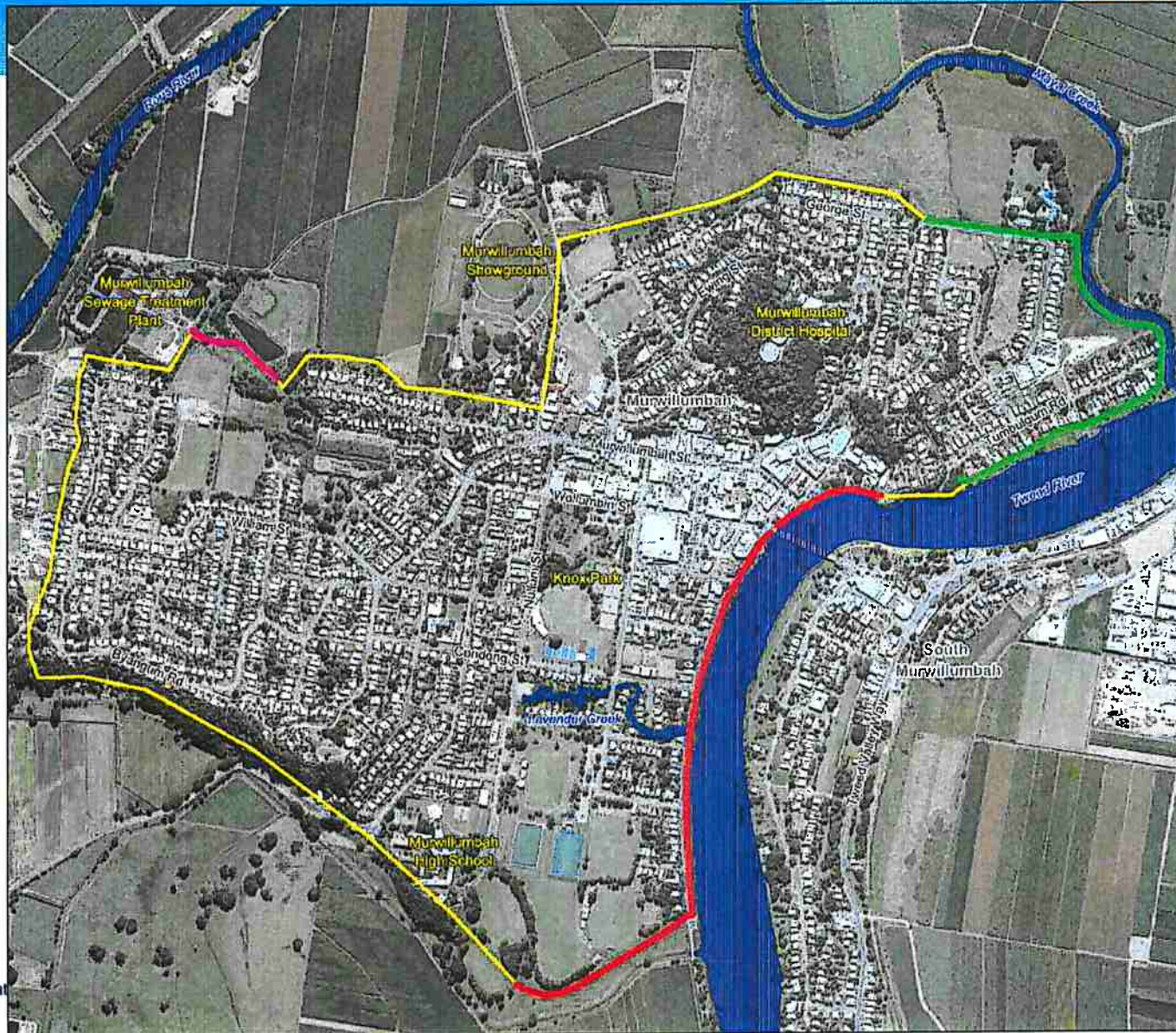


# Murwillumbah CBD Levee & Drainage Study Draft Report





# Study Area



**LEGEND**

- Murwillumbah CBD Level Study Area
- Level 1 - Communal Road
- Level 2 - East Murwillumbah
- Level 3 - Dorothy Street

**Notes:**  
Aerial photograph date: 2015

**Figure 1:  
Murwillumbah CBD  
Study Area**

Prepared By:  
 Catchment Simulation Solutions  
 Suite 2.01, 210 George St  
 Sydney, NSW 2000  
 File Name: Fig1 - Murwillumbah CBD Levels Study Area.wor

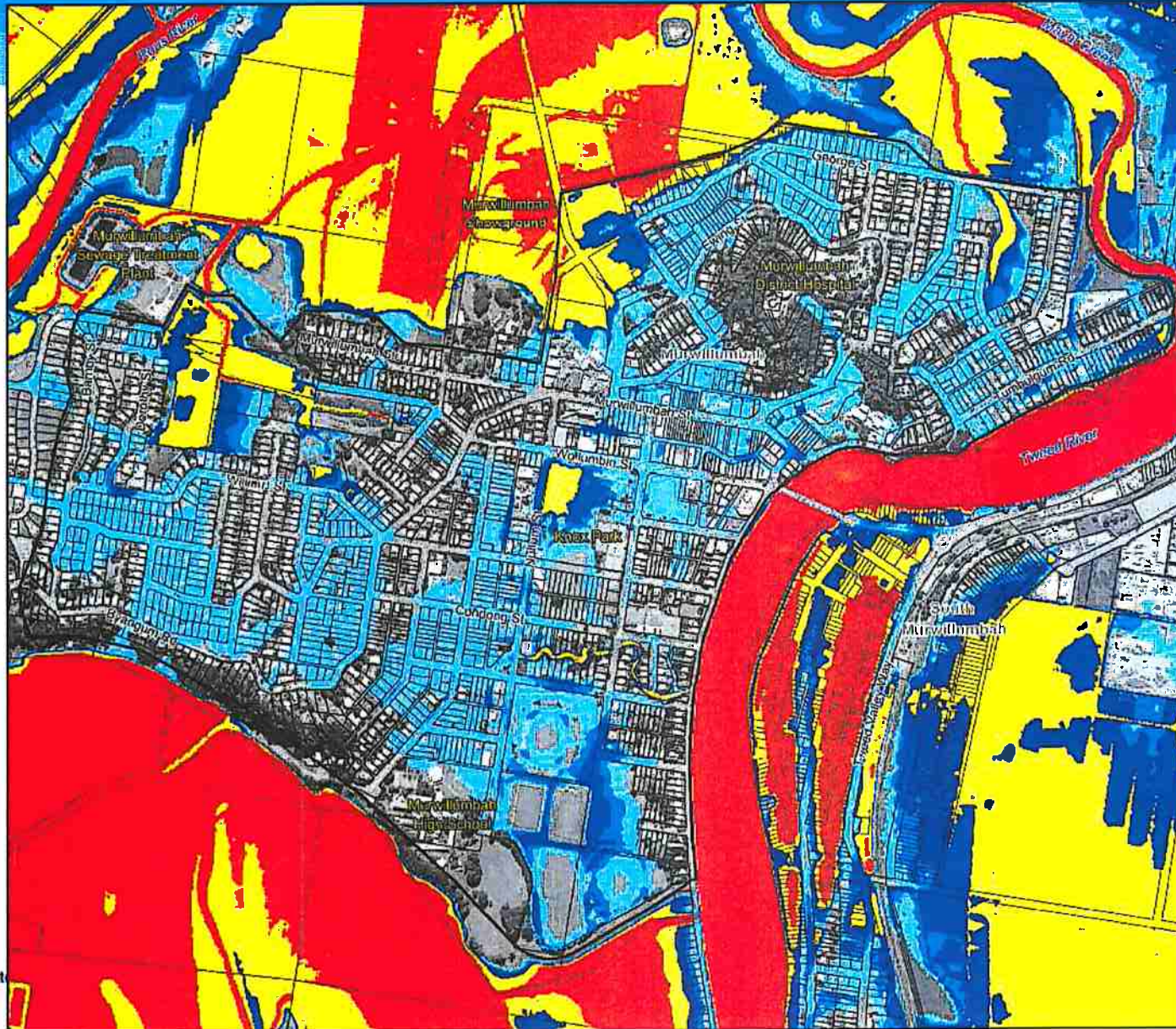


## Previous Work Components...

- New, more detailed TUFLOW flood model developed
- TUFLOW model calibrated:
  - March 2017
  - June 2016
  - January 2012
- TUFLOW model used to simulate design floods
  - 20% AEP
  - 5% AEP
  - 1% AEP
  - 0.2% AEP



# Small Events (20% AEP)

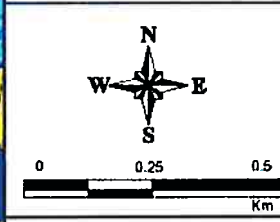


**LEGEND**

Depths (m)

