As of 2016, 25 Council and non-Council sites were connected to the network, with an additional nine sites identified for future connection. Water usage data provided by Council suggests that the total annual demand for recycled water is estimated to be 331 ML. The alignment of the distribution system and the sites that currently use the recycled water are shown on Figure 7.1.

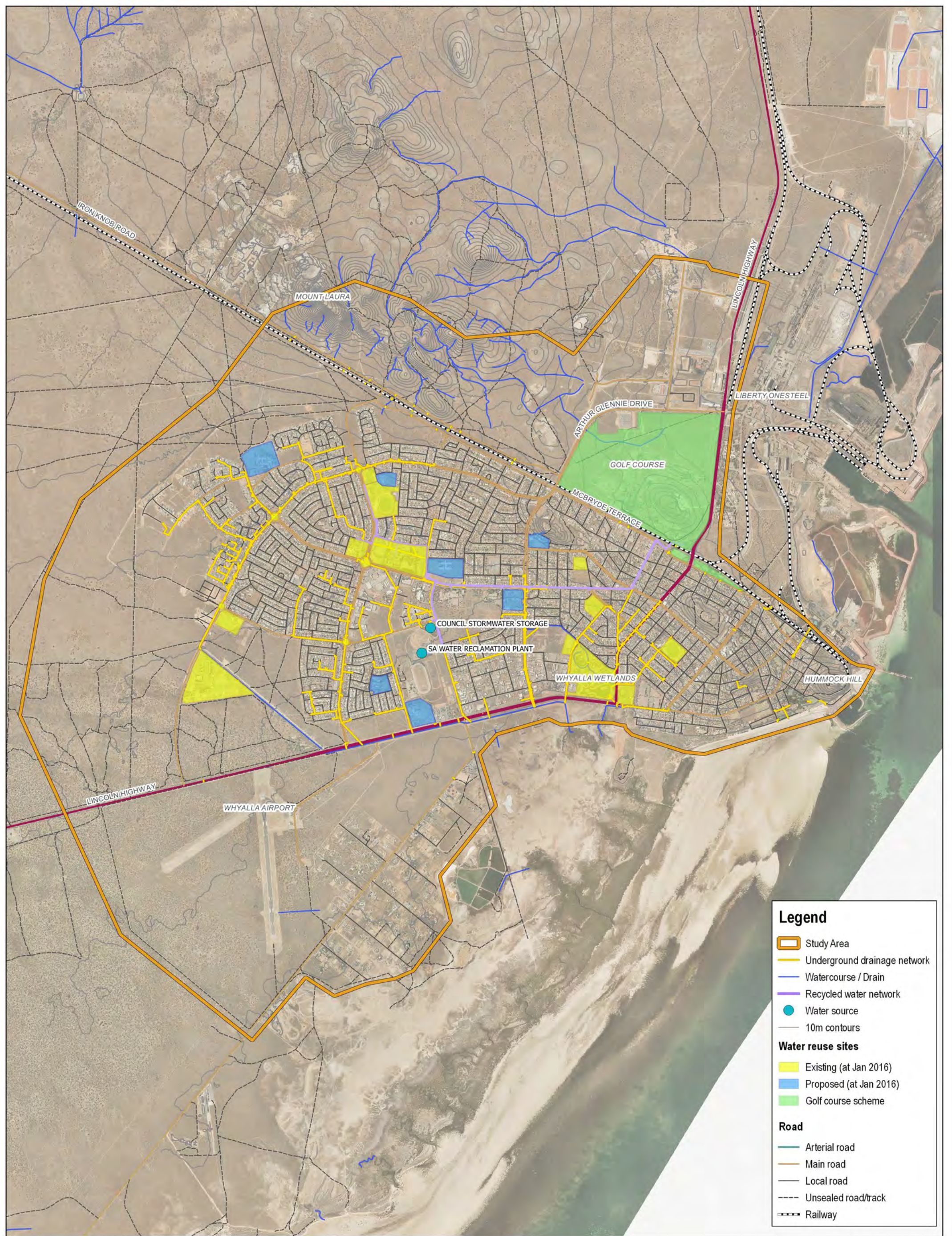
There is a small water storage located on land to the north east of the racecourse which receives some stormwater discharges. It is understood that Council uses water from this storage to fill up water carriers for the purpose of watering street trees.

As part of the SMP development, opportunities for development of a stormwater harvesting and reuse scheme have been assessed. The harvested stormwater could be used as an alternative supply to the treated effluent, thereby reducing the annual volume of water that Council is required to purchase from SA Water.

The stated objectives relating to stormwater harvesting and reuse are summarised in Table 7.1.

Table 7.1 SMP objectives relating to stormwater reuse

Objective 3	Goal
Maximise the economic use of stormwater runoff for beneficial purposes	Maximise harvesting and reuse of stormwater runoff within the city, where economically feasible. Seek opportunities to augment the existing reclaimed water reuse scheme with harvested stormwater.



Legend

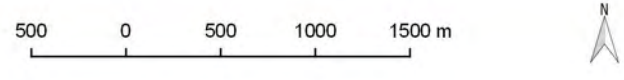
- Study Area
- Underground drainage network
- Watercourse / Drain
- Recycled water network
- Water source
- 10m contours

Water reuse sites

- Existing (at Jan 2016)
- Proposed (at Jan 2016)
- Golf course scheme

Road

- Arterial road
- Main road
- Local road
- Unsealed road/track
- Railway



CITY OF WHYALLA

**WHYALLA STORMWATER MANAGEMENT PLAN
EXISTING WATER REUSE SCHEME**



Job Number: 20160064
 Filename: 20160064GQ033A
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Data Acknowledgement:
 Aerial photography supplied by Council, 2013
 Digital Elevation Model supplied by Council, 2013
 Base data from DataSA

Figure 7.1



7.1 Opportunities for new schemes

7.1.1 Identification of potential locations

Stormwater harvesting and reuse requires relatively large areas of open space for the treatment and storage of the harvested water. Ideally the storage space is located in close proximity to the water supply (i.e. near a trunk drainage system).

To assess the potential for stormwater harvesting and reuse within the city, the potential to combine a water harvesting and reuse scheme with the proposed detention basin within the area referred to as the **'future education precinct' on the** eastern side of Racecourse Road was investigated. This could operate as a standalone system, or be connected into the existing basin on the opposite side of Racecourse Road which would act as the balancing storage.

Any storage requirements for the stormwater harvesting scheme would be in addition to the detention volume requirements for flood mitigation purposes.

A second location for a potential scheme, which was identified based on the presence of open space in close proximity to a stormwater supply is the open space on the northern side of the Lincoln Highway between McDouall Stuart Avenue and Heurich Terrace.

The yields that could be harvested at the existing water storage (assumed to have a volume of 15 ML) to the north east of the racecourse have also been assessed. The potential yield sites are shown on Figure 7.2.

7.1.2 Estimate of harvestable yields

The MUSIC model was used to undertake a high-level assessment of the potential yields that could be harvested at each site. It was assumed that only one water harvesting site would be established, with the existing non-potable reticulation network used to distribute the water to the demand sites. The annual demand for each site was therefore set at 330 ML (the estimated demand of the existing sites). Reflecting the fact that the non-potable water is largely used for irrigation, the pattern of demand was defined as potential evapotranspiration (PET) – rainfall. This means that when daily PET exceeds rainfall, the model assumes that reuse will occur.

The modelling assumes that the storages are lined, with no infiltration losses. A summary of the harvestable yields is provided in Table 7.2.

Table 7.2 Summary of harvestable yields

	Russell Street / existing basin	Lincoln Highway
Storage volume (assumed)	15-20 ML	20 ML
High flow bypass (m ³ /s)	1.0	1.0
Total flows upstream of basin	139 ML	211 ML
Harvestable yield	84 ML	105 ML

7.1.3 Further investigations

The assessment of yields is very high level and is based on the assumption that all of the water within the upstream catchment can be diverted to the basin. The level of water quality improvement that can be obtained, and the suitability of the water for irrigation purposes has not been confirmed.



In addition to testing the above assumptions, the following investigations are recommended prior to progressing the design of the schemes further:

- The likely presence of groundwater
- The ability to feed the water into the existing non-potable reticulation system (focussing on technical and regulatory requirements)
- The actual patterns of demand for the water
- The impacts of climate change on harvestable yields.

7.2 Reuse strategy

The City of Whyalla currently purchases reclaimed water from SA Water. Based on information provided by Council, the total annual demands for the reclaimed water are in the order of 330 kL/year.

Preliminary investigations have identified that incorporation of a stormwater harvesting and reuse scheme within one of the detention basins proposed for flood mitigation could yield in the order of 80 ML/year on average. It is estimated that up to a further 105 ML/year could be harvested from a site adjacent to the Lincoln Highway near the western extents of the southern drainage channel.

The yield modelling indicates that it is not possible to meet the current demands for non-potable water using stormwater alone. It may be possible to use stormwater to meet a portion of the demands, thereby reducing the volumes required to be purchased from SA Water.

The yield modelling presented in this report is very high level. Actual harvestable yields will be dependent on the configuration of the harvesting site (bypass flows, evaporation) and patterns of demand. Prior to committing to the development of a large-scale stormwater harvesting scheme, more detailed modelling is recommended to provide a greater level of confidence in the harvestable yields. Additional investigations are also recommended to understand the legislative requirements associated with injecting stormwater into the existing reclaimed water network.

The reclaimed water supplied by SA Water represents a secure supply of relatively low cost (compared to mains water) water. Stormwater, on the other hand, is an unreliable source and with projection of drier future climates, the volumes available for harvest are likely to decrease further. There will be capital costs associated with setting up the stormwater harvesting and reuse scheme.

Given that the reclaimed water can currently meet the demands for non-potable water within the City of Whyalla it is considered that the development of a large-scale stormwater harvesting and reuse scheme should be a low priority and is unlikely to be economically viable. It should only be considered should the demands for non-potable water increase to the point at which they exceed the volume of water able to be supplied by SA Water.

7.2.1 Increase volumes supplied by the existing Council basin

It is recommended, that should a flood mitigation basin be constructed on the eastern side of Racecourse Road, a permanent storage should be included. This storage could be used to supplement the water harvested from the existing basin on the western side of the road. The additional capital costs (on top of those required for the construction of the flood mitigation component of works) would be relatively small. A small low flow pump could be used to transfer the water to the existing storage as required.

These works are only recommended if Council determines that the demand for water from the existing basin exceeds the supply of the basin. Further investigations, including detailed yield and demand modelling and an estimate of capital and operating costs are recommended to assess the economic feasibility of the scheme.



7.2.2 Rainwater tanks

The development of a large-scale stormwater harvesting and reuse scheme within the City of Whyalla should only be considered if the demands for non-potable water exceed the supply volumes of the SA Water reclaimed water.

Rainwater tanks are the recommended strategy to encourage the harvesting and reuse of stormwater runoff within the city.

In areas of new development Council should encourage (potentially via financial subsidisation) the installation of rainwater tanks which, at a minimum, are plumbed into the hot water service and toilet. The volumes of reuse achieved will be dependent on:

- the area of roof plumbed into the rainwater tank
- the size of the tank
- daily water demands for rain water.

Assuming an average daily demand of 200 L, a 2 kL tank and a connected roof area of 150 m², it is estimated that each tank could supply 19 kL per year. Larger roof areas, larger tank sizes and a greater level of reuse would increase the reuse volume.

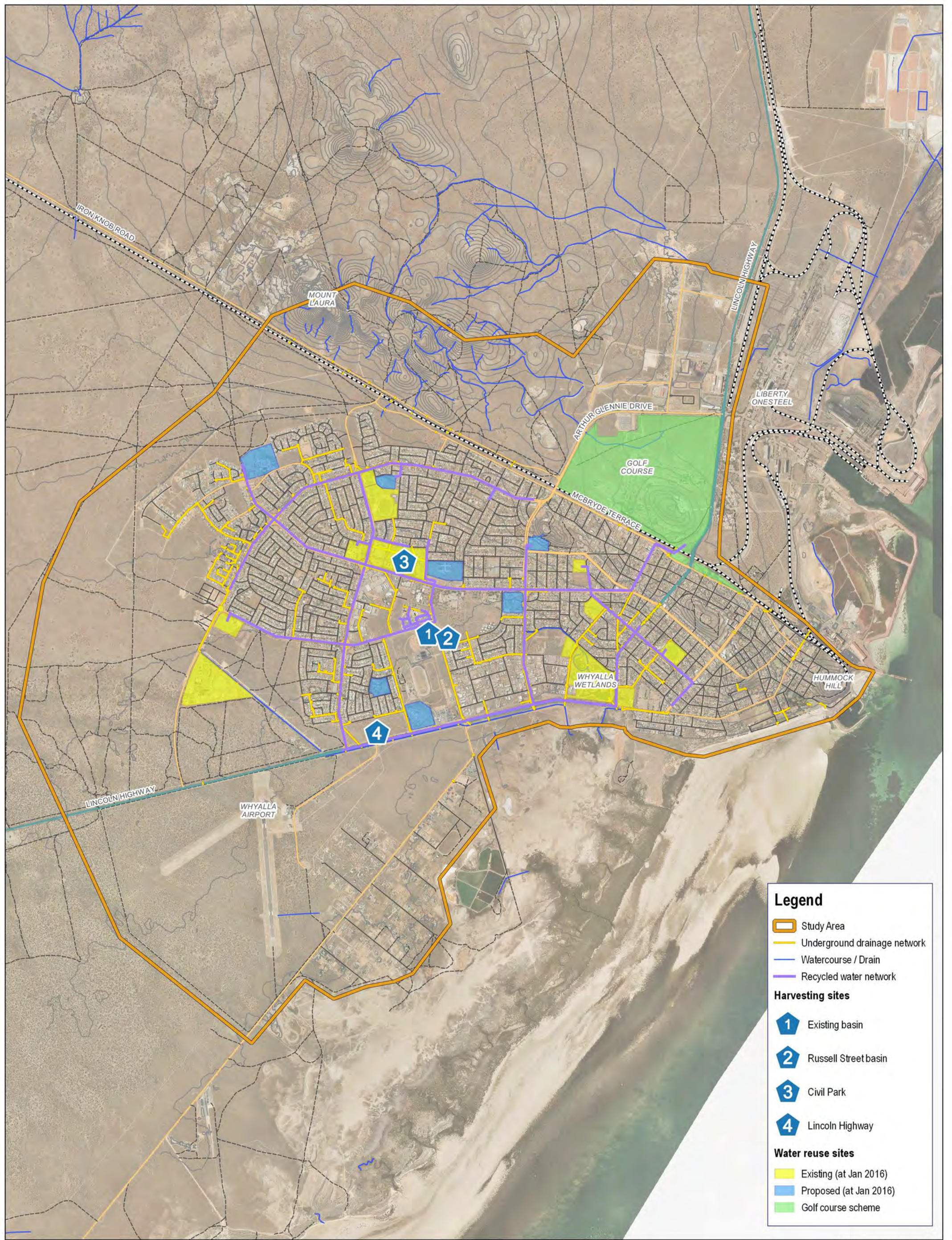
A detailed economic analysis is recommended to assess the level of subsidy provided by Council to encourage the installation of rainwater tanks.

