Surface Water
Rob Leslie

Surface Water Impact Assessment
Presenter

Rob Leslie, Principal Water Resources Engineer, WSP

- Chartered Civil Engineer
- 22 years experience (10 with WSP)
- Technical background in water engineering
- Particular focus on flood risk management; flood modelling; stormwater and drainage design; stormwater quality management, water quality modelling
- Led flooding and drainage design work on several major transport projects including Woolgoolga to Ballina Pacific Highway Upgrade (150km) and Inland Rail Freight Line Upgrades (300km)
## Surface Water Impact Assessment Presentation Overview

### EES Studies
- Methodology and work completed to date
- Existing conditions
- Impact assessment
- Further work undertaken
- Summary of impact assessment outcomes

### Submissions
- Themes
- Responses
- Specific responses to other expert witness reports

### Environmental Performance Requirements (EPRs)

## Surface Water Impact Assessment Methodology

<table>
<thead>
<tr>
<th>Establish design and assessment criteria</th>
<th>Legislation and Policies</th>
<th>Local and State guidelines and best practice</th>
<th>Identify sensitivities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish existing conditions</td>
<td>Drainage systems</td>
<td>Flow and water quality regimes</td>
<td>Flood behaviour</td>
</tr>
<tr>
<td>Risk assessment</td>
<td>Risk identification</td>
<td>Risk workshops</td>
<td>Quantitative risk assessment</td>
</tr>
<tr>
<td>Impact assessment</td>
<td>Flow impacts</td>
<td>Water quality impacts</td>
<td>Flooding impacts</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>Resolve / reduce impacts through design modification</td>
<td>Identify residual impacts</td>
<td>Mitigation recommendations and Environmental Performance Requirements</td>
</tr>
</tbody>
</table>
Surface Water Technical Reports Completed

- Hydrologic and Hydraulic Modeling
  - August 2018
- Surface Water Impact Assessment
  - October 2018
- Summary of Climate Change Impacts
  - November 2018

Existing Conditions

Flow Regime

- Established using a model calibrated to streamflow gauge on Dunlops Drain in Mordialloc Creek Catchment
  - Dunlops Drain median flow 1.2 ML/d
  - Woodlands Estate Wetland median flow 0.98 ML/d
- Separate water balance model developed for Edithvale Wetlands
  - Edithvale Wetland median flow 0.002 ML/d
- Significant periods of low to no flow
**Existing Conditions**

**Water Quality**

- Water quality data collected within Mordialloc Creek catchment and Edithvale Wetlands indicates water quality is poor but improving over time.
- Water quality data collected in Waterways Wetlands indicates better water quality than above.
- No data available for Woodland Industrial Estate Wetlands.

**Flooding**

- Model used to establish existing overland flow paths and flood extents, depths, velocities and hazard ratings.
Impact Assessment

Methodology

Flow Regime
- Based on calibrated MUSIC model
- Water balance model for Edithvale Wetlands
- Assessment impact by change in land use characteristics

Water Quality
- MUSIC modelling
- Achievement of WSRD target
- No increase in pollutant loadings into the wetlands

Flooding
- RORB model for hydrology
- TUFLOW 2-D model for hydraulics
- North model covers the section of the Project between Dingley Bypass and Mordialloc Creek.
- South model covers the section of the Project between Mordialloc Creek and Thames Promenade.
- Baseline model geometries adjusted to represent the Bypass corridor and infrastructure

Outcomes – Water Quality and Flow

- Water Body Health
  - Low impact on water body health - design can achieve the required WSRD targets for the project area as a whole
  - Localised mitigation measures are required to ensure no increase in pollutants loadings entering the three wetlands
  - Minimal impact on flow regime

- Oil and Fuel Spill
  - Areas where accident and spill risk is assessed as high are to be protected using spill containment, moderate risk areas protected using widened swales
Outcomes - Flooding

Performance requirements:

- No change in peak flood level and velocity up to 1% AEP
- No reduction in floodplain storage

