Planning and Design of the South Rockhampton Flood Levee
Queensland, Australia

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History and Overview
The Fitzroy Catchment

• The Fitzroy River Catchment area is approximately 142,000 square kilometers

• The largest river catchment flowing to the eastern coast of Australia

• Due to its immense size and fan-like shape, the catchment is capable of producing severe flooding

• Most significant historical flood events typically the result of ex-tropical cyclones

• Long-duration flood events (weeks)

• Large flows at Rockhampton > 16,000 m³/s (565,000 cfs)
Fitzroy River Flooding at Rockhampton

- Rockhampton has a long history of flooding (records date back to 1859)
- During major floods, the flow breaks out of the Fitzroy River at the Pink Lilly meander
- Bruce Highway, North Coast Rail, and Capricorn Highway are submerged
- Significant community impacts
2011 Flood Event
Feasibility Study and Options Analysis
Project Objectives

The overarching objectives of the project are:

• Develop a levee system that will protect low-lying areas of Rockhampton occupied by homes, businesses, schools, parks, and infrastructure from major flood events

• Improve the flood immunity of the Bruce Highway

• Minimize adverse impacts of the levee (visual amenity, hydraulics, environmental, existing infrastructure, resumptions)

• Develop a cost-effective strategy that warrants investment

• Address regulatory challenges (or lack of regulatory framework challenges)
Assessment Framework – High-Level Tests

**Effectiveness**
- Will the option meet targets and objectives?

**Feasibility**
- Will the option be buildable and cost effective?

**Acceptability**
- Will the option be acceptable?
What Are We Trying to Protect?

Parks, schools, and infrastructure

Businesses

Residential areas
Constraints and Stakeholder Considerations

Wetlands

Power lines

Constriction of flow path

Rail crossing

TMR infrastructure

Connectivity, visual impacts, and heritage trigger areas along Quay St.
Identified Options
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Regional Ecosystems and Essential Habitat Mapping
Watercourse and Wetland Mapping
Two-Dimensional Modeling
Peak Flood Depths and Extents (5% AEP) Developed Case

(8.95m GL Post Levee)
Difference in Predicted Water Surface Elevations

(8.95m GL Post Levee)
Internal Drainage

- Assessment of local drainage impacts
- Provision for backflow prevention
- Drainage augmentations and pump stations
1% AEP Local Rainfall Event (No Levee)
1% AEP Local Rainfall Event (with Levee)
Key Infrastructure – Quay Street
Key Infrastructure – Powerlink Easement
Key Infrastructure – QR North Coast Line
Key Infrastructure – Road Interface
Key Infrastructure – Stormwater Outfalls
Levee Configuration Options – Earth Levee
Levee Configuration Options – Adjacent Transmission Tower

OPTION 1 - Crib Wall

OPTION 2 - Sheet Pile
Levee Configuration Options – Quay Street
(Fitzroy Street to Derby Street)
Option Selection
Option 3 – Selected Option

- Encompasses key commercial and residential properties in Depot Hill and Port Curtis
- Avoids most environmental issues
- Encompasses major infrastructure (Sewage Treatment Plant, Rosel Park)
- Moderate effects on flows and afflux
- Lesser interference with power transmission lines

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Benefits – Protects Commercial Properties

• The selected option alignment protects key commercial properties, which offers the following benefits:
  – Mitigates flood impacts to local businesses due to forced closure and damage costs
  – Hastings Deering – 800 employees and suffered ~$25M in damages during past two flood events
  – Toll Intermodal – freight lifeline for all residents
Benefits – Protects Residential Areas

• The selected option alignment protects residential areas, which offers the following opportunities and benefits:
  – Protects over 1,000 properties including dwellings, commercial and rural properties
  – Provides urban renewal opportunities
  – Potential reductions in insurance rates and clean-up costs
Benefits – Protects Community Infrastructure

• The selected option alignment protects community infrastructure, which offers the following opportunities and benefits:
  – Mitigates flood impacts to public infrastructure (e.g., Sewage Treatment Plant and Pound) and reduces disaster management costs
  – Provides recreational possibilities such as the creation of Linear Parkland, connection between the CBD and Botanical Garden, and expanded use of Rosel Park
  – Improves the flood immunity of the Bruce Highway (Lower Dawson Rd.)
Benefits – Cost-Benefit Analysis

• Flood-damage model used for a range of flood events to calculate average annual damage before and after the levee is in place

• Reduction in flood damages in a 1% AEP flood event estimated be between $37.8 million and $45.9 million

• Reduction in average annual damages between $1.8 million and $2.1 million as a result of the proposed levee
Preliminary Economic Appraisal

• Preliminary appraisal carried out to assess the economic viability of the project.

• Benefits and disbenefits input to an economic model. Ten different sensitivities carried out.

• Average BCR is 1.6.

• The appraisal shows the project is viable and of relatively low risk at most discount rates and sensitivities and therefore is worthy of consideration.

• The fact that the first year rate of return is higher than the 7% discount rate is a good indication of project viability and indicates the project should proceed immediately.
Levee Types

Earth Levee + Vinyl Sheet Pile

Crib Wall / Embankment System
Levee Types

Composite Wall System

Temporary “Stoplog” System
Community Engagement and Outreach
Community Engagement and Outreach

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Community Engagement and Outreach
Community Engagement and Outreach
Outcomes and Lessons Learned

- Stakeholder engagement and building public support need to start EARLY!
- Clearly communicating the process
- Clear definition of key objectives
- Understanding everyone may not be happy
- Be prepared for a LOT of experts in the community!
- In the end, technical design challenges are the “easy” part
Thank You