0.0 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 2.0
>= 2.0

Notes:  
Aerial photograph date: 2015



**Figure 17:  
Floodwater Depths  
for the 20% AEP Flood**

Prepared By:  
Catchment Simulation Solutions  
Suite 2.01, 210 George St  
Sydney, NSW 2000

File Name: Fig 17 - Flood Depths 20AEP.wor





# Bigger Events (1% AEP)

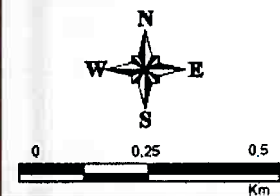


### LEGEND

Depths (m)

0.0 - 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 2.0
>= 2.0

Notes:  
Aerial photograph date: 2015



**Figure 19:  
Floodwater Depths  
for the 1% AEP Flood**

Prepared By:  
Catchment Simulation Solutions  
Suite 2.01, 210 George St  
Sydney, NSW 2000  
File Name: Fig19 - Flood Depths 1AEP.wor





# Bigger Events (0.2% AEP)





## Existing Flood/Drainage Summary

- Flooding behind the levees can occur during relatively frequent event
- Big “jump” in risk / damage between 1% AEP and 0.2% AEP
- Areas east of Knox Park have the potential to be isolated early in the flood and are predicted to be inundated during large floods
- Protection afforded by levees:
  - Commercial Rd < 1% AEP
  - East Murwillumbah ~1% AEP
  - Dorothy St > 1% AEP (but < 0.2% AEP)

## What happened next?

- Community consultation
- Evaluating options for better managing the existing flooding/drainage problem



# Community Consultation



## Community Consultation

- Questionnaire sent out to >800 households and businesses
- Received 116 questionnaire responses back
- Questionnaire had 3 primary goals:
  - To determine if people have experienced flooding
  - To determine the level of flood awareness and how people would respond during future floods
  - To seek feedback on flood/drainage management options



## Community Consultation

- Flood awareness:
  - 19% did not know whether they could be flooded
  - 63% who claimed they “could not be flooded” were within the PMF extent
- Flood response:
  - 57% indicated they would remain at home (primary reason - my home can not be flooded)
  - 16% indicated they would evacuate to an official evacuation centre
  - 10% had no plan!

# Assessment of Options

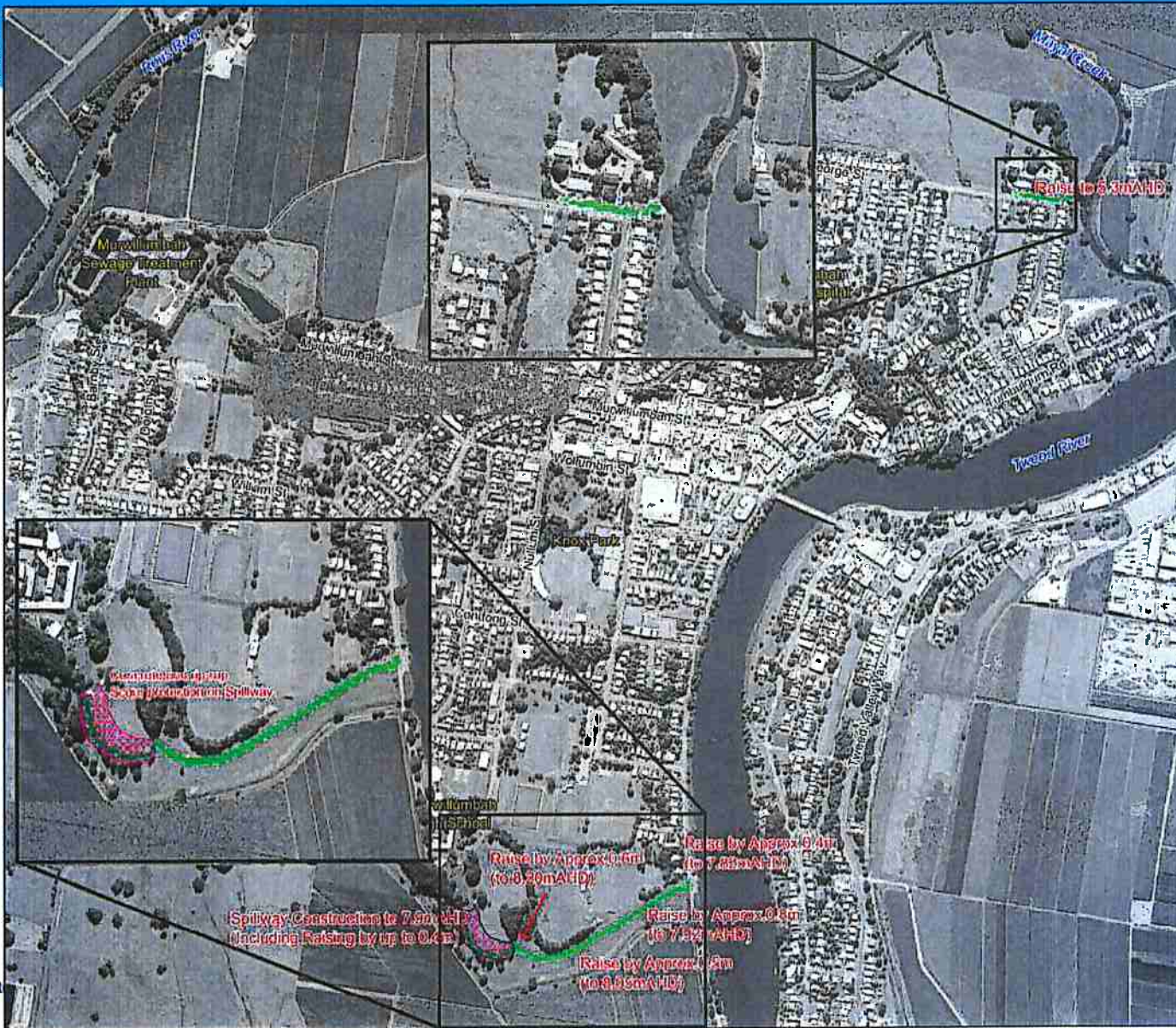




## Assessment Approach

- 11 different options investigated (structural and non-structural)
- Assed against the following criteria:
  - Hydraulic impacts
  - Financial feasibility
  - Community acceptance
  - Emergency response benefits

# Option A – Levee Raising

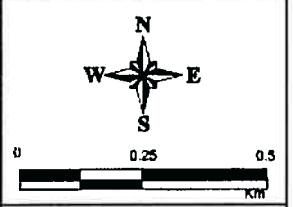


**LEGEND**

Cut / Fill (m)

Dark Red	-2.50
Red	-1.00
Orange	-0.50
Yellow	-0.10
White	No Change
Light Green	0.10
Green	0.50
Dark Green	1.00
Very Dark Green	2.50

**Notes**  
Aerial photograph date: 2015



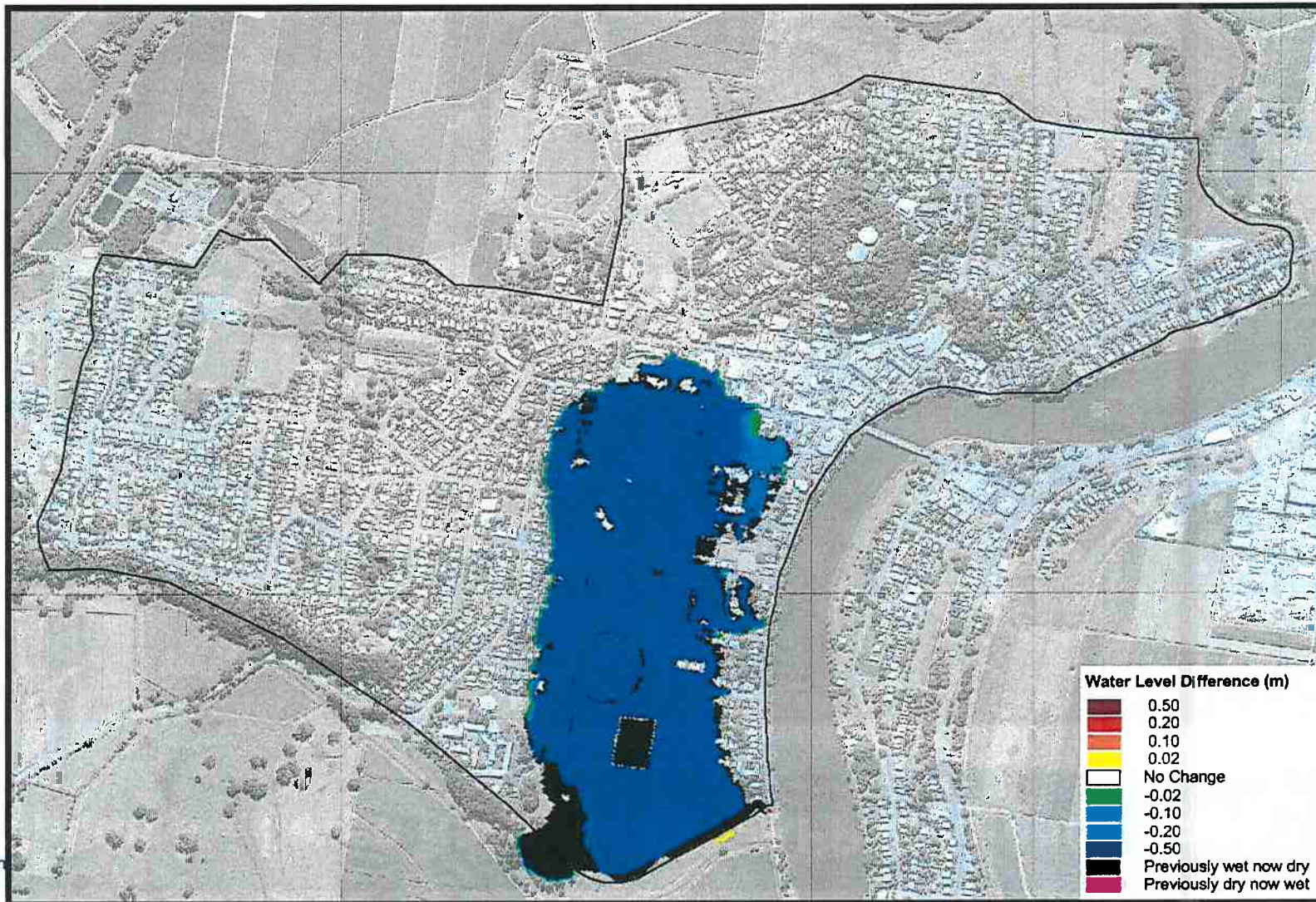
**Figure H1:  
Levee Raising  
Locations**