Generally compliant with no change in flood parameters, however, floodplain storage reduced in Braeside Park (approx. 5%)

Exceptions:

- Location 1: 10 to 500mm impact within Braeside West D.S. Drain
- Location 2: 10 to 46mm impact around Dingley Drain near Braeside Park
- Location 3: 10 to 55mm near The Waterways but contained within project boundary
Further work undertaken

Additional Flooding Analysis

- Further assessment of climate change impacts
  - Further assessment of the three impacted areas under the climate change scenario (0.8m sea level rise + 17% increase in rainfall intensity)
  - Further assessment of joint probability of flooding and high tides
  - Impacts increase under climate change with afflux ranging from 15 to 220mm and occurring over approx 60 properties
  - Concluded that impacts at 2 out of 3 locations can be mitigated through design modifications at detailed design stage, including areas of highest impact
  - Third location can also be mitigated somewhat, but impacts are lowest (max of 27mm afflux) and only occur under most severe and low probability event combinations (100 year flood occurring at same time as 100 year surge tide)

Further work undertaken

Alternative Infrastructure Option

- Assessment of alternative arrangement at Lower Dandenong Road interchange
  - No additional obstruction of flows
  - No significant change in road pavement area
  - Effects assessed to be very similar to EES / Reference Design
Impact Assessment

Summary of Outcomes

- Flow
  - Minimal impact on flow regime
- Water quality
  - Impacts mitigated through stormwater treatment and spill containment measures provided in design
  - WSRD targets achieved
- Flooding
  - Impact criteria met for most of the adjacent floodplain
  - 3 areas experience afflux >10mm
  - No increase in flood hazard
  - Impacts increase under climate change scenario but areas of most significant impact (afflux > 27mm) can be mitigated through design modifications

Submissions

Themes

- Flooding impacts on private properties
- Adequacy of road drainage design
- Contamination of wetlands/waterways from runoff from works area during construction
- Contamination of wetlands/waterways from runoff from road pavement after construction
- Flooding impacts of temporary works during construction
- Flooding and drainage impacts under climate change
- Flooding impacts on private properties
  - Impacts confined to already flood prone areas within existing channels, floodways and overland flow paths
  - No increase in flood hazard around buildings or accesses to buildings
  - Reductions in flood hazard around some commercial areas

- Adequacy of road drainage design
  - Road drainage design based on achieving minimal change to existing flooding and drainage processes and to meet Melbourne Water’s flood impact criteria
  - Transverse drainage system and associated flood impact mitigation measures (compensatory flood storage provided within the project boundary) have been designed to minimise changes to the existing flooding and drainage regime

- Contamination of wetlands/waterways from runoff from works area during construction
  - Construction phase will manage water quality impacts through:
    - A Construction Environmental Management Plan to be approved by EPA Victoria and implemented prior to construction that will incorporate best practice sedimentation and pollution control measures in accordance with EPA Victoria publication 480 Environmental Guidelines for Major Construction Sites and EPA publication 275 Construction techniques for sediment pollution control
    - A water collection and treatment system to be designed and approved by Melbourne Water prior to construction that will comply with the State Environment Protection Policy (Waters of Victoria) 2004 (and subsequent updated policy State Environment Protection Policy (Waters) 2018) and Melbourne Water performance criteria

- Contamination of wetlands/waterways from runoff from road pavement after construction
  - Drainage design has incorporated stormwater quality management measures to treat runoff from the road corridor and protect the adjacent waterways and wetlands from pollution, including:
    - Vegetated swales to treat runoff from the road corridor
    - Additional bio-retention systems at road drainage outfalls into Edithvale, Waterways and Woodlands Industrial Estate Wetlands
    - Spill containment within swales and separate containment systems
Submissions

Responses

– Flooding impacts of temporary works during construction
  • During construction requirements of Melbourne Water standards for infrastructure in flood prone areas must be complied with
  • Measures must be implemented to the satisfaction of Melbourne Water (and other drainage authorities) to ensure that temporary construction activities do not increase flood risk to surrounding areas
  • A flood management plan must be developed in consultation with Melbourne Water for any temporary works