7.3 Summary of water harvesting and reuse strategy

It is recommended that Council undertake an economic assessment of the provision of subsidies for the installation of large rainwater tanks to encourage the harvesting and reuse of water at an allotment scale.

Should the flood mitigation basin on the eastern side of Racecourse Road be constructed, it is recommended that Council undertake detailed yield and economic assessment to assess the economic feasibility of using water from this basin to supplement the supply of water in the existing basin on the western side of Racecourse Road.

Consideration of a large-scale stormwater harvesting and reuse scheme should only be considered if the demands for non-potable water exceed the volumes of reclaimed water able to be supplied by SA Water.



Legend

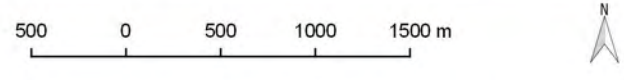
- Study Area
- Underground drainage network
- Watercourse / Drain
- Recycled water network

Harvesting sites

- 1 Existing basin
- 2 Russell Street basin
- 3 Civil Park
- 4 Lincoln Highway

Water reuse sites

- Existing (at Jan 2016)
- Proposed (at Jan 2016)
- Golf course scheme



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**WHYALLA STORMWATER MANAGEMENT PLAN
 POTENTIAL STORMWATER HARVESTING SITES**

Figure 7.2



8 Consultation summary

8.1 Key project stakeholders

The project was undertaken with the involvement of the following stakeholders:

- City of Whyalla
- Natural Resources Eyre Peninsula (EP NRM)
- Stormwater Management Authority – represented until January 2018 in a technical review capacity by the Department of Planning, Transport and Infrastructure.

No formal steering committee was formed for this project, instead a review of deliverables was undertaken by each stakeholder group upon draft completion. Comments received were incorporated into final deliverables.

Collaboration was maintained with the City of Whyalla throughout the project.

8.2 Community engagement

The City of Whyalla created a page on the Council website in 2017 containing a brief summary of the Stormwater Management Planning process, its aims and how members of the community can provide feedback.

<https://www.whyalla.sa.gov.au/page.aspx?u=1014&t=uList&ulistId=0&c=55619>

The Draft SMP was released for public feedback for a three-week period in March 2019 via Council's website. Details of this consultation are included in the following section.

8.3 Consultation on the draft plan

Formal review and consultation on the draft SMP was undertaken between February and May 2019. This included:

- Council consultation:
 - Formal briefing of Council elected members and Chief Executive Officer in February 2019
 - Community Consultation – three-week period in March 2019.
- SMA review and feedback – comments received May 2019
- EPNRM review and feedback – comments received May 2019.

The outcomes of the consultation and review process are summarised below.

8.3.1 Council consultation

Following submission of the Draft SMP Document to Council, EPNRM and the SMA for formal review in February 2019, a copy of the Stormwater Management Plan was uploaded to Council's **website along** with a link to a survey form inviting feedback.

The community survey invited the following feedback:

1. Which of the following best describes your interest in the Whyalla Stormwater Management Plan?
Local Resident
 - Interest or experience of flooding
 - Interest in local environment
 - Interest in improving water quality
 - Interest in water conservation and/or stormwater harvesting and reuse
 - other?
2. The draft SMP proposes a range of measures to improve flood management, including detention basins, upgrade and extension of an existing levee bank, and upgrades to drainage systems. The



draft SMP also presents recommended priorities for Whyalla with preliminary estimated costing to aid in project selection and planning. Do you support the proposed measures to provide better flood protection and manage stormwater as shown in Figure 5.1 of the Consultation Summary Report? Please explain your response.

3. Do you have any further suggestions regarding the draft SMP?
4. To help us understand who participated in the consultation please leave the following details: Street Name; Suburb.

A total of 22 responses were received via the online survey, with a further four hard copy responses received. Figure 8.1 shows the response to Question 1, **indicating most people's primary interest in the SMP is as a local resident (19 responses)**. The next most popular answer related to stormwater harvesting and reuse (9 responses), followed closely by an interest or experience of flooding (8 responses).

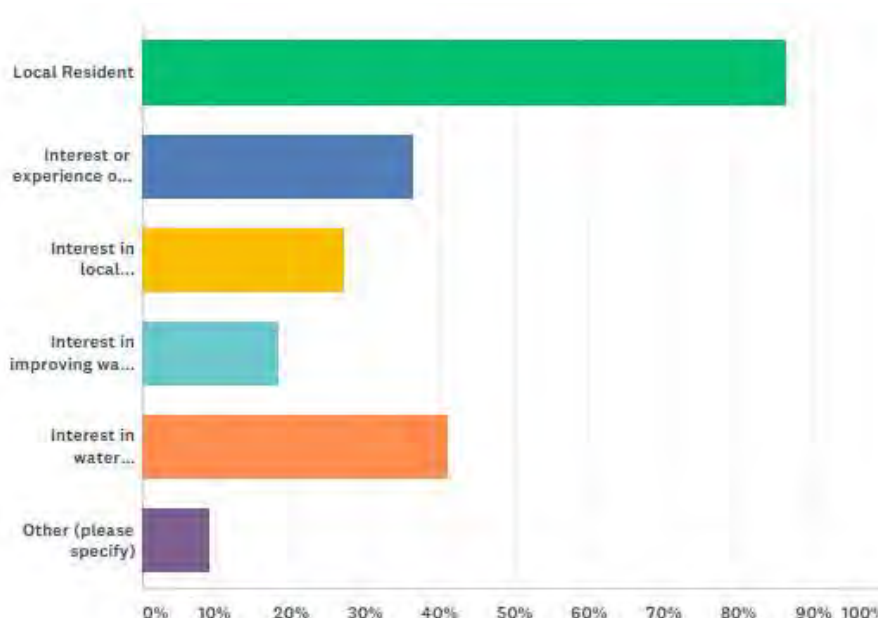


Figure 8.1 Community survey results – Q1 Community Interest in the SMP

The results of the community survey are included in Appendix C. Eighty five percent (85%) of respondents supported the measures proposed by the Draft SMP.

Comments were varied, with a number of responses related to localised stormwater flooding issues not covered by this plan. Other notable responses related to:

- Opportunities for stormwater harvesting and reuse
- Flooding risk from external catchments
- Capacity issues and lack of maintenance of the airport drain.

The survey process was concluded with a media release on 3 April 2019 summarising the outcomes of the consultation. This is also included within Appendix C.

Following briefing of elected members, the Council resolved to endorse the Draft SMP. No additional, formal feedback was provided by Council.



8.3.2 SMA and EPNRM review

Comments on the Draft SMP provided by the Stormwater Management Authority and Natural Resources Eyre Peninsula have been addressed in the preparation of the final report.

Feedback provided by EPNRM related primarily to concerns about the long-term health of the samphire flats and saltmarsh communities which currently provide a buffer between stormwater outfalls and the Spencer Gulf. It was recommended that further studies be conducted into the impact of continued stormwater discharges into this area, along with a range of other hydrological and ecological studies to ascertain any environmental effects of the proposed works such as the levee extension and new outfall channel.



9 Consolidated stormwater management plan

9.1 Summary of actions, costs, benefits and priorities

The actions presented in the preceding sections are summarised in Table 9.1. The table also provides a summary of the benefits of each option, including the primary benefit and any secondary benefits that might be realised. An indication of eligibility for SMA funding is also provided.

9.2 Timeframes for implementation

The actions detailed in this plan will be implemented over a period of many years, as budget and funding opportunities permit.

- High priority – 0 to 5 years
- Medium priority – 5 to 10 years
- Low priority – 10+ years

The plan should be considered flexible and will be subject to change over time. Circumstances that may alter the proposed timing of strategies include:

- The need for more detailed studies and investigations to refine concepts
- Availability of opportunistic funding
- **Development within Whyalla, such as the development of the new 'Super School' complex, along with development driven by any planned expansion of OneSteel operations.**

In some cases, this may result in strategies being 'brought forward' or in other cases, deferred.

Some strategies, such as the flood levee extension may be constructed in a staged manner, as budget and availability of fill material allows.

The City of Whyalla should continue to liaise with the Stormwater Management Authority in relation to the availability of funding over time for eligible projects.

9.3 Responsibilities for implementation

The City of Whyalla is responsible for the implementation of the majority of strategies associated with this plan. Whilst some elements may ultimately become the responsibility of third parties, such as developers (e.g. the Ocean Eyre development detention basin) the Council has ultimate responsibility for driving implementation through the planning and development approval process.

Table 9.1 also identifies key stakeholders likely to be involved in the implementation of any of the proposed strategies.



Table 9.1 Summary of recommended actions and funding

Name	Description	Budget estimate	Priority	Indicative design standard	Flood mitigation benefit	Water quality benefit	Other benefits	SMA funding eligibility	Key Stakeholders**
Northern levee repair	Repairs and short extension to strengthen existing levee.	\$190,000	High	100 year ARI	100 year ARI protection of City areas within Zone 3 (particularly north of Jenkins Avenue) due to flooding from external rural catchments.			Eligible.	Council, NVC, EPNRM
Northern levee extension	Construct new 6.2 km extension of the northern levee to direct floodwater around the city and airport.	\$2.58M	Medium	100 year ARI	Diversion of floodwaters around the western and southern extents of Whyalla, providing 100 year ARI flood protection to Whyalla Airport and Mullaquana rural living area (Zone 5) and future residential extension south of the existing Ocean Eyre development (Zone 4).	Directing floodwater away from urban areas reduces likelihood of urban pollutants becoming entrained.		Eligible.	Council, NVC, EPNRM, DPTI
Airport channel upgrade	Widening of the existing airport channel to increase capacity. Existing culverts to be enlarged to match new channel capacity. New channel outfall at Horseshoe Road.	\$3.18M	Low	100 year ARI	Reduced flooding along Broadbent Terrace (Zones 3, 4 and 5) and immediately upstream due to additional capacity within upgraded drain and new outfall.	Sedimentation and nutrient removal during low flow periods.	Possibility for increased amenity and public use (e.g. walking path)	Eligible.	Council, NVC, EPNRM, CPB, Crown Lands, Native Title claimants
McRitchie Crescent pipe upgrades	Upgrade existing underground network to reduce residential flooding in McRitchie Crescent and Brook Street.	\$1.88M	Medium	20 year ARI	Reduces nuisance flooding within McRitchie Crescent, Brook Street and surrounding streets (Zone 3) and prevents potential property flooding in events up to 20 year ARI event through increased pipe capacity and additional inlet pits.	None.		Eligible.	Council
McLennan Avenue drain upgrades	Upgrade underground pipes to a 5 year ARI standard. Construct new open channel drain to manage surface floodwater in larger events (up to 100 year ARI).	\$6.39M	High	5 year ARI / 100 year ARI	Provides minimum 5 year ARI underground drainage capacity for flood hot spot McLennan Avenue (Zone 3). Overflow cut-off drain around northern and eastern boundary of Civic Park and on northern side of Nicolson Avenue reduces 100 year ARI surface flows on the northern side of Nicolson Avenue by up to 300 mm. Significantly reduced flooding through University site in the 100 year ARI event. 100 year ARI flood protection provided to future development of community facility within existing Civic Park site.	Potential to direct minor rainfall events into open channel for removing of sediments.	Possibility for landscaping or open channel for improved amenity.	Eligible.	Council, EPNRM



Name	Description	Budget estimate	Priority	Indicative design standard	Flood mitigation benefit	Water quality benefit	Other benefits	SMA funding eligibility	Key Stakeholders**
Future education precinct drainage system	Construct formal drainage system using open channels and detention basins to control surface floodwater.	\$4.03M	High	100 year ARI	Substantial reduction in flooding downstream (south) of the University of SA site and within residential areas to the south and east of Russell Street (Zone 3). Flood depths reduced in the order of 100-300 mm in the 100 year ARI event. 100 year ARI flood protection to the future Super School site.	Large detention basin can be configured to provide sediment and nutrient removal.	Possibility for education programs with nearby schools. Landscaping for increased amenity and biodiversity.	Eligible.	Council, NVC, EPNRM, Dept for Education
Cabin Park levee	Small levee to divert surface floodwater around temporary accommodation.	\$20,000	Low	20 year ARI	20 year ARI flood protection to the cabin park (Zone 3), reducing risk to tourists who are not likely to be familiar with flood risk.	None.		Not eligible.	Council
Broadbent Terrace culverts	Additional culverts at regular intervals beneath Broadbent Terrace, discharging floodwater into the Airport Channel. Designed to reduce flooding on the north side of Broadbent Terrace.	\$1.16M	Low	20 year ARI	When constructed in conjunction with the Airport channel upgrade, reduces flooding on the northern side of Broadbent Terrace (Zone 3, 4 and 5).	None.		Eligible.	Council, EPNRM
Iron Knob Road bunding	Detention of rural floodwater north of Iron Knob Road to reduce residential flooding through Whyalla Norrie.	\$900,000	Medium	100 year ARI	Protection of properties on southern side of McBryde Terrace (Whyalla Norrie – Zone 3) from flooding from Mount Laura catchment in the 100 year ARI event.	Small reduction in sediment and nutrients loads during detention periods.		Eligible.	Council, NVC, EPNRM
McBryde Terrace bunding	Detention of rural floodwater north of McBryde Terrace to reduce residential flooding through Whyalla Norrie.	\$330,000	Medium	100 year ARI	As above.	As above.		Not eligible.	Council, NVC, EPNRM
McConville Street	Upgraded underground pipe system to reduce residential flooding in Darragh Street, Ferry Street and Billing Street.	\$1.16M	Medium	20 year ARI	Reduced depth of flooding through properties between Darragh Street and Billing Street (Zone 2) in 20 year ARI event.	Additional stormwater volume will be directed to existing constructed wetlands.		Eligible.	Council, EPNRM
Ocean Eyre basin	Detention storage to manage runoff from potential future development of the Ocean Eyre residential areas.	\$1.74M	TBD ¹	100 year ARI	Detention of 100 year ARI post-development flows to pre-development flows for future Ocean Eyre development (Zone 4) to prevent impact on downstream areas and drainage system.	Large detention basin can be configured to provide sediment and nutrient removal.	Possibility for landscaping for improved amenity and biodiversity.	Eligible.	Council, Developers, EPNRM
Sugarwood Crescent bund	Detention of floodwater in undeveloped Council land to reduce flooding along Broadbent Terrace.	\$360,000	Low	100 year ARI	Reduced flooding along Broadbent Terrace (Zone 4) in events up to and including the 100 year ARI event.	Low removal of sediments during periods of detention.		Not eligible.	Council