Prepared By:  
Catchment Simulation Solutions  
Suite 2.01, 210 George St  
Sydney, NSW 2000  
File Name: Fig H1 - Levee Raising.wor



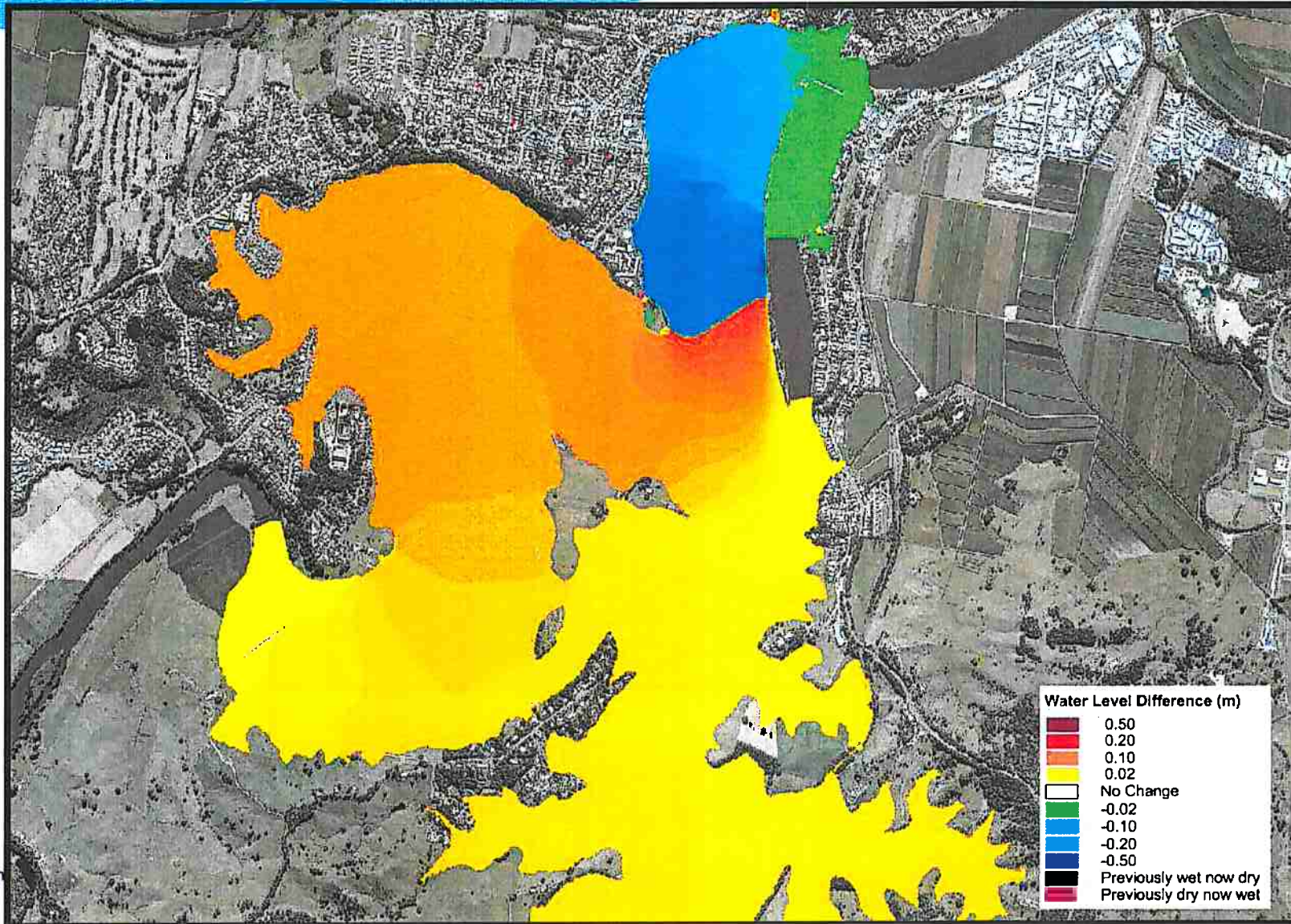


# Option A – Levee Raising (1% AEP difference map)





# Option A – Levee Raising (0.2% AEP difference map)





## Option A – Levee Raising

- Supported by the community
- Financial:
  - \$4.6 million to implement
  - BCR < 0.1
- Emergency Response:
  - Additional 4 hours to evacuate during 0.2% AEP
- Recommendation: not recommended for implementation, however....

## Option A – Levee Raising

- 1 Levee remediation is recommended:
  - 2 Elevating levee sections that have “settled” over time
  - 3 Look to install a formalised spillway so that overtopping occurs in a controlled manner at a known location





# Option B – New & Upgraded Pump System

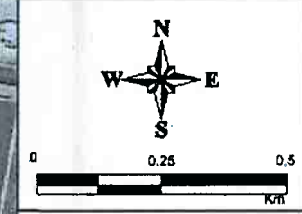


Figure Extent



**LEGEND**

Notes:  
Aerial photograph date: 2016



**Figure H2:  
Additional Pump  
Locations**

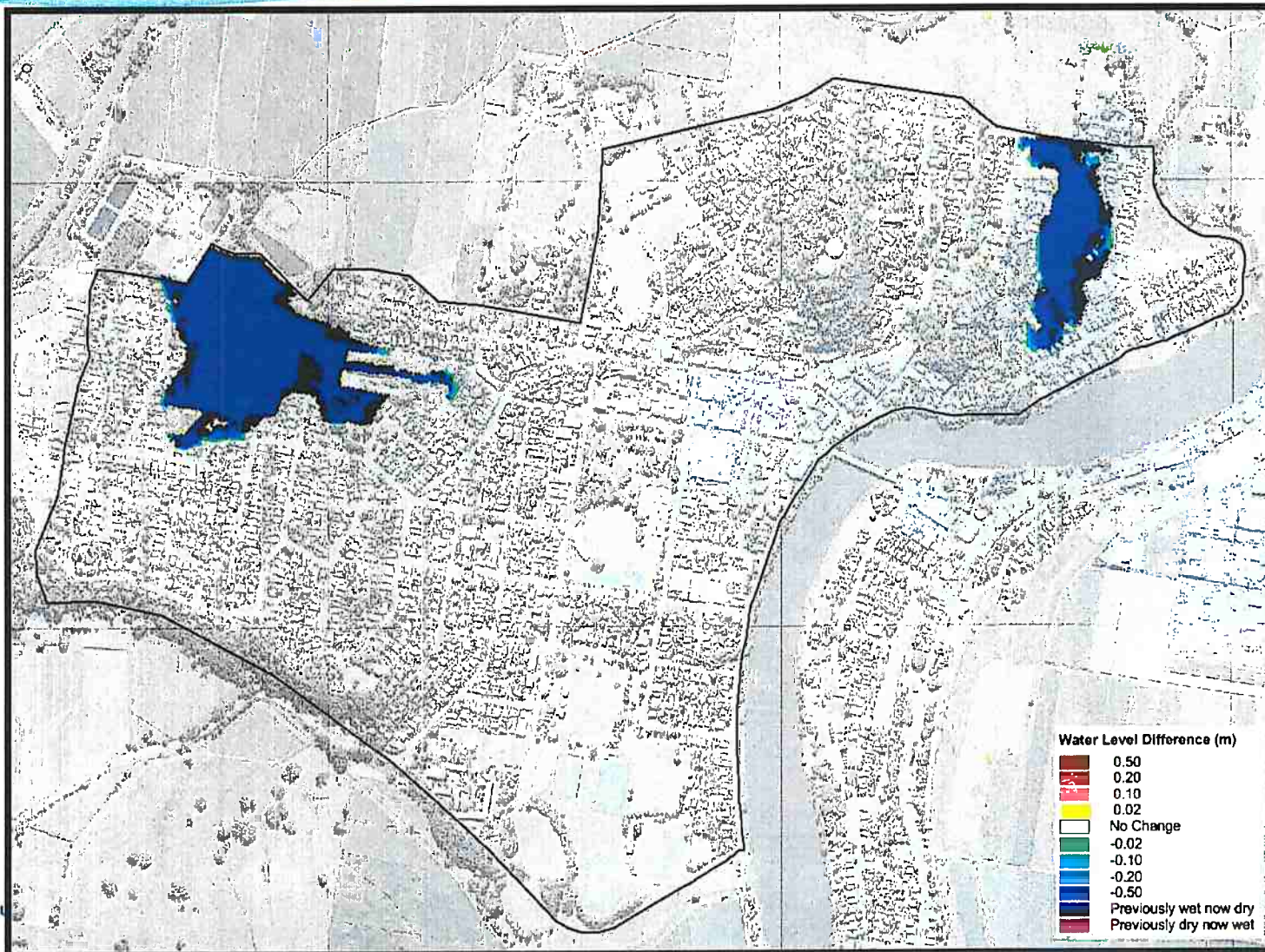
Prepared By:  
Catchment Simulation Solutions  
Suite 2.01, 210 George St  
Sydney, NSW 2000