– Flooding and drainage impacts under climate change
  • Impacts shown to increase under climate change scenario
  • Can be mitigated at detailed design stage through:
    • Earthworks and drainage design refinements
    • Alignment refinements to allow overtopping in extreme events

Submissions – specific responses to other expert reports

Warwick Bishop (Water Technology) on behalf of Kingston City Council

Key recommendations and responses

• Confirmation of the impacts of afflux on the general health and ecology of the receiving wetland systems downstream, particularly the Woodlands Wetlands
  • Ecology team have confirmed predicted afflux will not affect health and ecological function of wetlands

• An Asset Management Plan be established to cover all proposed on-going maintenance and “full reset” activities including lifecycle costing
  • This is a standard requirement of MRPA/VicRoads for projects of this nature

• Considering the scale, complexity and sensitivity of the study area it is recommended sensitivity testing between AR&R 1987 and AR&R 2016 be undertaken
  • Section 5.6.3 of the Hydrologic & Hydraulic Modelling Report discusses the difference in rainfall depths between the two guidelines and demonstrates that AR&R 1987 rainfall depths are higher for the critical storms for this catchment. Therefore, the current flood model (which is based on AR&R 1987) is conservative
  • Melbourne Water have agreed to preserve the model in AR&R 1987 form as the current flood risk management datasets for the catchment are based on this guideline
  • No sensitivity testing considered necessary
Warwick Bishop (Water Technology) on behalf of Kingston City Council

Key recommendations and responses

• Recommend further modelling be undertaken to ensure no catastrophic flooding occurs as a result of the bypass in the 0.5% and 0.2% AEP design floods
  • Section 9.4.2 of the Hydrologic & Hydraulic Modelling Report presents results of a qualitative assessment of the effects of rare and extreme events. This indicated that the project should not modify or obstruct overland flow paths during events > 1% AEP in most areas. The Smythes Drain and Springvale Road warrants further investigation at detailed design.
  • Agree that the 0.5 and 0.2% AEP events (and 0.05% AEP for bridge stability) should be assessed but this can be deferred to detailed design as the qualitative assessment does not indicate any critical risks associated with these events

• Localised hydraulic models with grid resolution of finer than 4 m should be used to test drainage around areas of sensitivity such as residences close to the bypass
  • Agreed and also included as a recommendation in the Hydrologic & Hydraulic Modelling Report (section 10.2.1) for the detailed design stage
  • Considered appropriate to defer to detailed design when more detailed road and pavement drainage system models are developed

A Prout & P Clemson (Engeny) on behalf of Anna Lugeo Nominees

Key recommendations and responses

• The Project should consider changes made to land levels within the property which has changed the flood behavior within the property close to the Project boundary
  • Inclusion of updated topography within the flood model is unlikely to change the impact assessment as the Engeny report shows that topographic changes on the property do not affect the flood behaviour upstream and immediately downstream of the project area, and the EES modelling shows that the project will reduce flood levels on the property
  • The updated topography should be incorporated into the flood model at the detailed design stage
Submissions – specific responses to other expert reports

Lance Lloyd (Lloyd Environmental) on behalf of Kingston City Council

Key recommendations and responses

- **Lack of detail in EPR W1 on protection of water body health**
  - The EPR sets out the principles to be followed, the details of the management measures are to be determined at detailed design when the pavement drainage system and water quality management measures are confirmed.

- **Lack of detail in EPRs W3 and W5 on surface water management during construction and monitoring plan for water quality**
  - As above, the EPR sets out the principles to be followed, the details of the management measures are to be determined prior to construction as part of the required environmental management plans.
  - Typical measures for sediment and erosion control associated with bulk earthworks would include minimisation of disturbed areas, progressive revegetation of disturbed areas, dust control, soil and stockpile management, clean water diversion, stabilisation and drainage of access tracks and temporary sediment basins to collect runoff from disturbed areas where required.
  - For any contamination hotspots that may be disturbed during piling or other activities, more specific controls would apply to prevent contaminated runoff discharging to waterways or wetlands.

