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my organisation

Flood Commission - Submission

Engineers Australia - Subcommittee

October 2011

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Acknowledgements

- Acknowledge Engineers Australia.
- Thank members of committee and contributors.
- This presentation represents views of Engineers Australia and not the views of the employers of any members of the committee.

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Floods – 2010-2011

- Floods occurred throughout Queensland.
- Largest flood in Brisbane River since 1974.
- Government established Commission of Inquiry on 17 January, just days after the flood peak in Brisbane.
- Engineers Australia provided comment on the interim and final reports.

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Queensland Floods Commission of Inquiry

- The Commission investigated a wide range of issues.
- Interim report released on 1 August 2011.
  - Provide recommendations for 2011-12 wet season.
- Final report released in March 2012.
  - Longer term recommendations for flood management in Queensland.

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Interim Report – August 2011

- Primarily aimed at ensuring the community was better prepared for floods in coming wet season.
- Some comments on resilience.
- Comments on potential operation rules for the flood mitigation dams.

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Final Report – March 2012

- Major sections concerned with longer term recommendations for floodplain management in Queensland.
- Comments on operation of flood mitigation dams
- Three engineers were referred to the Crime and Misconduct Commission.

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Flood Commission of Inquiry

- Established under *Commission of Inquiries Act 1950*.
- Consultations and hearings in areas affected by floods around the state.
- 345 witnesses appeared, with 6,133 pages of transcript (wide range of witnesses).
- Over 700 written submissions received.

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Final report recommendations - Planning

- Floodplain management.
- State and local planning instruments, and satellite planning systems.
- Development and flood considerations.
- Development assessment in practice, building controls, buy backs and land swaps.

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Final report recommendations – Other issues

- Development and flood considerations.
  - Includes consideration of levees.
- Essential services.
- Performance of private insurers.
- Mining.
- Emergency response and other interim report issues.

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Dams

- Operation of Wivenhoe and Somerset Dams.
  - Critical flood mitigation for Brisbane.
- Other dam issues.
  - Principally concerning Brisbane River dams, but also others elsewhere in Queensland.

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Comments on report

- The Commission report was legalistic, with limits on the technical inputs.
- For a report covering technical topics, it lacked maps and tables.
- Technical contributions treated similarly to community comments.

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Brisbane River catchment

- High but not unprecedented flood levels, though hard to compare with historical floods.
- Population unprepared for flood.
- More houses flooded than in 1974 when flood was 1 m higher in the city.
- Reliance on flood mitigation dams.

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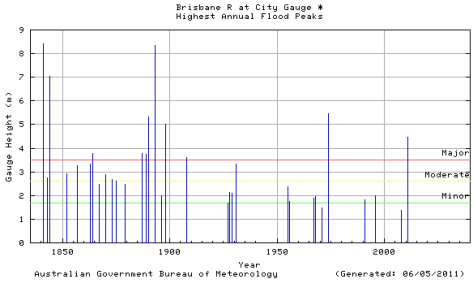
Brisbane River Floods



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Previous Floods – 1893 and 1974

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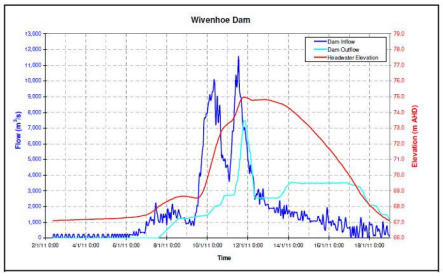
Wivenhoe Dam Operation



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Remainder of state

- Flooding was severe in Brisbane.
- However serious flooding (record levels in some cases) occurred elsewhere.
- Particularly Toowoomba and Lockyer Valley.
- Some regions escaped serious flooding in 2010-2011, north Queensland and Gold Coast for example.