File Name: Fig H2 - Additional Pumps wor



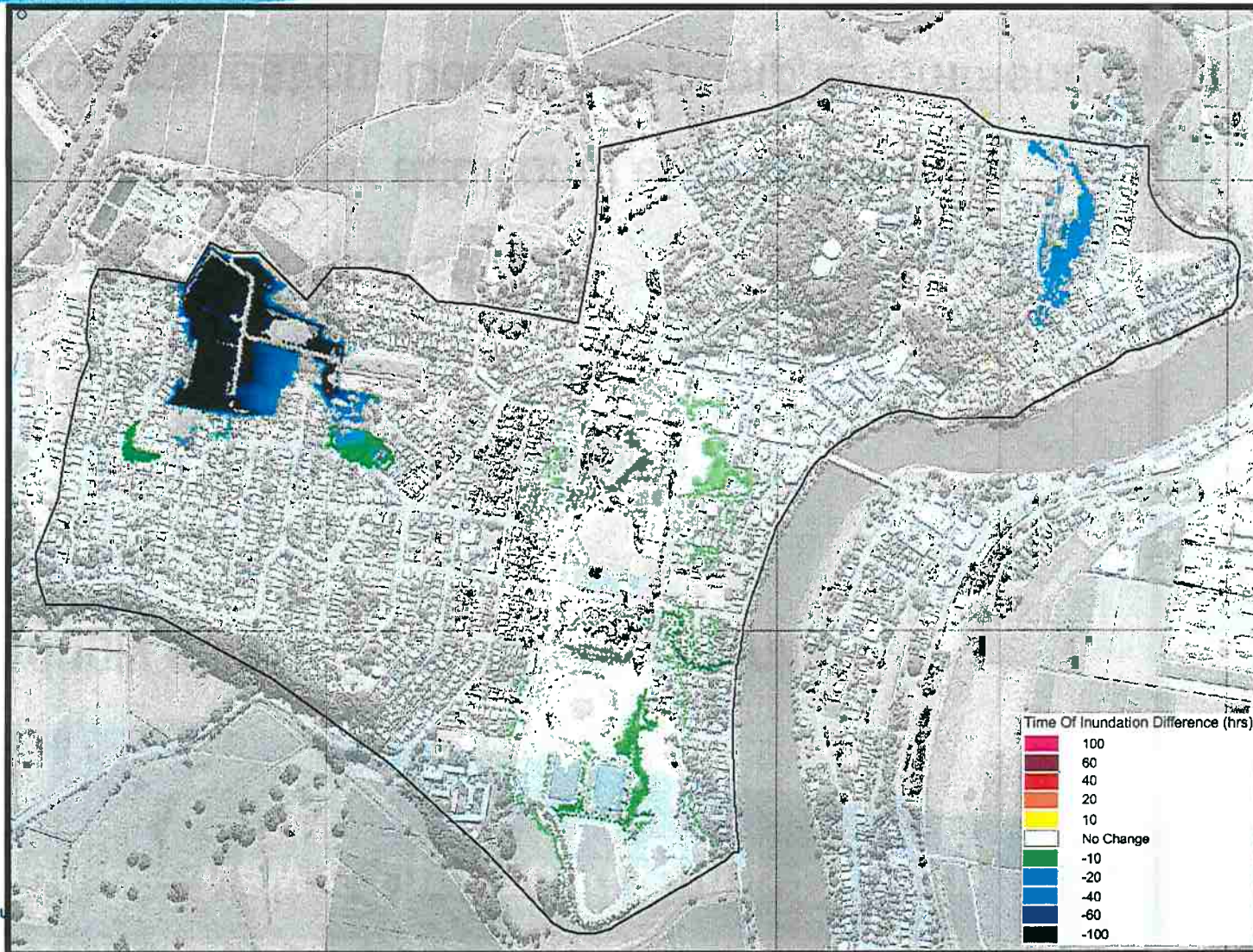


# Option B – New & Upgraded Pump System (1% AEP)





# Option B – New & Upgraded Pump System (1% AEP)

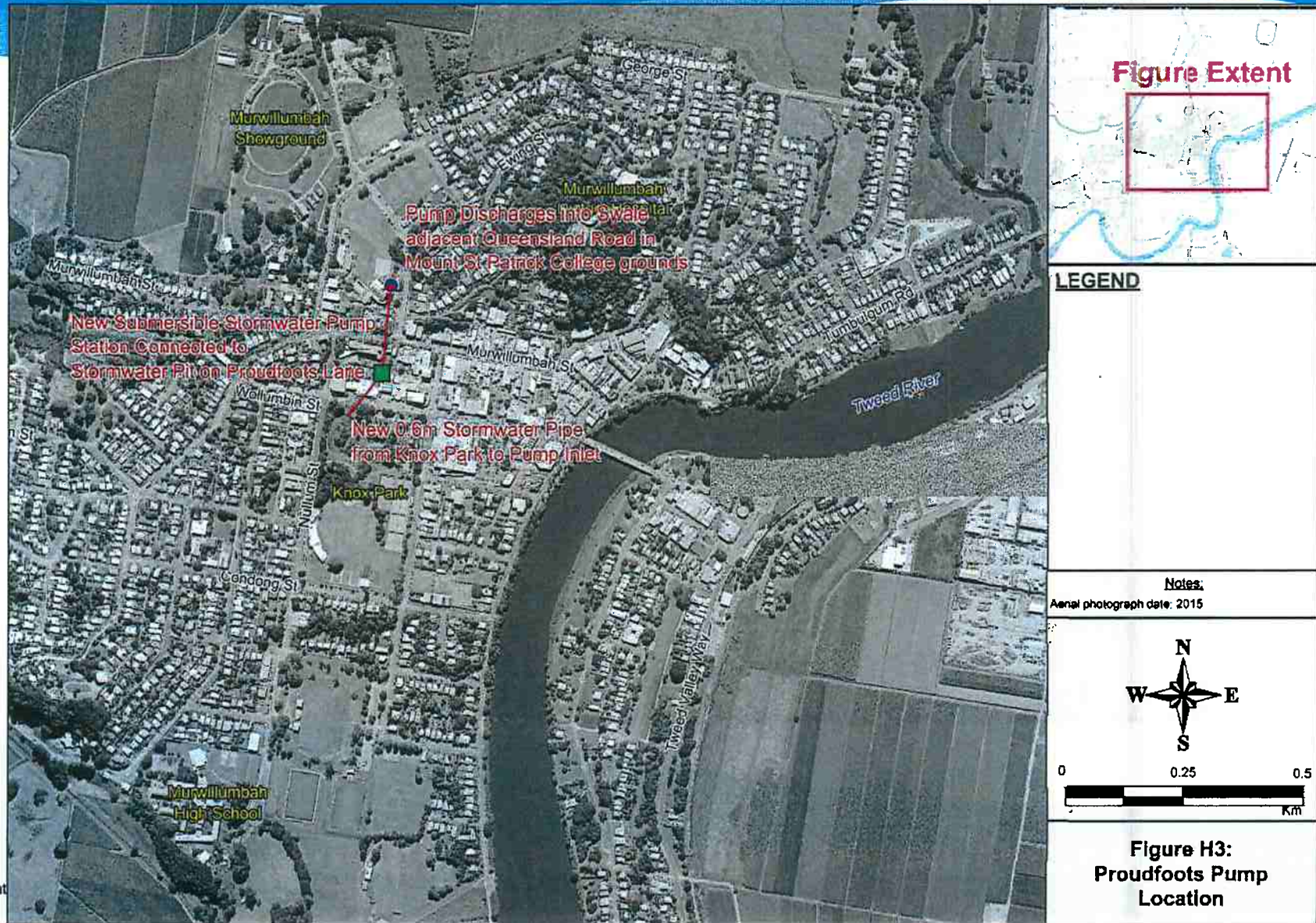


## Option B – New & Upgraded Pump System

- Strongly supported by the community
- Financial:
  - \$2.4 million to implement
  - BCR < 0.1
- Emergency Response:
  - Up to 1 hour additional evacuation time
- Recommendation: Dorothy St pump recommended for implementation