Name	Description	Budget estimate	Priority	Indicative design standard	Flood mitigation benefit	Water quality benefit	Other benefits	SMA funding eligibility	Key Stakeholders**
Farrell Street and Wood Terrace pipe systems	New underground drainage system along Farrell Street and Wood Terrace to reduce surface stormwater and improve public safety during minor flood events.	\$810,000	High	5 year ARI	Minimum 5 year ARI underground drainage standard to eliminate nuisance flooding within Wood Street and Farrell Street (Zone 1). Eliminates overflows through properties between Forsyth Street and Whitehead Street for events up to and including the 10 year ARI event.	None.	Increased public safety during flood events.	Eligible.	Council
Neagle Terrace raingardens and basin		\$120,000	High	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads.	Improved amenity and biodiversity.	Not eligible.	Council, EPNRM
Dunstone Street - infiltration basin		\$35,000	High	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads.	Improved amenity and biodiversity.	Not eligible.	Council, EPNRM
Development controls for new developments		n.a.	High	5 year ARI	Stormwater detention development controls will ensure future development does not place additional pressure on downstream, existing stormwater systems.	Development controls can be implemented to reduce runoff volume and sediment and nutrient loads.	Improved amenity and biodiversity.	Not applicable (will depend on location and size of new developments).	Council, Developers
Cudmore Terrace infiltration basin		\$80,000	Medium	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads.	Improved amenity and biodiversity.	Not eligible.	Council, EPNRM
Roberts Terrace raingardens		\$110,000	Low	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads.	Improved amenity and biodiversity.	Not eligible.	Council, EPNRM
Civic Park wetland (opportunistic)		n.a.	Low	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads. Plant growth reduces nutrient load as well.	Increased amenity and public use of Civic Park. Increased biodiversity and habitat types.	Eligible.	Council, EPNRM
Airport channel erosion and landscape works			Medium	None	When undertaken in conjunction with channel upgrade, improves conveyance capacity.	Reduction of sediment volume being discharged to marine environment.	Improved amenity and biodiversity.	Eligible.	Council, EPNRM, NVC
Ocean Eyre WSUD*		n.a.	High		Limited.	Development controls can be implemented to reduce runoff volume and sediment and nutrient loads.		Not applicable.	Council, Developers



Name	Description	Budget estimate	Priority	Indicative design standard	Flood mitigation benefit	Water quality benefit	Other benefits	SMA funding eligibility	Key Stakeholders**
Small inlet raingardens along Beach Road and in the foreshore carpark		\$20,000 each	Low	Less than 1 year ARI	Limited.	Infiltration reduces runoff volume and sediment and nutrient loads.	Improved amenity if landscaped or incorporated in streetscape renewal.	Not eligible.	Council, EPNRM
WSUD in the backyard education campaign		\$10,000	Low	Less than 1 year ARI	None.	Water quality is affected by actions of community. Education raises awareness and attempts to change behaviours affecting water quality in the catchment.	Possibility to combine with school education programs.	Not eligible.	Council, EPNRM
Stormwater harvesting and re-use strategy			Low	None	None.	Water harvesting and re-use removes runoff from reaching the receiving water body.	Possibility of reducing Council usage of SA Water potable recycled water.	Eligible.	Council, EPNRM, SA Water

* cost to be borne by developer

** NVC – Native Vegetation Council, EPNRM – Natural Resources Eyre Peninsula, CPB – Coastal Protection Board, DPTI – Department of Planning, Transport and Infrastructure.



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Whyalla Council Development Plan (consolidated 14 June 2017) downloaded from
http://www.dpti.sa.gov.au/_data/assets/pdf_file/0012/250023/Whyalla_Council_Development_Plan.pdf



Appendix A – Flood inundation and hazard maps

Disclaimer

This map has been prepared to a standard of accuracy sufficient for broad scale flood risk management and planning. The flood extents are not based on actual historical floods. The map does not increase the risk or affect the level of flooding over an area or property. The limit of flooding shown on this map is not a boundary between flood prone and flood free land. Land outside the flood extent shown on this map could be affected by:

- Floods with a different Average Recurrence Interval (ARI).
- Blockage in drainage systems, creeks and culverts caused by vegetation and other debris carried by flood flows.
- Further development, earthworks and other changes to the catchment that alter the actual flood extents.

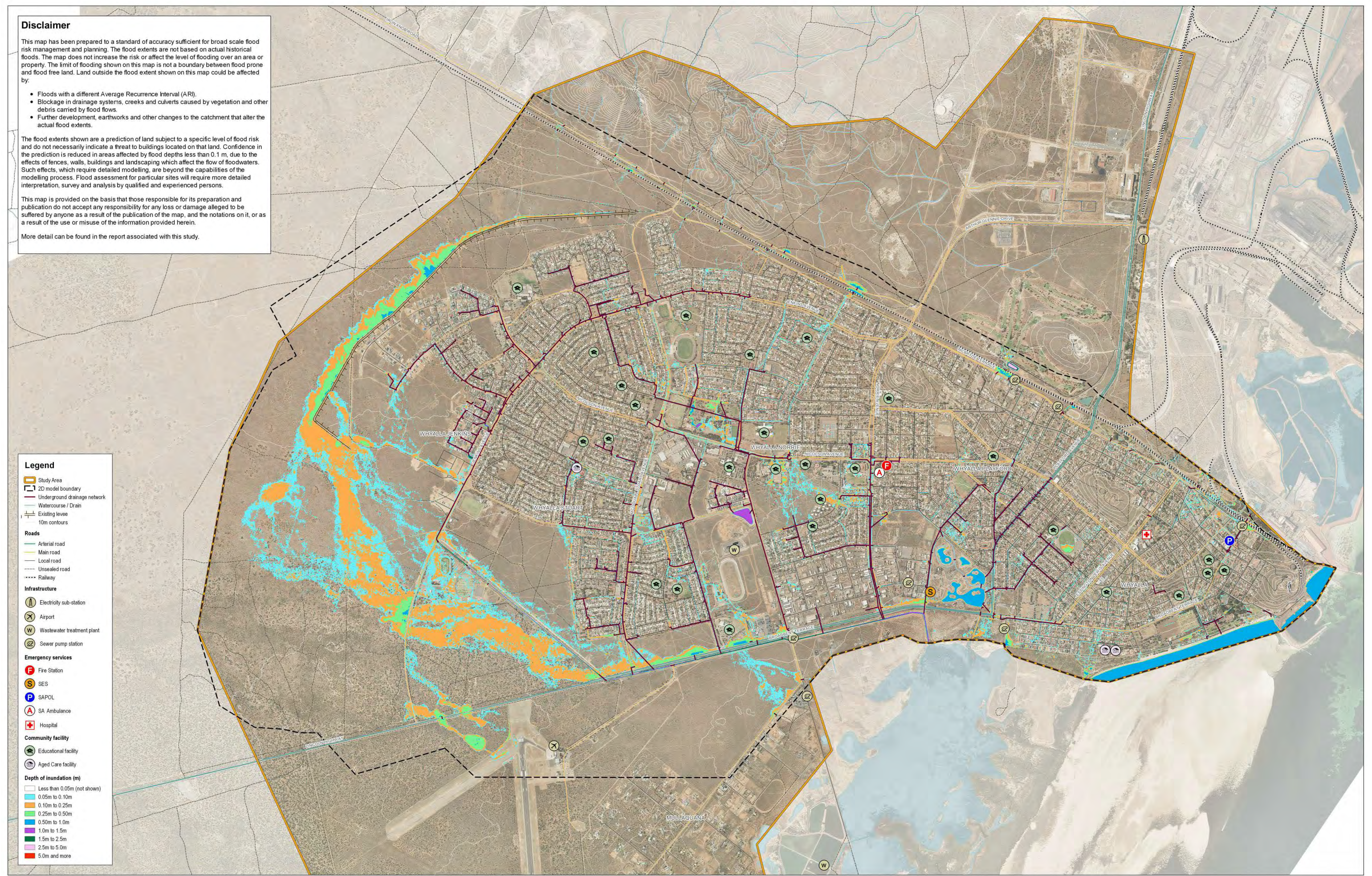
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Legend

- Study Area
 - 2D model boundary
 - Underground drainage network
 - Watercourse / Drain
 - Existing levels
 - 10m contours
- Roads**
- Arterial road
 - Main road
 - Local road
 - Unsealed road
 - Railway
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 - Airport
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- Depth of inundation (m)**
- Less than 0.05m (not shown)
 - 0.05m to 0.10m
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 - 1.5m to 2.5m
 - 2.5m to 5.0m
 - 5.0m and more



0 500 1000 1500 2000 2500 m
 1:15,000
 at A1
 Job Number: 2016.0064
 Filename: 2016.0064 - Whyalla SMP - Flood maps v3.gis
 Revision: Rev. C
 Date: 2019-06-04
 Drawn: SEM