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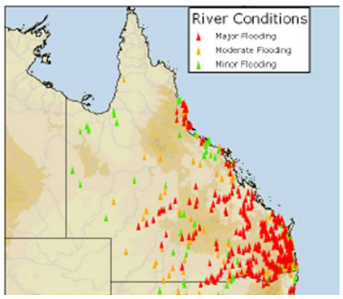
Flooding throughout the State



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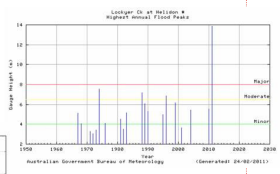
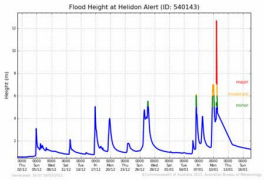
Lockyer Creek at Helidon

- 6 m higher than previous record from 1974





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Mt Sylvia Flood Damage

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Engineers Australia Subcommittee

- Queensland Division of Engineers Australia established sub-committee.
- Comment on Interim and Final reports and make recommendations.
- Members drawn from Water Panel, National Committee on Water Engineering and EA membership with relevant skills and experience.
- Subcommittee prepared papers in September 2011 and July 2012.

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Engineers Australia – Comments

- Submission was developed with meetings of subcommittee and developing draft submission.
- Limited consultation with members, but subcommittee represented a range of interests and stakeholders.
- Possibly not reflect the views of absolutely all members of EA, but we see this as a balanced view reflecting engineers concerns.
- Paper was prepared in the context of the commission report, but essentially covered important flood planning issues.

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Engineers Australia - Comments

- Provided unbiased and technical comments.
- Represented views of professional engineers.
- Released press releases and made media appearances.
- Did not comment on political matters.

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EA Press releases

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MEDIA RELEASE
Friday 23 March 2012

Engineers continue to play a vital role in community safety

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MEDIA RELEASE
Friday 23 March 2012

Flood report highlights complexity of engineering decisions

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Engineer referred to CMC

Dam engineer who was unregistered while working through 2011 flood disaster sentenced, fined $1500

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Water Engineering press release

Engineers Australia releases Queensland floods report

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The Eight Myths (and Reality)

- **Myth:** Wivenhoe Dam was built only for flood mitigation.
- **Reality:** Wivenhoe Dam was conceived as a water supply dam in the early 1970's. The devastating flood of 1974 provided the catalyst to proceed with construction and make Wivenhoe Dam larger than originally conceived to provide a dual role of water supply and flood mitigation.

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The Eight Myths (and Reality)

- **Myth:** The 2011 flood in Brisbane was unprecedented, and the flooding across Queensland was the worst experienced in history.
- **Reality:** The 2011 flood had a similar peak flow rate as the 1974 flood upstream of Wivenhoe Dam. The 2011 flood had similar flood volume to the 1893 flood. Flood levels in Ipswich and Brisbane were lower in the 2011 flood than the 1974 and 1893 floods. The flood impacts from the 2011 flood were the worst in Queensland history because the State is more developed.

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The Eight Myths (and Reality)

- **Myth:** Properties located outside the defined flood line are "flood free".
- **Reality:** A defined flood line is the extent of flooding for a specifically selected flood probability or historical event. It is possible, though less probable, that flood events larger than the defined flood can occur.

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The Eight Myths (and Reality)

- **Myth:** The "average recurrence interval" of a flood indicates when the next flood of this size may occur.
- **Reality:** The recurrence interval is only a measure of probability of the flood and does not indicate that floods occur at defined intervals in history or in the future. Engineers Australia discourages use of average recurrence interval to define floods, and instead recommends that the definition of floods should be based on annual exceedance probability.

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The Eight Myths (and Reality)

- **Myth:** Levees or other structural flood mitigation could prevent flooding in Brisbane.
- **Reality:** Properly designed, constructed, and maintained levees can have a partially useful role to mitigate flooding up to a limit. Levees can also have adverse effects on levels and flow patterns elsewhere on the floodplain and this requires careful assessment in planning and management of levees.

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The Eight Myths (and Reality)

- **Myth:** Rainfall forecasts are accurate enough to allow dam operations to use them reliably.
- **Reality:** Dam operations need to carefully consider a range of complex factors including where, when, and how much rain falls across the dam catchment. The lack of accuracy of forecast rain amount is a concern for use in dam operations. It is possible that if large dam releases are made based on expectation of high forecast rainfall and if that rainfall does not actually occur, the flooding caused by dam releases could be viewed unnecessary and irresponsible.