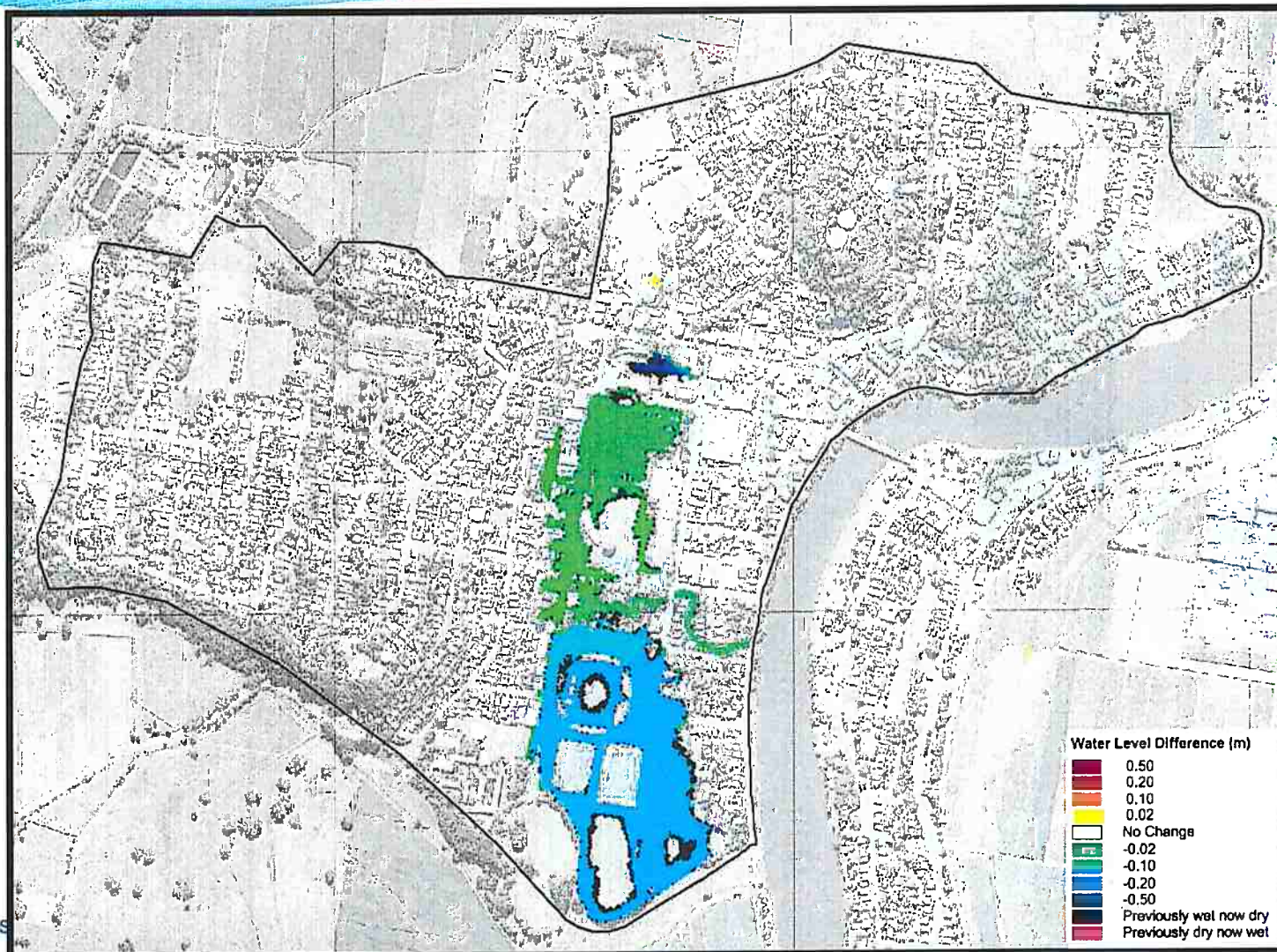


# Option C – Proudfoots Lane Pump System



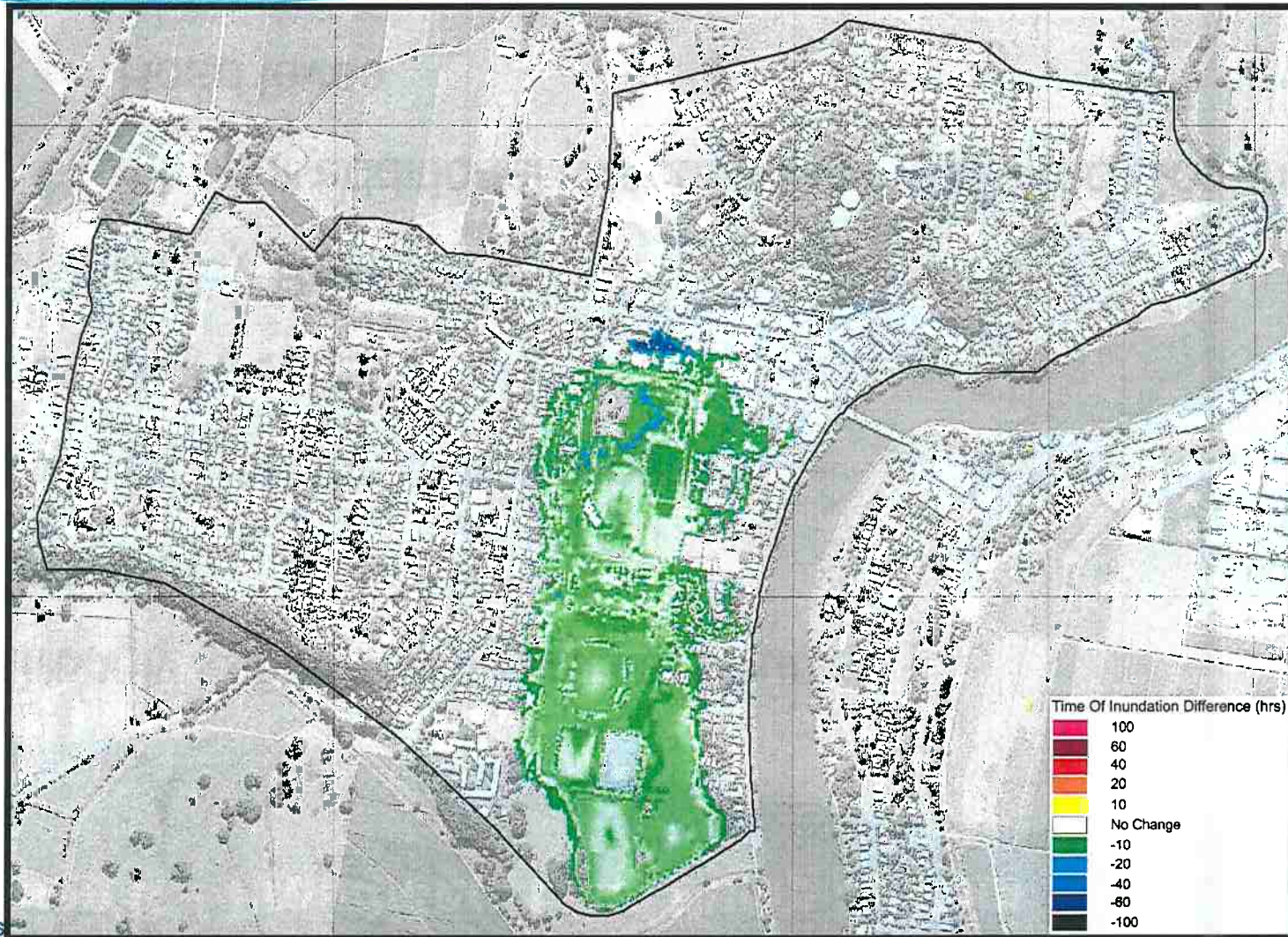


# Option C – Proudfoots Lane Pump System (20% AEP)





# Option C – Proudfoots Lane Pump System (1% AEP)



## Option C – Proudfoots Lane Pump System

- Strongly supported by the community
- Financial:
  - \$2.7 million to implement
  - BCR < 0.2
- Emergency Response:
  - ~1 hour additional evacuation time behind Commercial Road levee
- Recommendation: High cost limits feasibility