Data Acknowledgement
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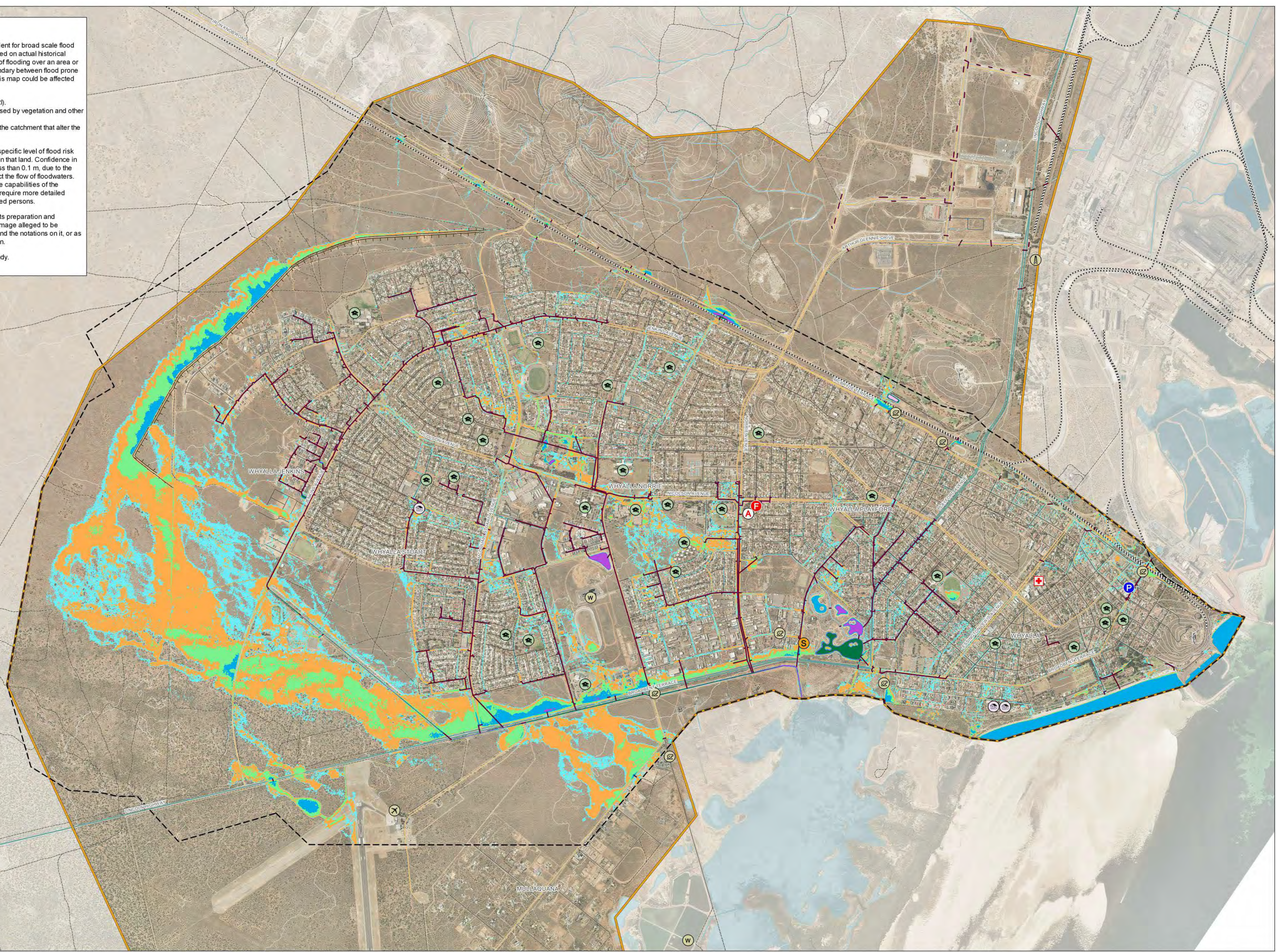
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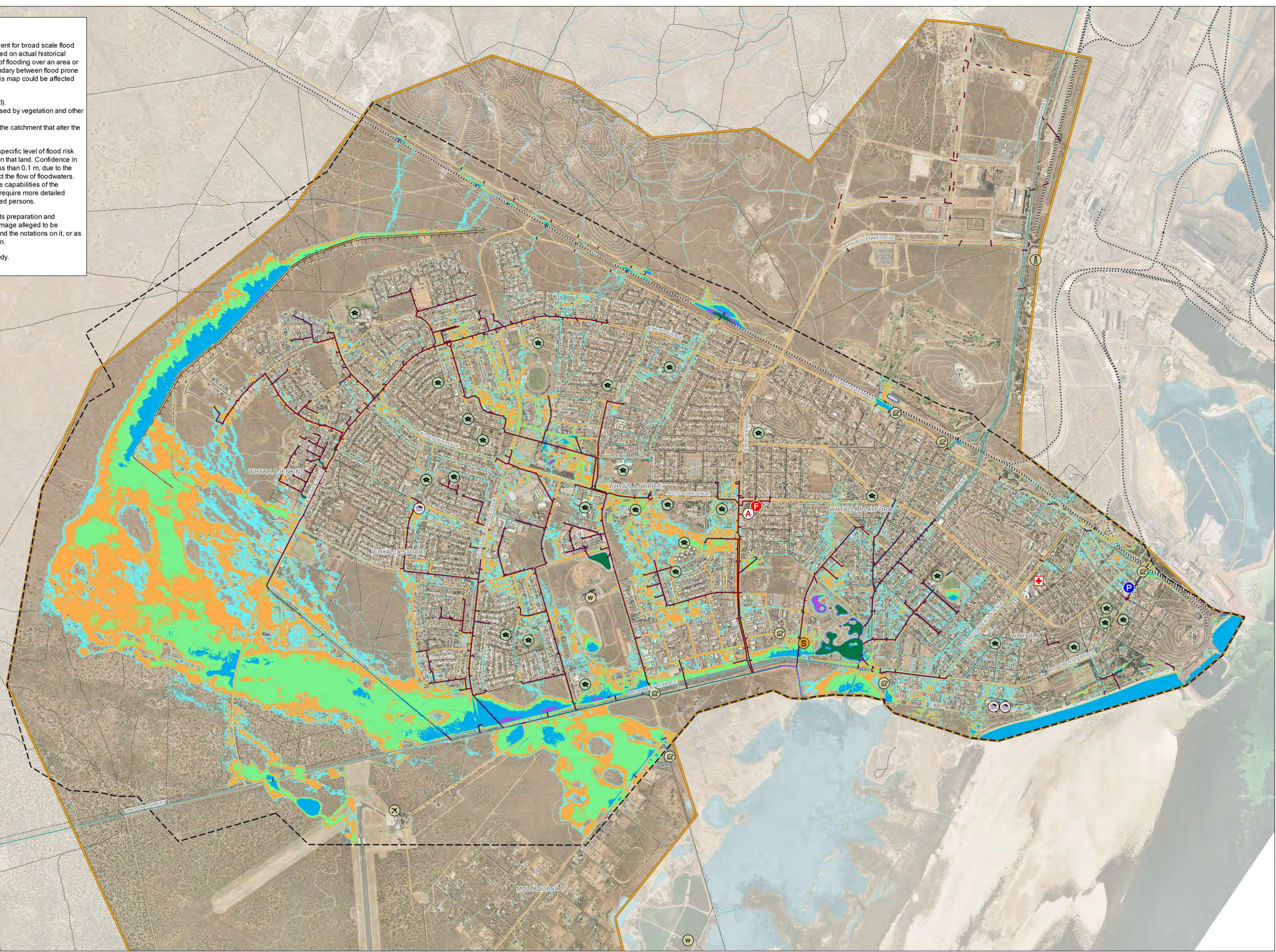
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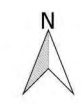
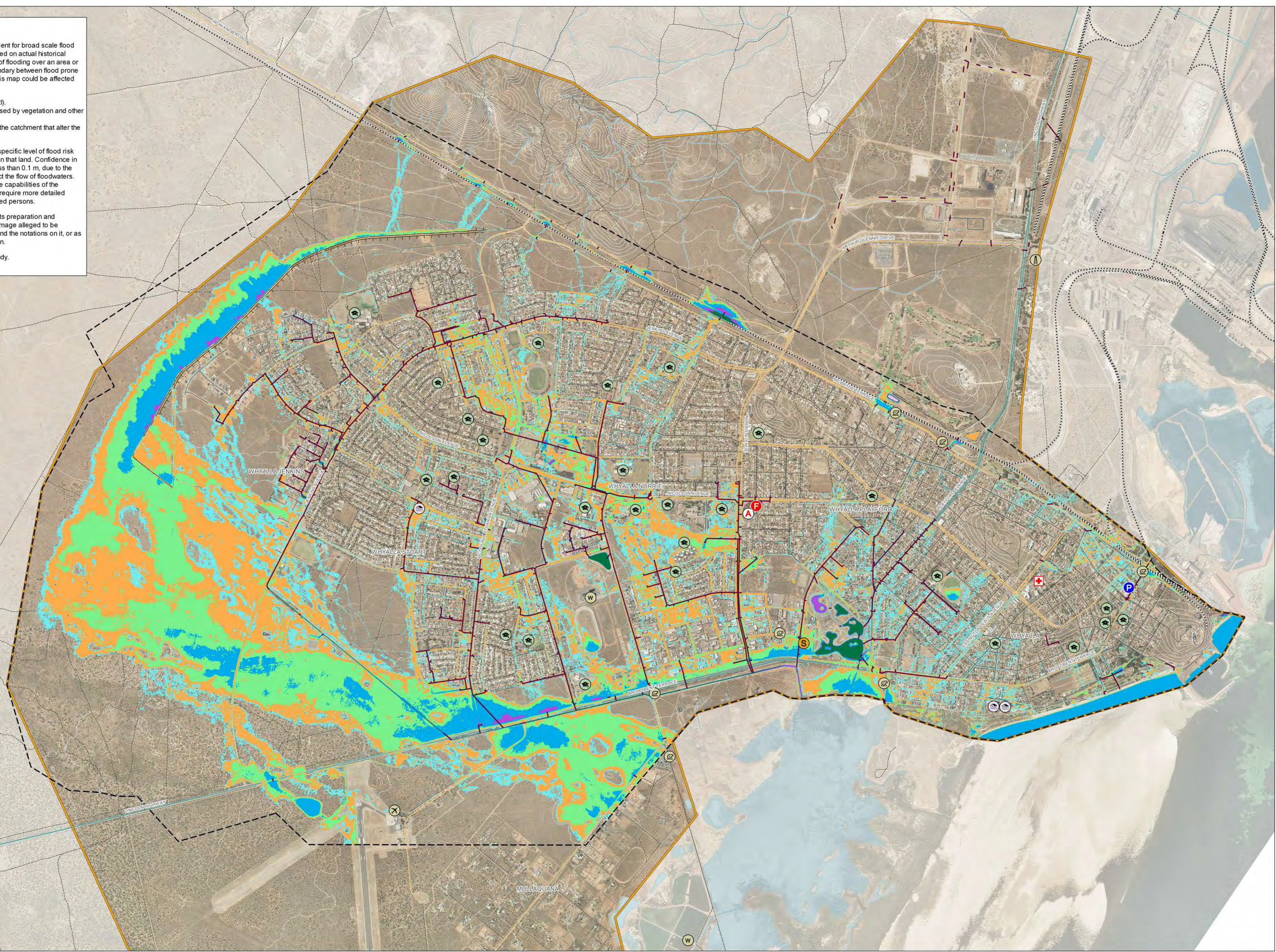
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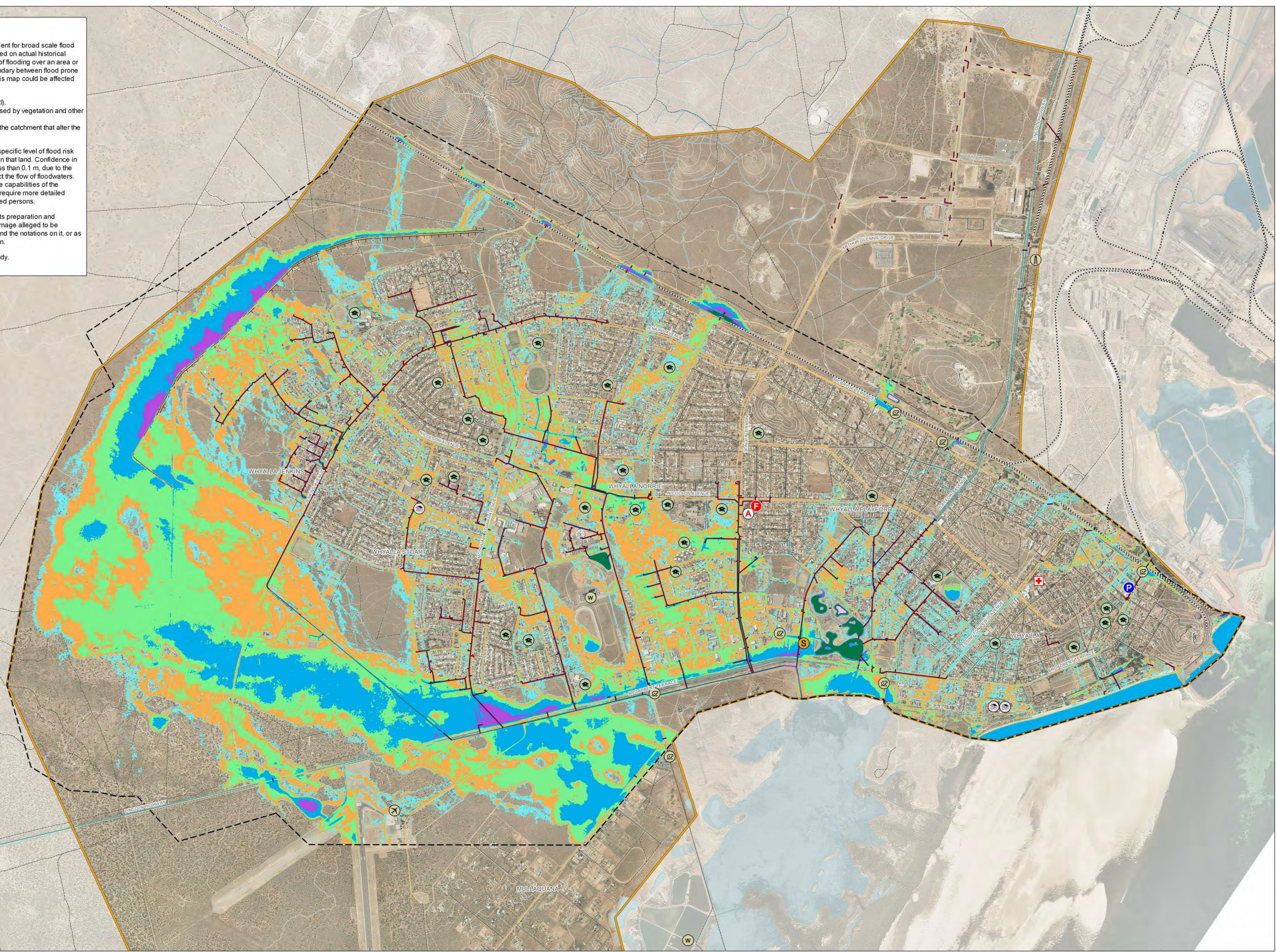
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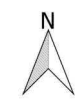
Legend

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0 500 1000 1500 2000 2500 m
 1:115,000
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 Drawn: SEM