### Environmental Performance Requirements

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<tr>
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<th>ENVIRONMENTAL PERFORMANCE REQUIREMENT (EPR)</th>
<th>PROJECT PHASE</th>
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<tr>
<td>W1</td>
<td>Water body health</td>
<td>Design and Operation</td>
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<td></td>
<td>During design and operation, impacts on surface water quality and flow must be minimised through adoption of measures to avoid an increase in discharge of pollutants leading to higher than existing levels on beneficial uses due to the construction of the project in accordance with CSIRO Best Practice Environmental Management Guidelines for Urban Stormwater (1999) and Water Sensitive Urban Design (WSUD). In addition, the project must incorporate spill containment at the outfalls which pose a high risk to sensitive receptors, including Brunde Park Wetlands, Waterways Wetlands, Woodlands Wetlands and Fiddlers Werland. The design of surface water control measure must comply with the VicRoads Integrated Water Management Guidelines (2011) and CSIRO Best Practice Environmental Management Guidelines for Urban Stormwater (1999).</td>
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<td>W2</td>
<td>Flood impacts</td>
<td>Design and Operation</td>
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<td>Changes to flood behaviour resulting from the project must meet the requirements of Melbourne Water’s guideline “Melbourne Water standards for infrastructure in flood prone areas”. Design-specific maintenance requirements relating to floodwater, and that do not form part of standard VicRoads maintenance requirements, must be included in the Water Management and Monitoring Plan (EPR W3).</td>
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<td>W3</td>
<td>Surface water management (construction)</td>
<td>Construction</td>
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<td>— Protect local waterways by applying best practice sedimentation and pollution control measures in accordance with EPA Victoria publication 490 Environmental Guidelines for Major Construction Sites and EPA publication 275 Construction techniques for sediment pollution control through the Construction Environmental Management Plan(s) and other plans. Implement a water collection and treatment system to ensure that stormwater discharges comply with the State Environmental Protection Policy (Waters of Victoria) 2006 and Melbourne Water performance criteria. Such plans and systems should be prepared in consultation with relevant authorities before the commencement of works.</td>
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<tr>
<td>W4</td>
<td>Flood protection (construction)</td>
<td>Construction</td>
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<td>During construction, the requirements of the “Melbourne Water standards for infrastructure in flood prone areas” must be complied with. Measures must be implemented to the satisfaction of Melbourne Water and in consultation with any other relevant drainage authority. Two temporary construction activities do not increase flood risks (including flood levels, flow and velocity) to the surrounding areas. A flood management plan must be developed in consultation with and not objected by Melbourne Water for any temporary works.</td>
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<tr>
<td>W5</td>
<td>Water Management and Monitoring Plan</td>
<td>All</td>
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<td>A Water Management and Monitoring Plan (WAMP) must be prepared in consultation with EPA Victoria and relevant water authorities, and be implemented prior to construction, during construction and for five years following opening the project to the public. The WAMP must incorporate both surface and groundwater monitoring. In addition to the baseline data collected to date, the WAMP must include:</td>
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<td>- Details of the monitoring parameters, including the frequency and location of both surface water points and groundwater monitoring bores.</td>
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<td>- Specific trigger levels (water quality in surface water bodies and groundwater bores) and details of contingency plans in the case trigger levels are exceeded.</td>
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<td>- Detailed reporting requirements.</td>
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<td>- Roles and responsibilities, not limited to:</td>
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<td>- The role of monitoring network assets.</td>
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<td>- The maintenance of monitoring network assets and results.</td>
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<td>- The party undertaking monitoring (prior to construction, during construction and for five years following opening).</td>
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<td>W6</td>
<td>Surface water management (design and operation)</td>
<td>Design and Operation</td>
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<td>The volume, peak flow and quality of surface water discharges during operation must have no adverse impact to the drainage network capacity in consultation with Melbourne Water, Kingston City Council and Greater Dandenong City Council, as appropriate.</td>
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Thank you
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Any questions