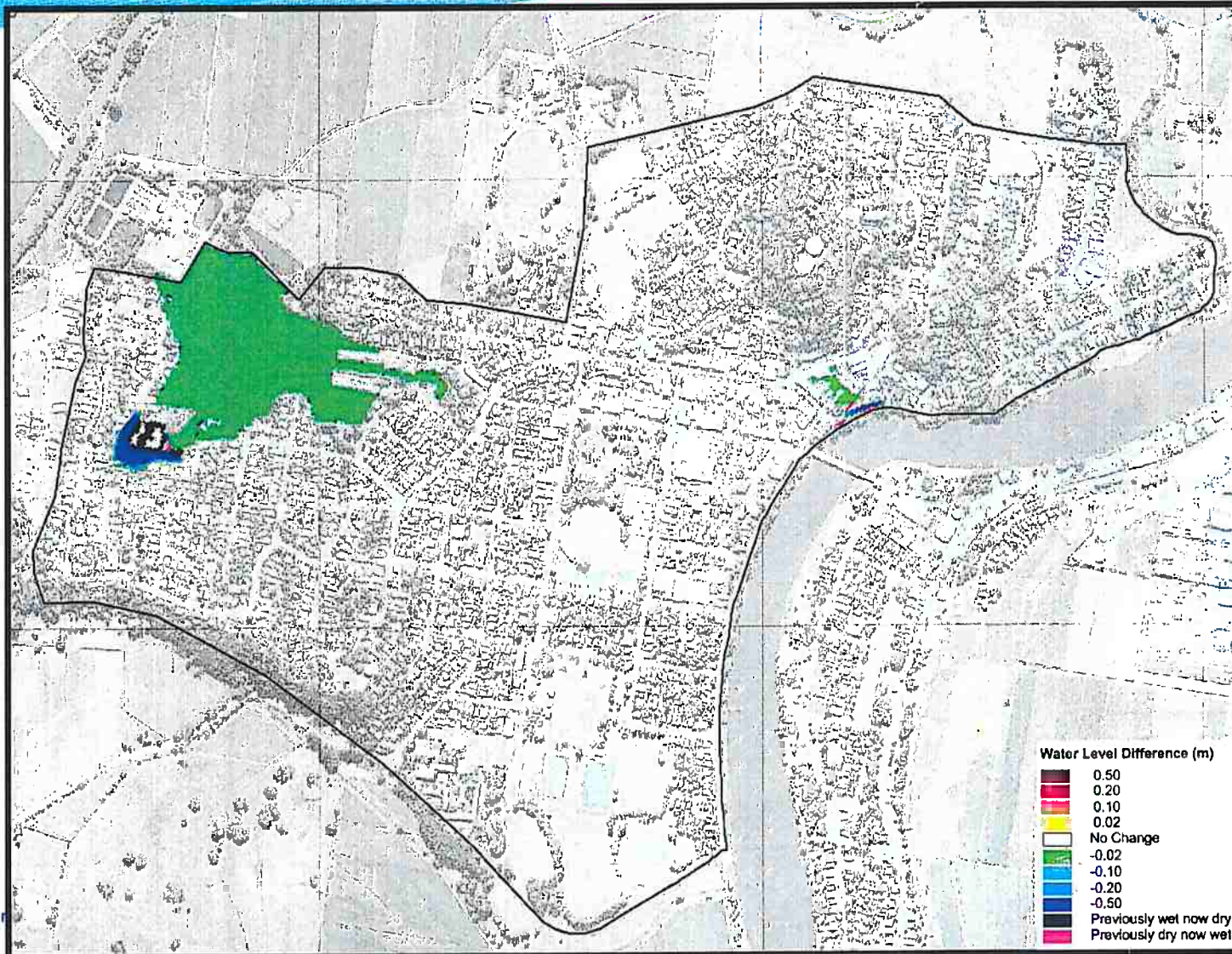


# Option D – Regrading of William St and Wharf St





# Option D – Regrading of William St and Wharf St (1% AEP)





## Option D – Regrading of William St and Wharf St

- Strongly supported by the community
- Financial:
  - \$1.4 million to implement
  - BCR < 0.05
- Emergency Response:
  - ~30 minutes additional evac time along Commercial Road / Wharf Street
- Recommendation: Not recommended



# Option E – Drainage Upgrades

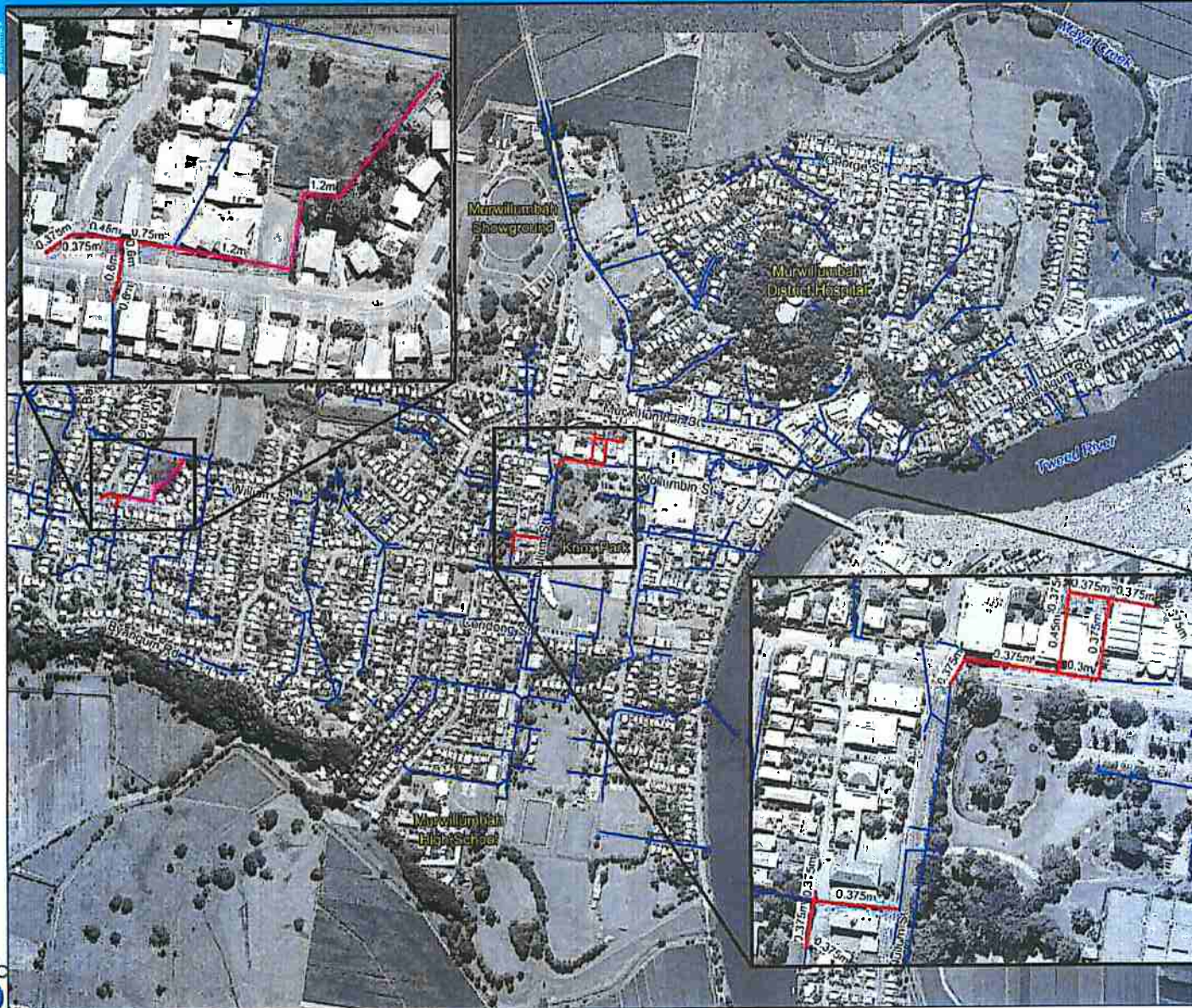


Figure Extent



### LEGEND

- Stormwater Network
- Existing Stormwater Pipe
  - Duplicated Stormwater Pipe
  - New Stormwater Pipe