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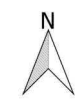
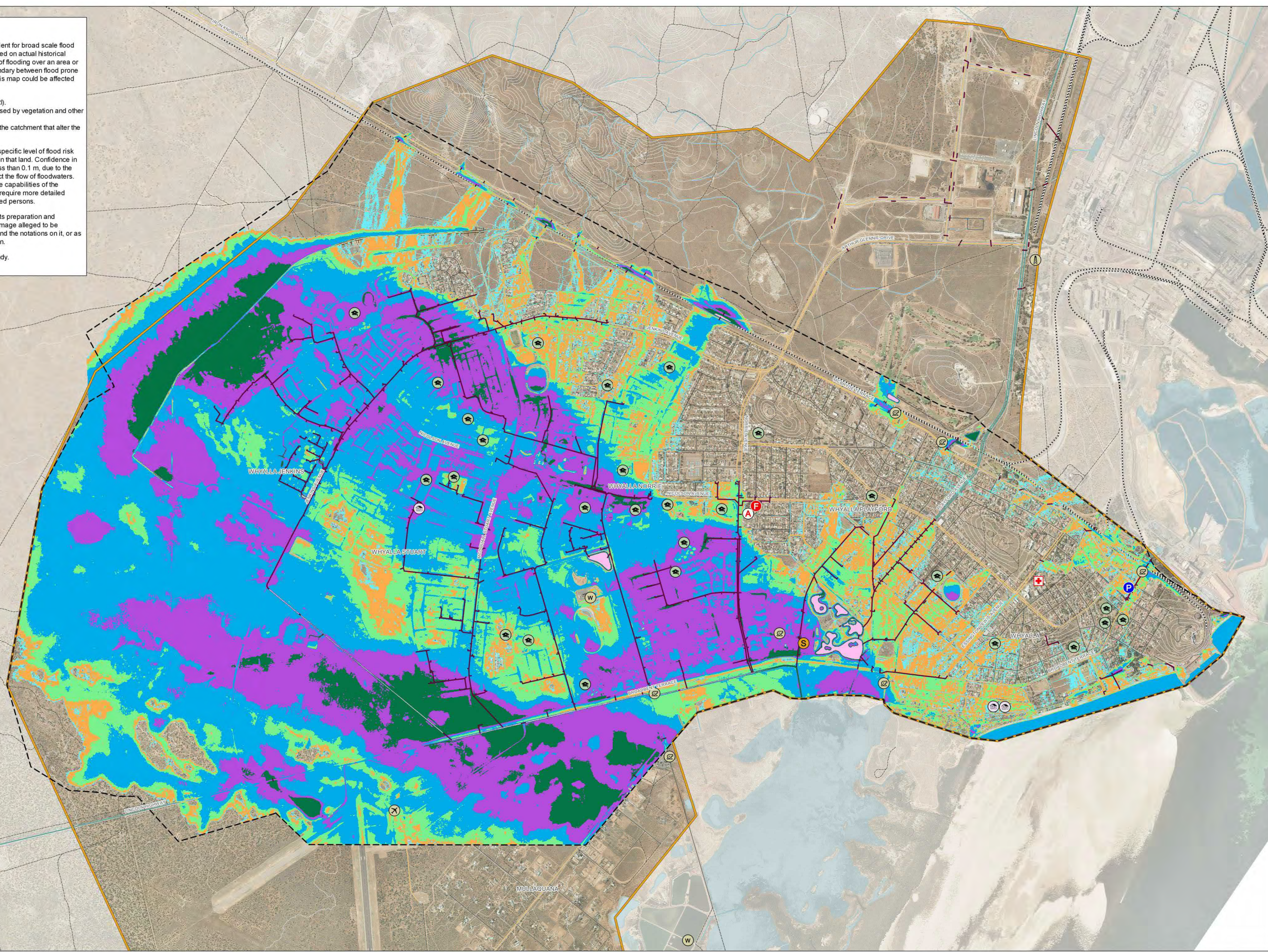
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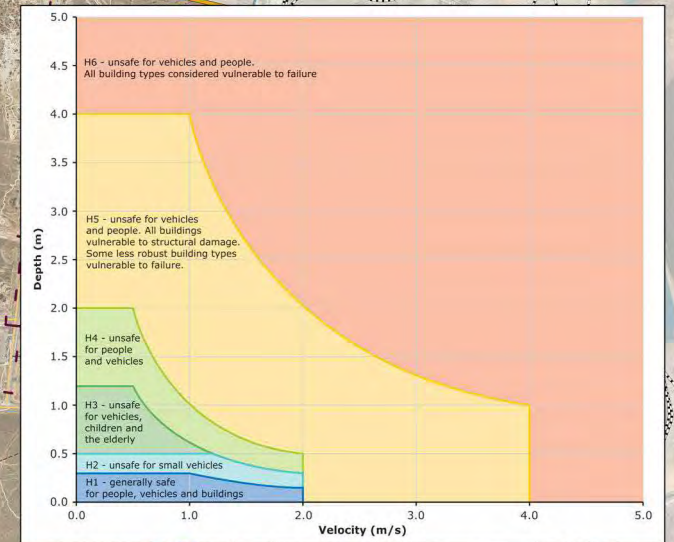
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Australian Emergency Management Institute Flood Hazard Categories



Legend

- Study Area
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 - SAPOL
 - SA Ambulance
 - Hospital
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 - Aged Care facility

Hazard category

- No hazard
- H1
- H2
- H3
- H4
- H5
- H6

0 500 1000 1500 2000 2500 m



1:15,000 at A1
 Job Number: 2016.0064
 Filename: 2016.0064 - Whyalla SMP - Flood maps v3.ags
 Revision: Rev. C
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City of Whyalla
WHYALLA STORMWATER MANAGEMENT PLAN
 CITY Catchment- 100 year ARI flood hazard existing development scenario

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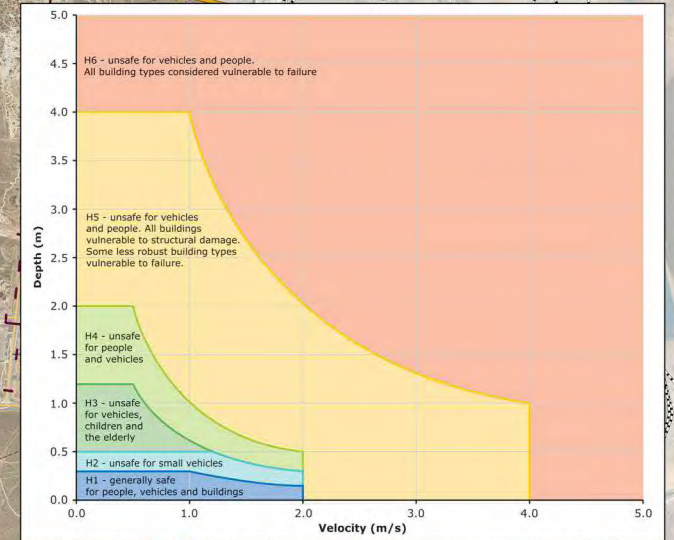
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Infrastructure

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- Airport
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Emergency services

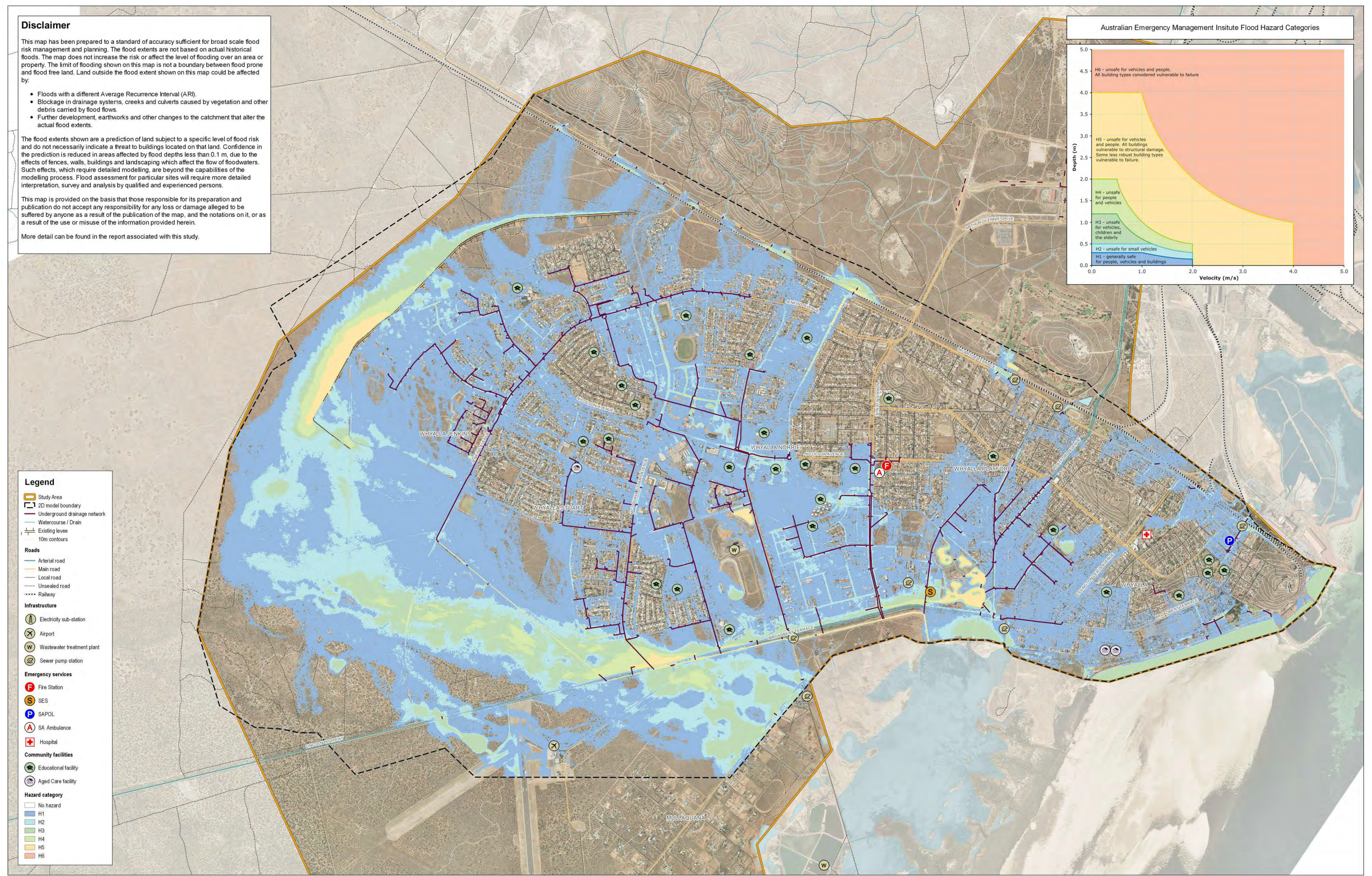
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0 500 1000 1500 2000 2500 m