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The Eight Myths (and Reality)

- **Myth:** An engineer who operates a gated dam controls strategies and makes decisions focusing mainly on the strategy of the operations.
- **Reality:** The reality is that the only thing the engineer can actually manage is the timing and magnitude of the spillway gate release rates. The conditions that affect strategy selection are influenced by many factors that the engineer cannot control, such as the magnitude of the flood into the dam, or flows occurring in tributaries downstream of the dam.

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The Eight Myths (and Reality)

- **Myth:** Other sources of water supply (such as desalination) can be as cheap and reliable as dams and have low environmental impacts.
- **Reality:** The true costs of water supply include capital and operating costs and impacts to society and environment. Energy is a major cost for alternative water supplies such as desalination. Brine disposal is a significant environmental concern for desalination. The reliability of water supply is not only the certainty of having source water available, but also the reliability of the technology and equipment to produce and deliver water.

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Planning responsibility

- Currently floodplain management is principally the responsibility of local authorities in Queensland.
- Engineers Australia sees that the state government should take a larger role.
- Councils however are locally based and they will also be critical in implementation.
- Good quality floodplain maps and community education is essential.

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State-wide focus

- The interim and final reports focused on the regions of the state affected most severely in 2010-2011.
- In particular the Brisbane River has been a primary concern.
- While not reducing the concern for these regions, floods can affect any part of the state, including many areas of significant flood risk that were not affected in 2010-2011.

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Rockhampton - 2011

Mackay - 2009

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Flood Design Standard

- Risk levels should be considered in the planning process to ensure a balance between the risk of flooding and the location, land use and infrastructure.
- Different risk levels are appropriate for different types of development or situations.

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Uncertainty and resilience

- Need to recognise that all aspects of assessment of floods have uncertainties.
- Flood management systems must be resilient and include contingency planning, redundancy, fall back provisions and opportunities for relocation.
- Resilience should be a requirement in the design process.

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Flood emergency and response

- Community needs to understand the appropriate response.
- Needs on-going community education.

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Wivenhoe and Somerset Dams

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Dam Operation – 2011 Flood

- Flood mitigation was shown to be practically as good as was possible.
- Dam operation engineers performed under extreme pressure.
- Operation manual provides general guidance, but judgement is needed during the flood event.
- Expert and experienced staff are needed to operate major flood mitigation dams.

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Dam Operation

- Dam operation is a complex task, and critical for the mitigation of floods in the Brisbane River.
- Detailed studies will be needed for development of effective operational rules.
- The water supply function of the dams must not be compromised by requirements for flood mitigation.
- Forecast rainfalls should only be used where data is sufficiently reliable.

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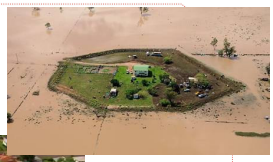
Wivenhoe Dam – Water supply and drought

Brisbane River Flood Risk

Flood risk

- Design flood probabilities needed for Brisbane River.
- Critical for effective planning.
- Difficult question needing complex analysis.
- Similar problems elsewhere in Queensland.
- Note that the Defined Flood Level is a risk based level, and there is still a probability that larger floods can occur.

Regulation of levees



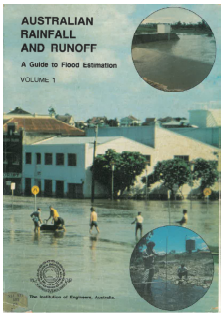
Regulation of Levees

- Support a review of all aspects of levee approvals and operation.
- Regulation of levees needs a risk based approach.
- Practical aspects need careful consideration, including data capture, surveillance and enforcement.

Data collection

- Hydrology data is used for both forecasting and warning systems and design.
- Found to provide significant benefits over costs in application.
- Commission has recommended ALERT gauges.
- However water resources assessment gauges also have benefits.

Australian Rainfall and Runoff



- Australian's principal guide to flood estimation.
- Published in 1987.
- Data and procedures essential for improvement in flood management.
- Recommend financial support for revisions to ARR.

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Final conclusions

- **Lessons.** Need to learn from experience of floods.
- **Planning:** Need to plan for the inevitability of floods.
- **Resilience:** Flood damage can still occur even with good quality planning, resilient structures and processes can minimise the damage.
- **Response:** Appropriate response during and after the flood can minimise damage and disruption.
- **Implementation:** Floods are an inevitable part of Queensland's environment and we musty implement appropriate planning and leadership.

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Thank you