Notes:  
Aerial photograph date: 2015

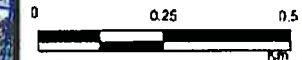
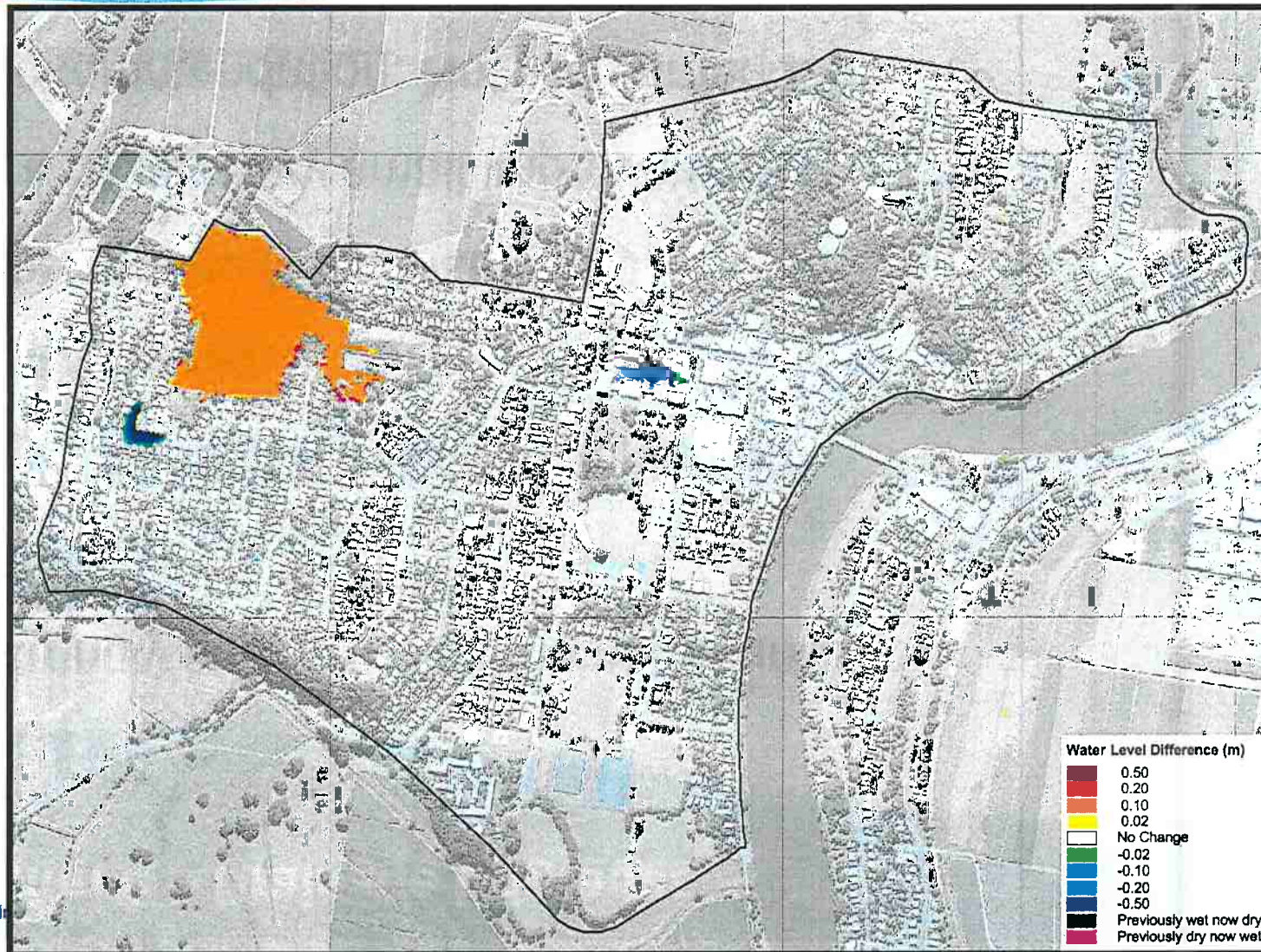


Figure H5:  
Stormwater Upgrade Locations

Prepared By:  
Catchment Simulation Solutions  
Suite 2.01, 210 George St  
Sydney, NSW 2000



# Option E – Drainage Upgrades (20% AEP)



## Option E – Drainage Upgrades

- Strongly supported by the community
- Financial:
  - \$880,000 million to implement
  - Negative BCR
- Emergency Response:
  - Only very small improvements
- Recommendation: Not recommended