1:115,000 at A1

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0 300 600 900 1200 m



1:7,500
at A1
Job Number: 2016.0064
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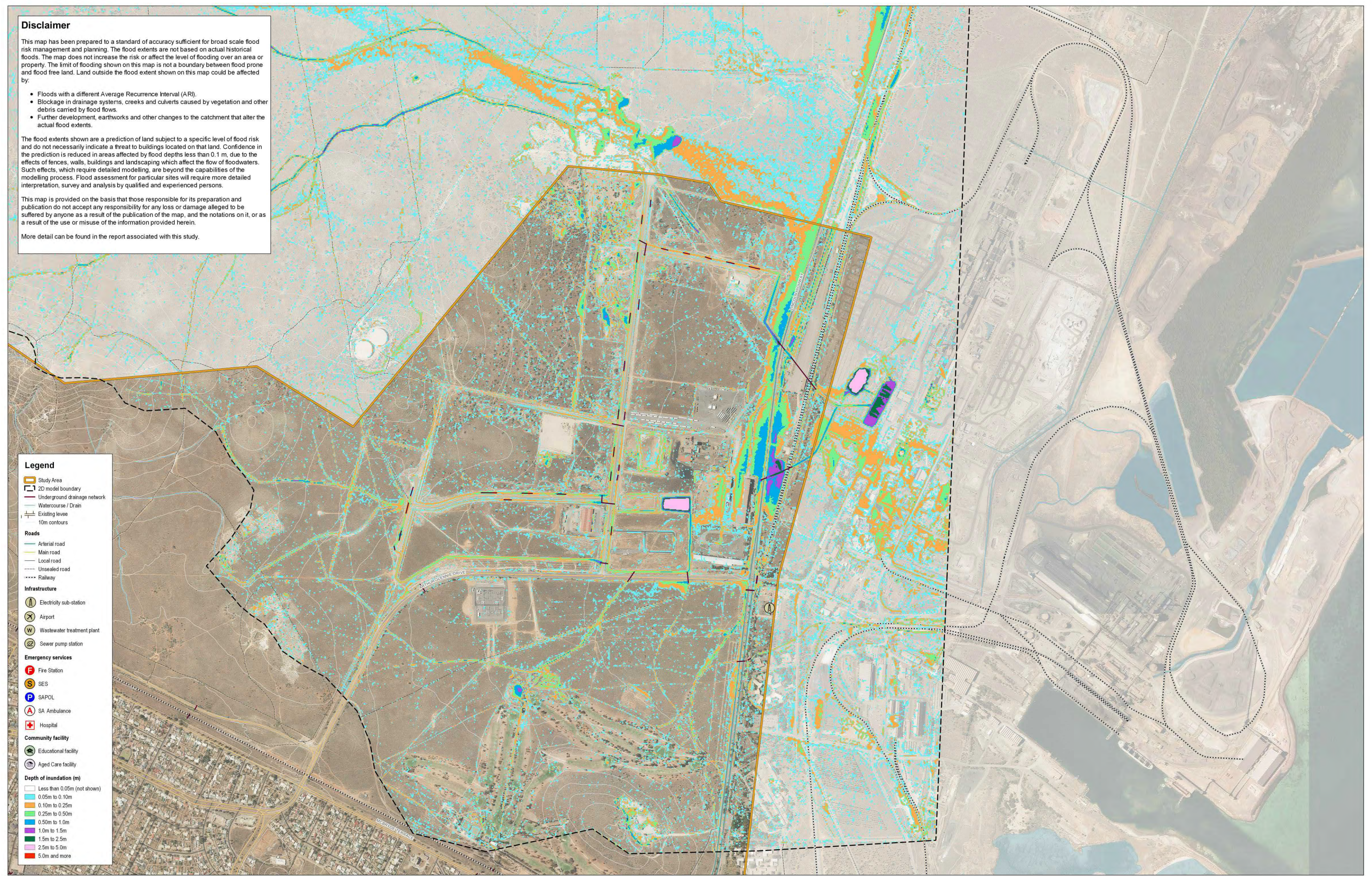
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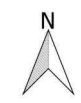
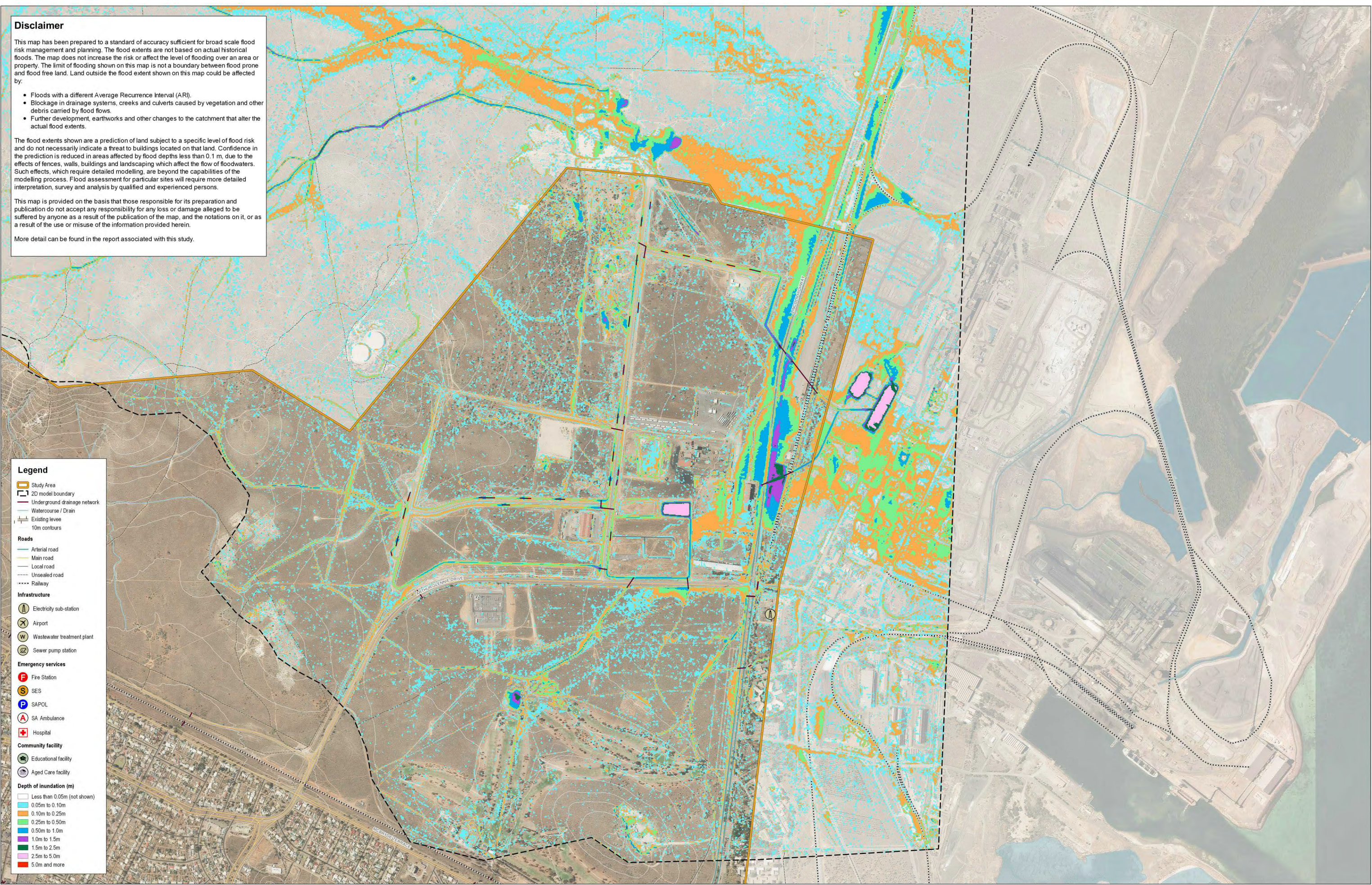
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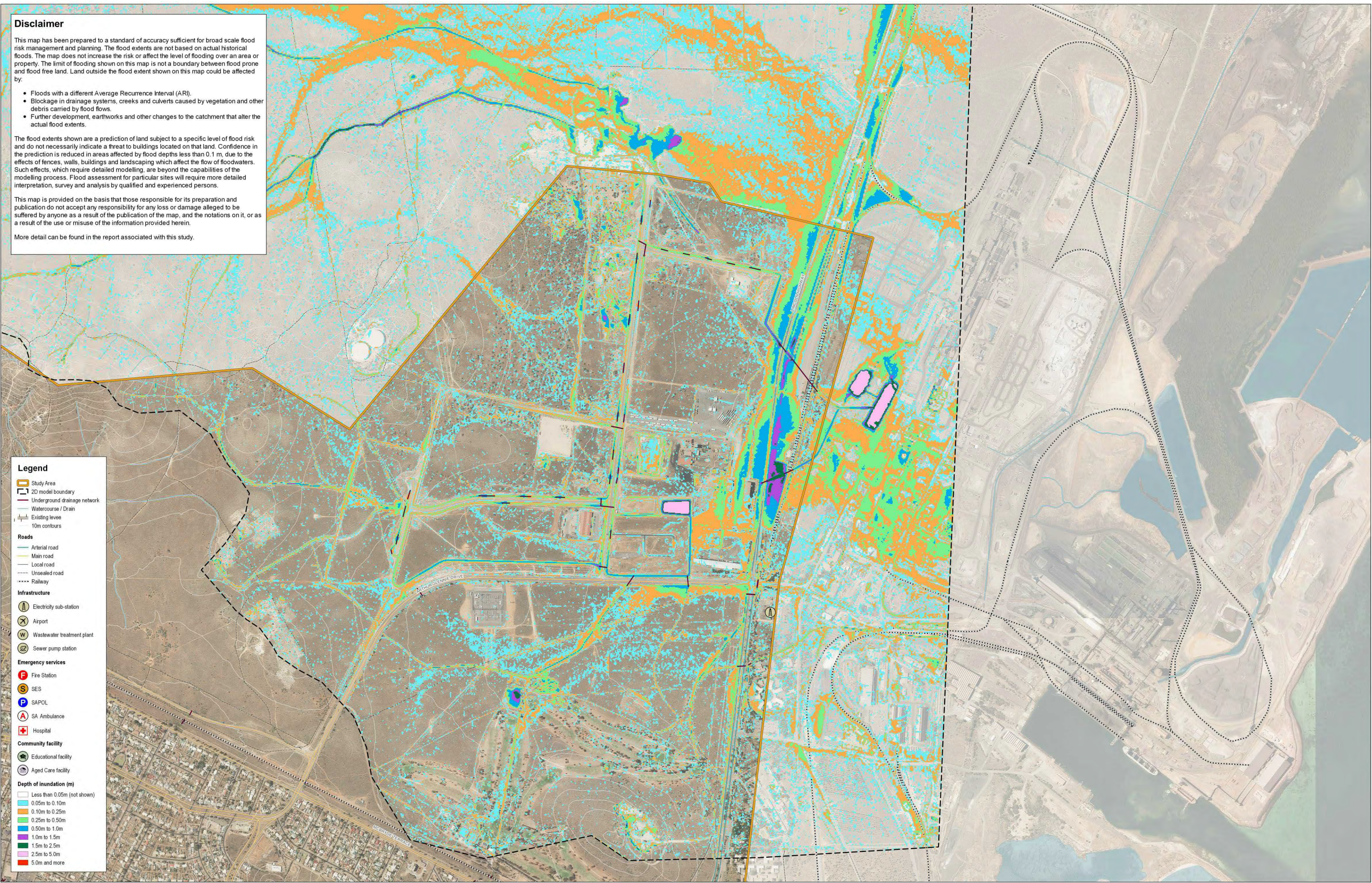
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0 300 600 900 1200 m



1:7,500
at A1
Job Number: 2016.0064
Filename: 2016.0064 - Whyalla SMP - Flood maps v3.ggs
Revision: Rev. C
Date: 2019-06-04
Drawn: SEM

Data Acknowledgement
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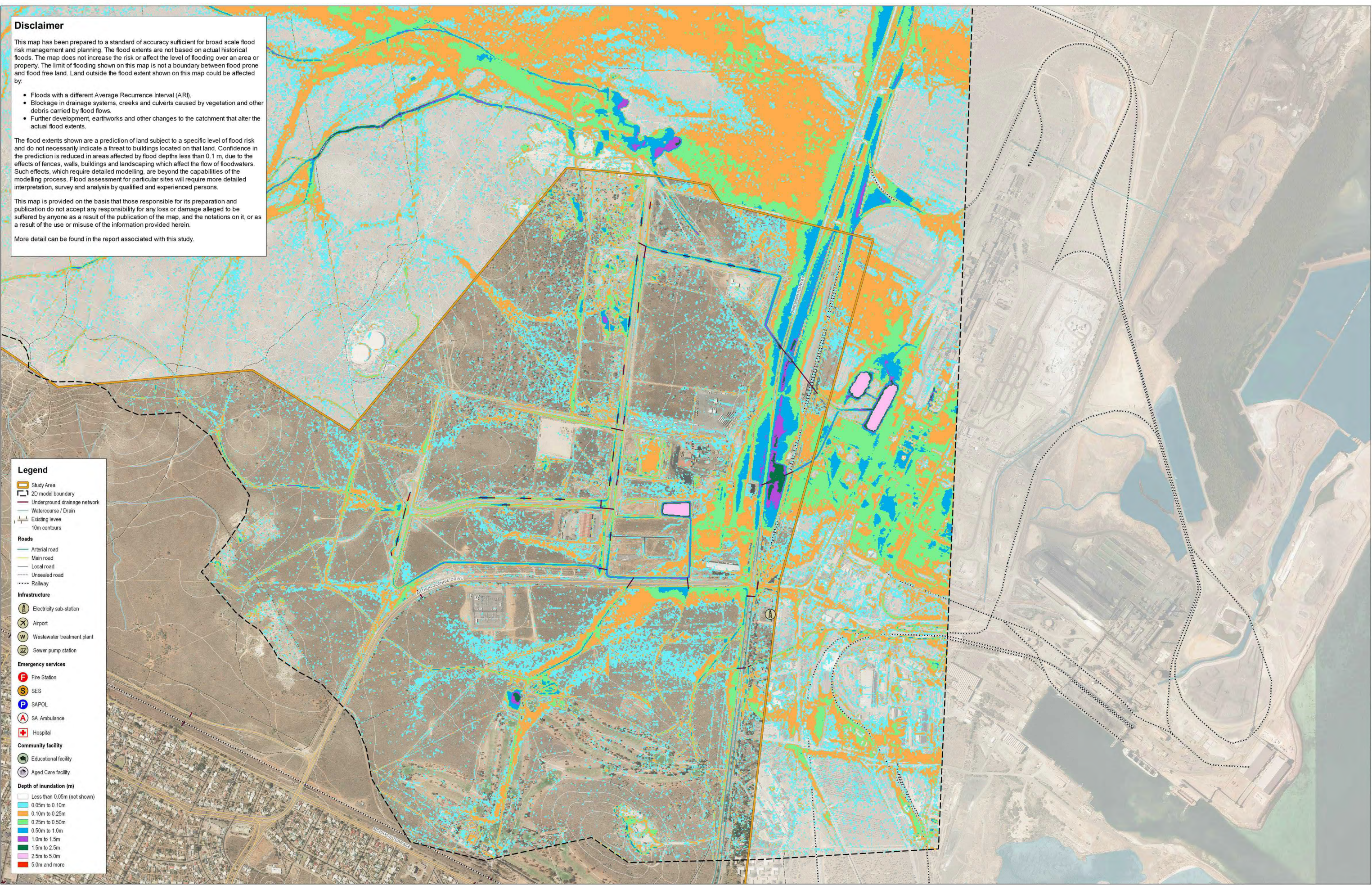
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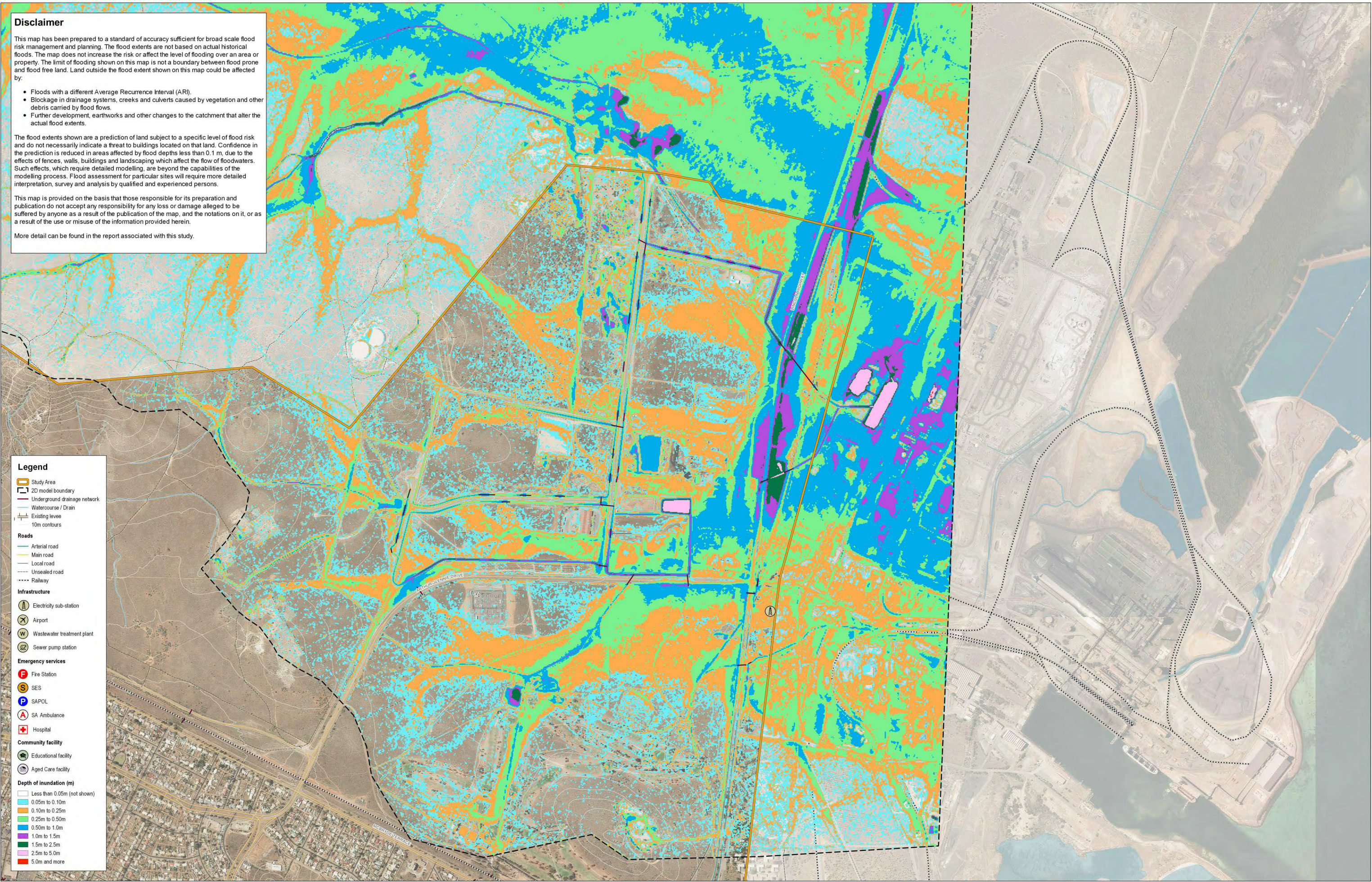
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0 300 600 900 1200 m
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 at A1
 Job Number: 2016.0064
 Filename: 2016.0064- Whyalla SMP- Flood maps v3.ggs
 Revision: Rev. C
 Date: 2019-06-04
 Drawn: SEM

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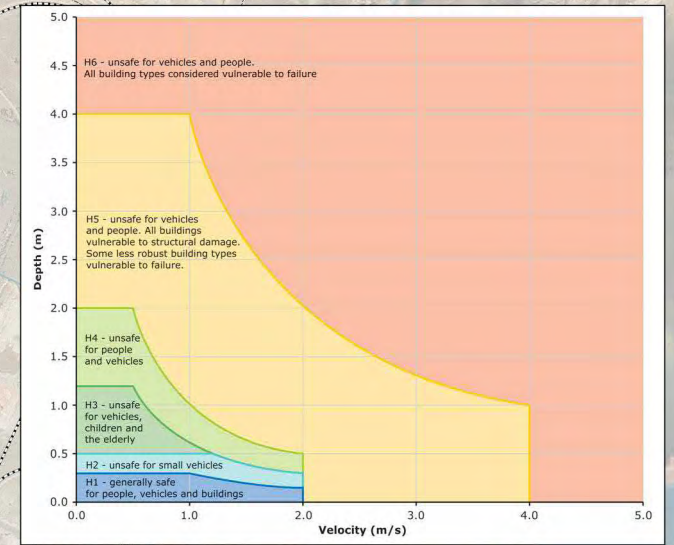
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Australian Emergency Management Institute Flood Hazard Categories



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Roads

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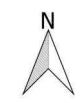
Hazard category

- No hazard
- H1
- H2
- H3
- H4
- H5
- H6



1:7,500
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Job Number: 2016.0064
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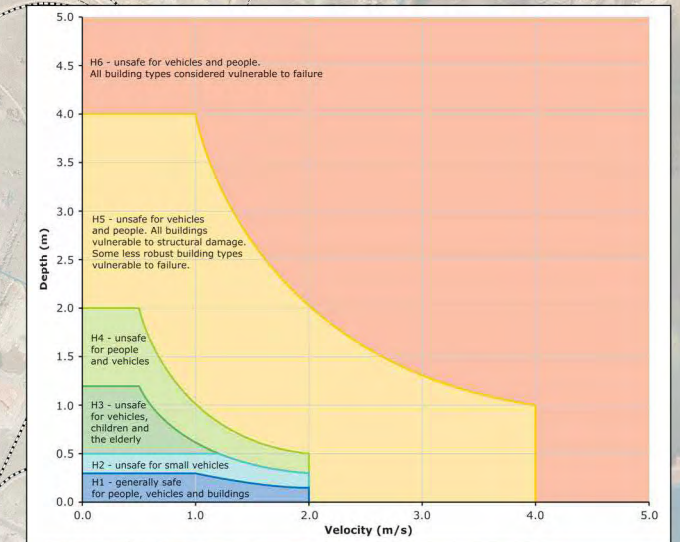
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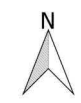
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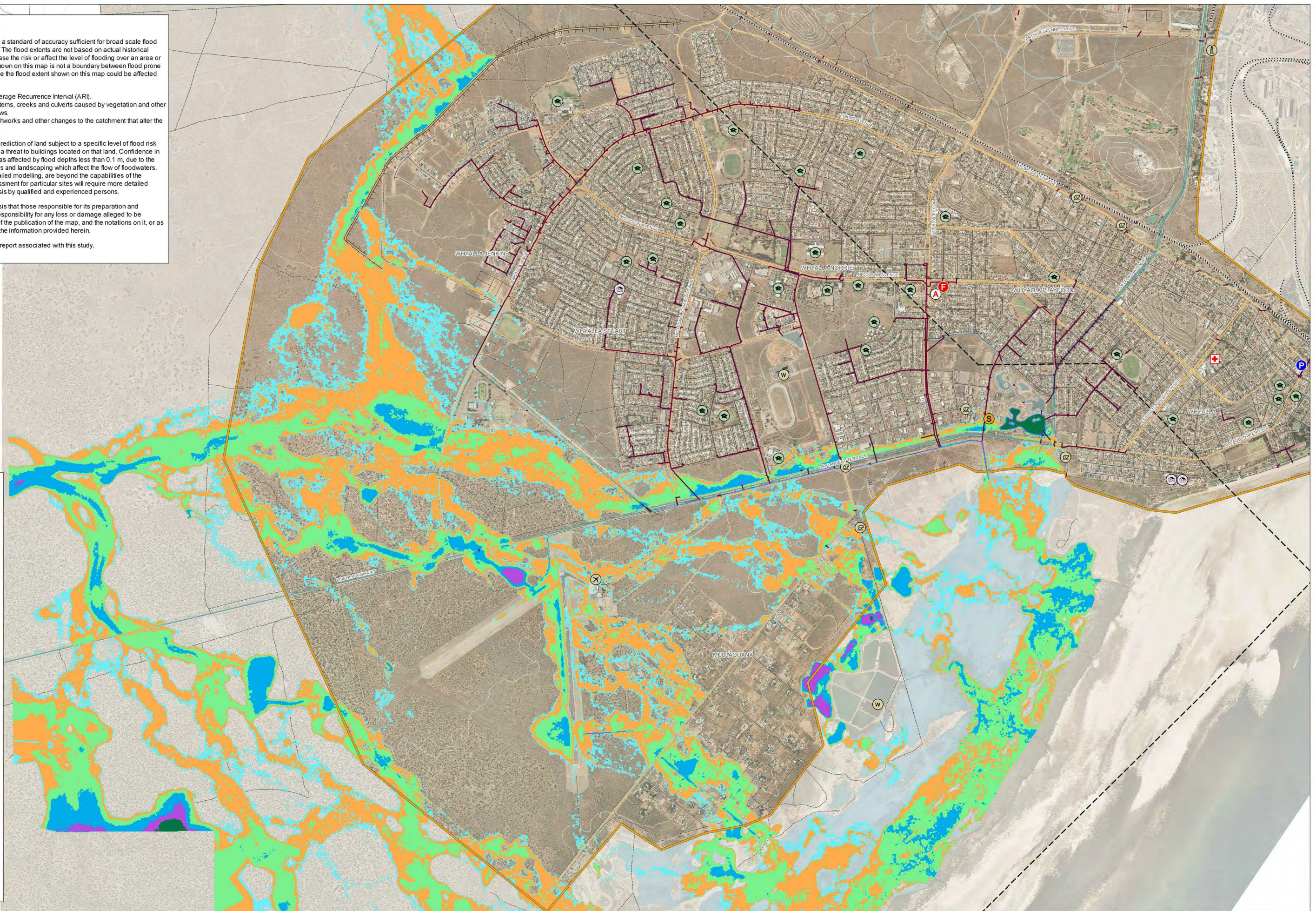
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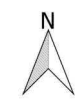
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0 500 1000 1500 2000 2500 m
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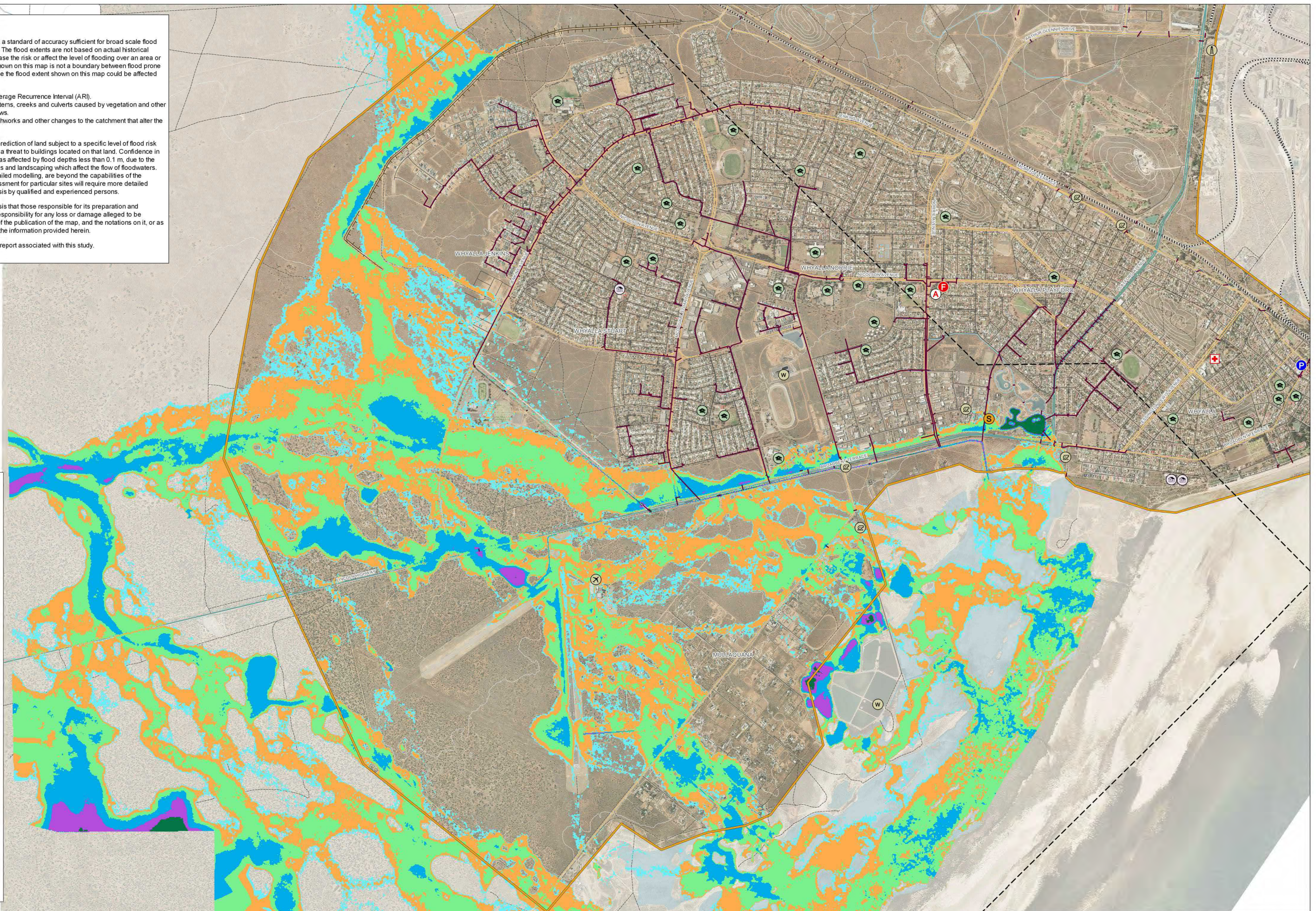
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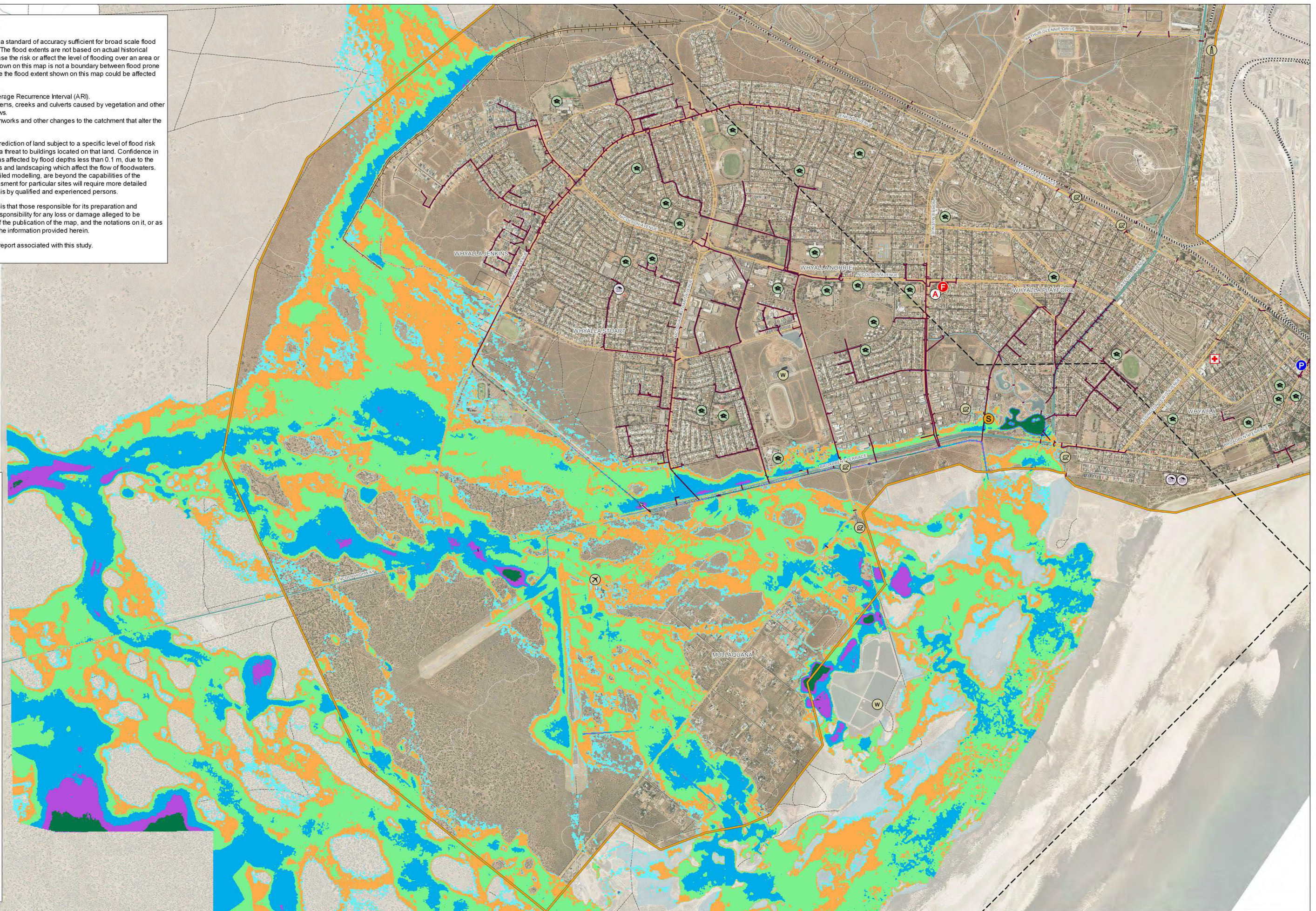
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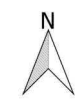
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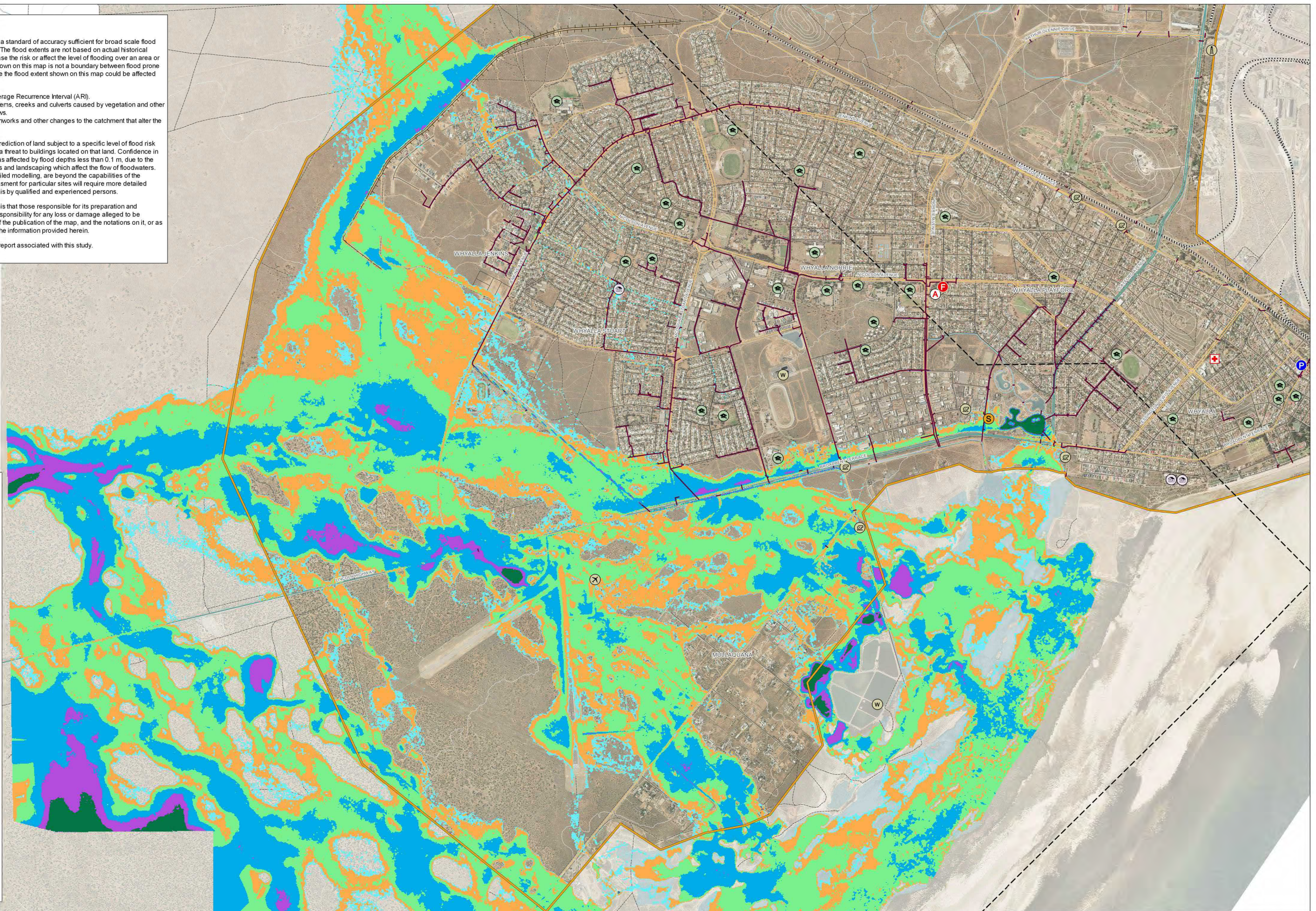
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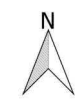
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- Blockage in drainage systems, creeks and culverts caused by vegetation and other debris carried by flood flows.
- Further development, earthworks and other changes to the catchment that alter the actual flood extents.