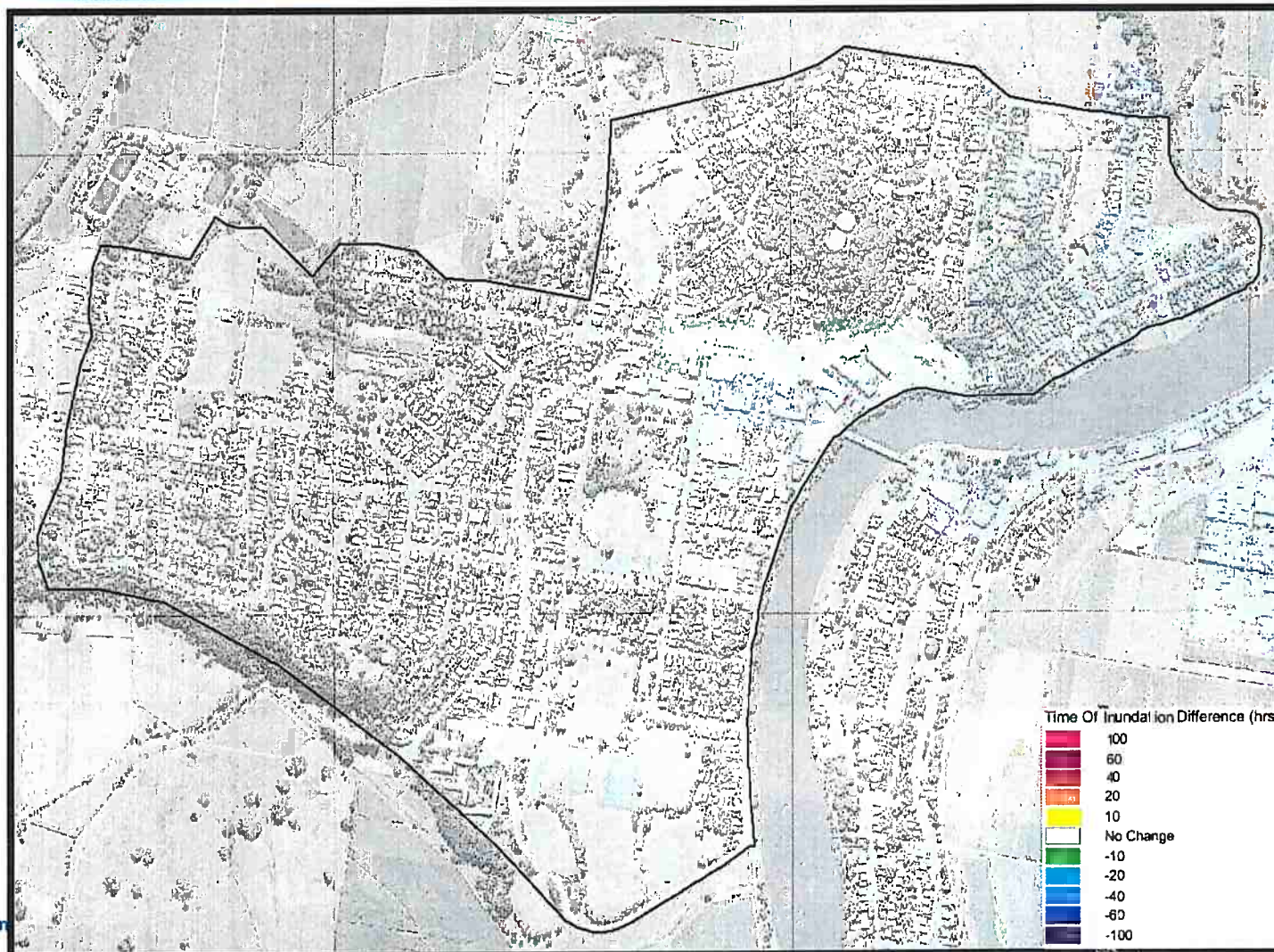


## Option F – Commercial Road Levee Gate Modifications





# Option F – Commercial Road Levee Gate Modifications (0.5% AEP)





## Option F – Commercial Road Levee Gate Modifications

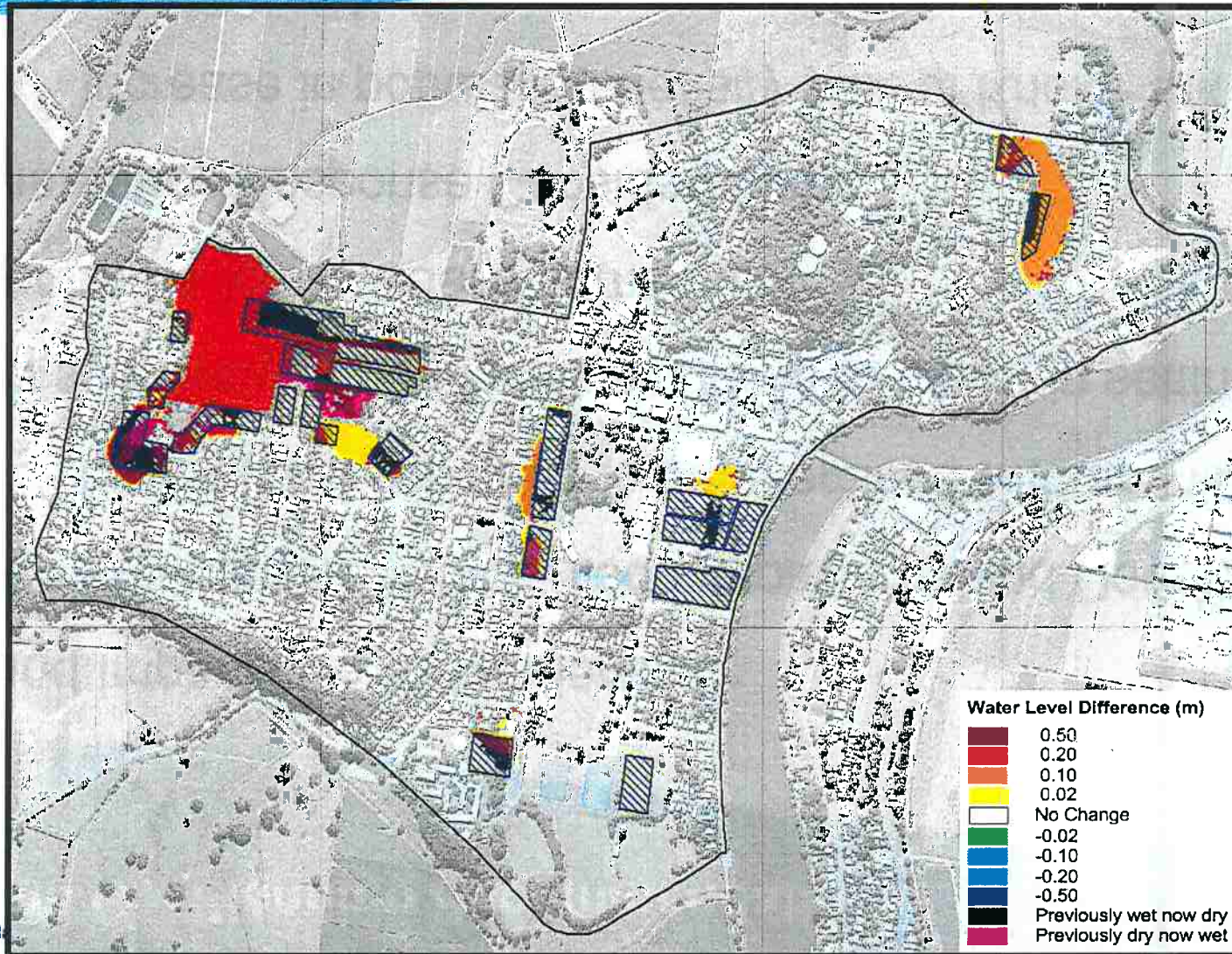
- Supported by the community
- Financial:
  - \$60,000 to implement
  - BCR = 0
- Emergency Response:
  - Minimal improvements
- Recommendation: Not recommended

# Option G – Planning/Development Recommendations





# Option G – Planning/Development Recommendations (20% AEP)



## Option G – Planning Recommendations

- Flood Impacts Considerations:
  - Potential for notable flood impacts behind Dorothy St Levee (care will need to be exercised with any filling)
- Revised design flood levels available to assist in setting floor levels for new developments
- Emergency Response Considerations:
  - Increase in population density east of Knox Park not recommended



## Option H – Flood Barriers for Commercial Properties



## Option H – Flood Barriers for Commercial Properties

- Supported by the community
- Financial:
  - \$~21,000 per property (average frontage of 5m)
  - BCR = 1.1
  - Would be reliant on individual property owners to purchase
- Recommendation: Recommended for implementation



## Option I – Local Flood Plan / Flood Intelligence Updates

- Local flood plan / flood intelligence updates recommended based on:
  - Information from ex-tropical cyclone Debbie
  - More detailed flood information produced as part of the current study (e.g., emergency response classifications, road overtopping information)

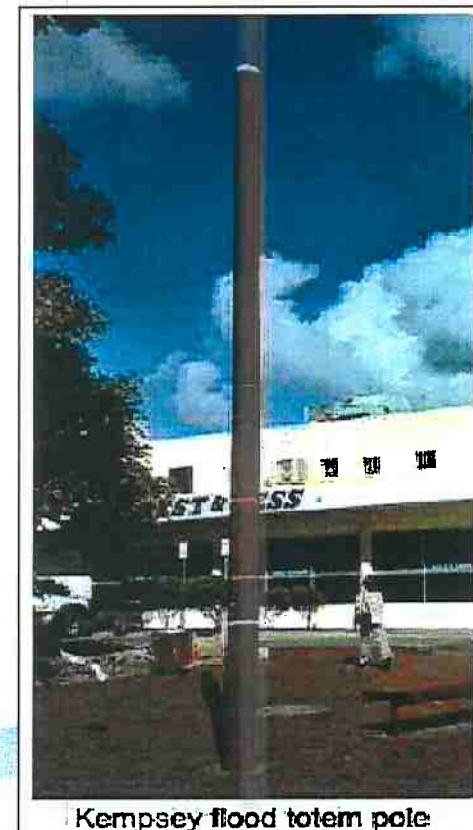
## Option J – Flood Warning System Updates

- Bureau of Meteorology's Flash Flood Advisory Resource (FLARE) was used to identify areas where current flood warning system could be improved.
- Review identified the following areas for improvement:
  - Communication (SMS warnings, social media)
  - Response (community education)



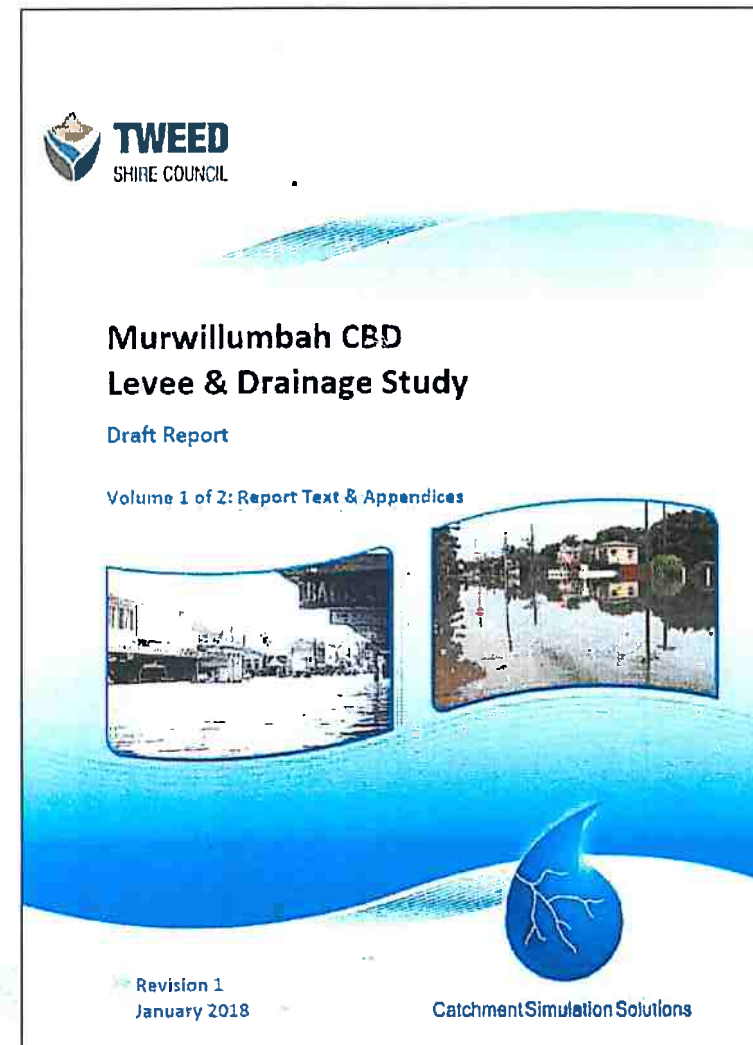
## Option K – Community Education

- A residual flood risk will always remain!
- The following community education opportunities were identified:
  - Flood Markers
  - Educational messages
  - Property Level Flood Information



# Report

- Draft report provided to Council last month
- Comments on draft report will be addressed and incorporated into a final draft report
- Final draft report will be placed on public exhibition





# Questions?