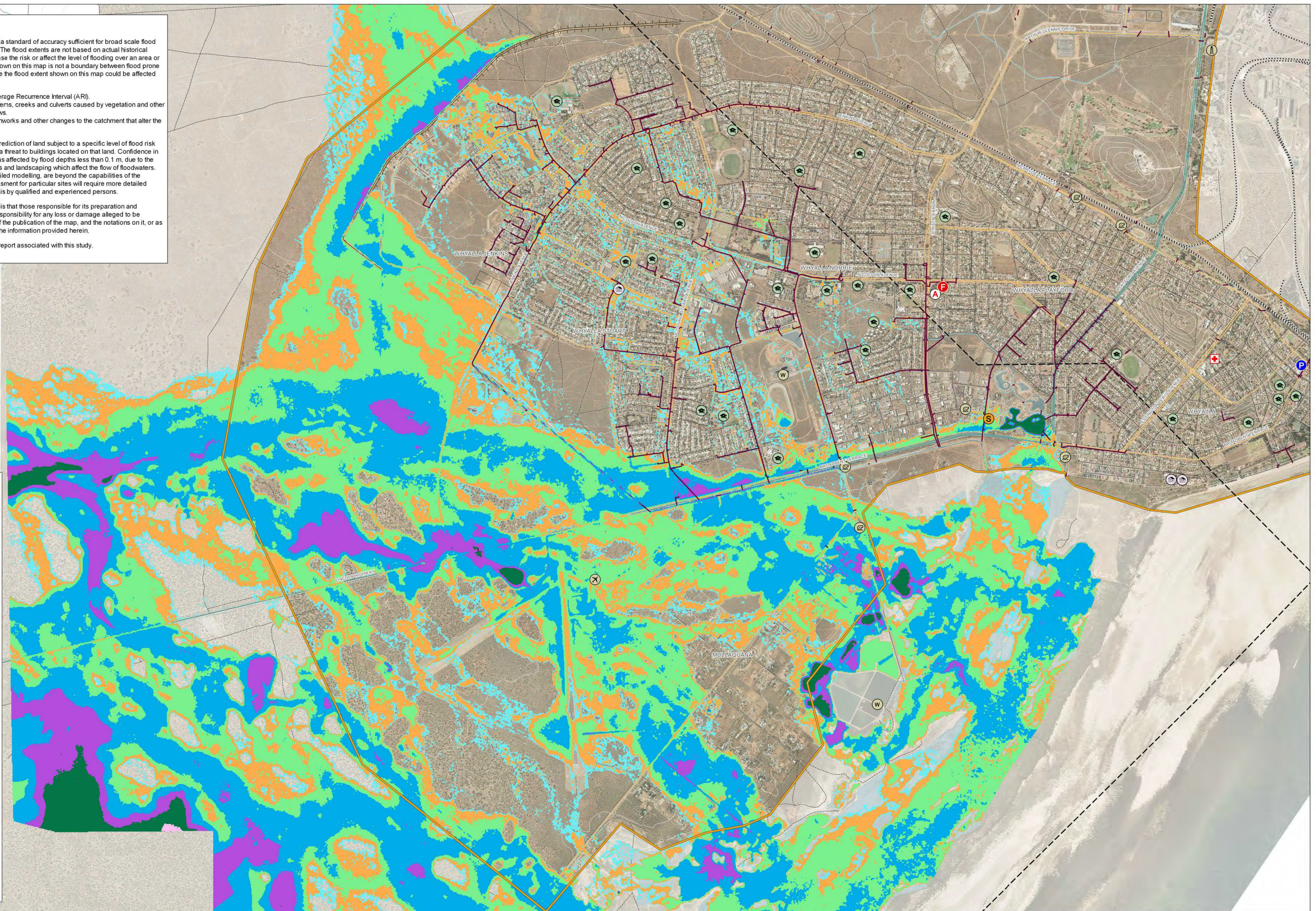
The flood extents shown are a prediction of land subject to a specific level of flood risk and do not necessarily indicate a threat to buildings located on that land. Confidence in the prediction is reduced in areas affected by flood depths less than 0.1 m, due to the effects of fences, walls, buildings and landscaping which affect the flow of floodwaters. Such effects, which require detailed modelling, are beyond the capabilities of the modelling process. Flood assessment for particular sites will require more detailed interpretation, survey and analysis by qualified and experienced persons.

This map is provided on the basis that those responsible for its preparation and publication do not accept any responsibility for any loss or damage alleged to be suffered by anyone as a result of the publication of the map, and the notations on it, or as a result of the use or misuse of the information provided herein.

More detail can be found in the report associated with this study.

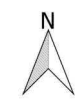
Legend

- Study Area
 - 2D model boundary
 - Underground drainage network
 - Watercourse / Drain
 - Existing levee
 - 10m contours
- Roads**
- Arterial road
 - Main road
 - Local road
 - Unsealed road
 - Railway
- Infrastructure**
- Electricity sub-station
 - Airport
 - Wastewater treatment plant
 - Sewer pump station
- Emergency services**
- Fire Station
 - SES
 - SAPOL
 - SA Ambulance
 - Hospital
- Community facility**
- Educational facility
 - Aged Care facility
- Depth of inundation (m)**
- Less than 0.05m (not shown)
 - 0.05m to 0.10m
 - 0.10m to 0.25m
 - 0.25m to 0.50m
 - 0.50m to 1.0m
 - 1.0m to 1.5m
 - 1.5m to 2.5m
 - 2.5m to 5.0m
 - 5.0m and more



0 500 1000 1500 2000 2500 m
 1:15,000
 at A1
 Job Number: 2016.0064
 Filename: 2016.0064 - Whyalla SMP - Flood maps v3.dwg
 Revision: Rev. C
 Date: 2019-06-04
 Drawn: SEM

Data Acknowledgement
 Aerial imagery captured December 2013. Used with permission of City of Whyalla.
 Base data from DataSA.



Disclaimer

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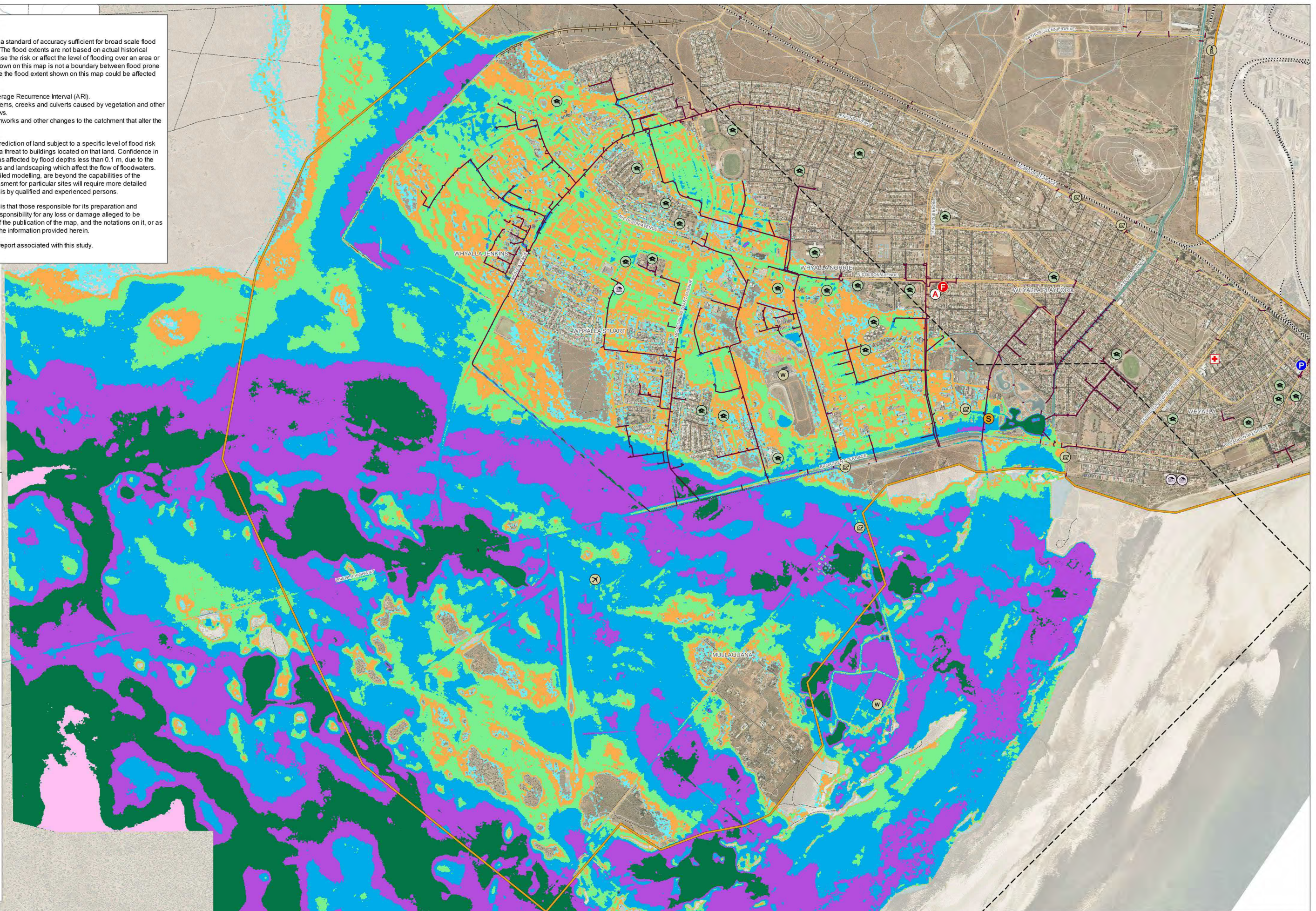
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 - 1.5m to 2.5m
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 - 5.0m and more



0 500 1000 1500 2000 2500 m
 1:115,000
 at A1
 Job Number: 2016.0064
 Filename: 2016.0064- Whyalla SMP - Flood maps v3.agg
 Revision: Rev. C
 Date: 2019-06-04
 Drawn: SEM

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