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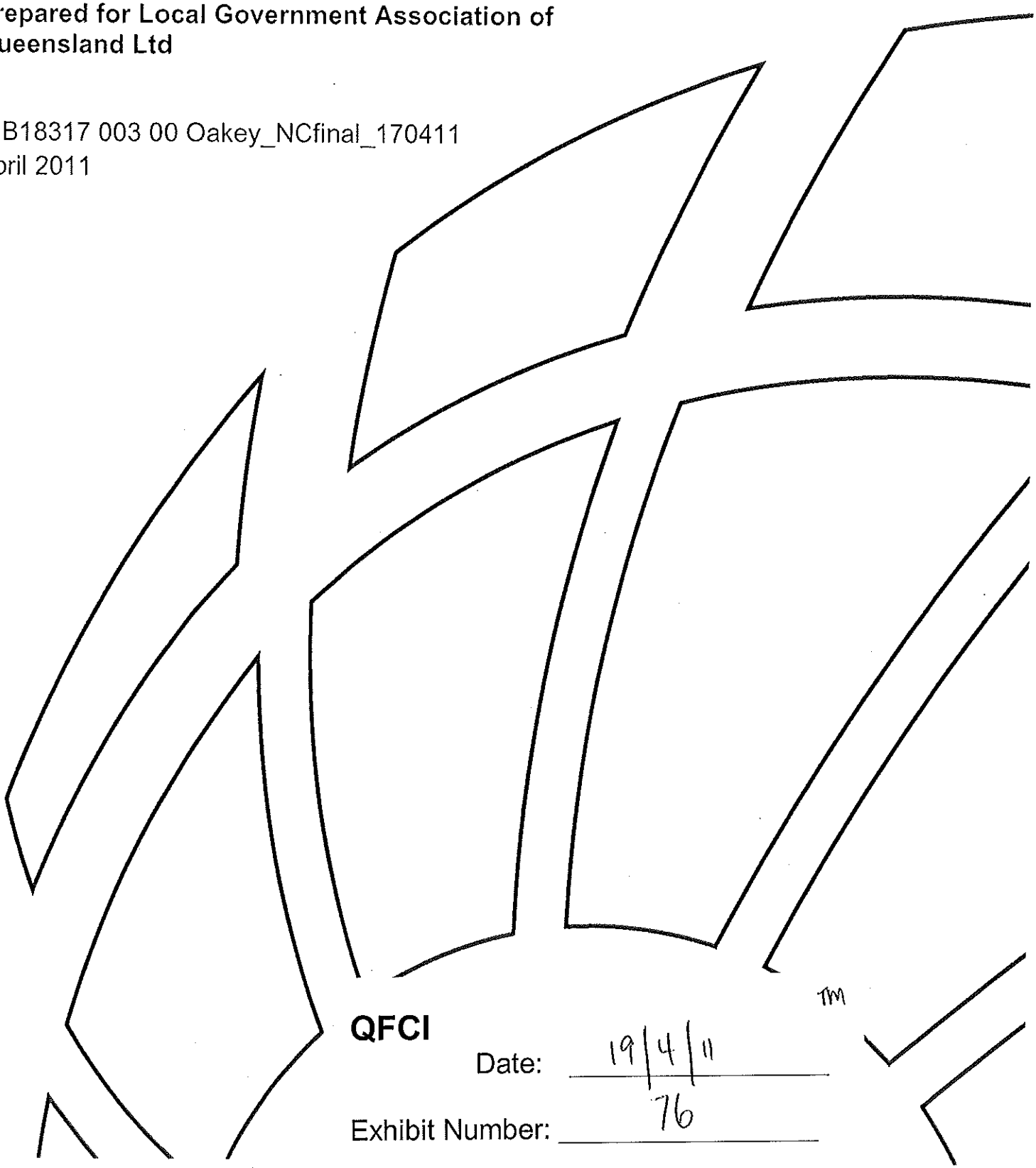
Queensland Floods Commission of Inquiry

Technical Report on the Oakey Flood of 10-11 January 2011

Prepared for Local Government Association of Queensland Ltd

R B18317 003 00 Oakey_NCfinal_170411
April 2011



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Date: 19/4/11

Exhibit Number: 76

Queensland Floods Commission of Inquiry

Technical Report on the Oakey Flood of 10-11 January 2011

Prepared for Local Government Association of Queensland Ltd

April 2011

Prepared For:	Local Government Association of Queensland Limited
Prepared By:	BMT WBM Pty Ltd (Member of the BMT group of companies)

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Client :	
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Title :	Technical Report on the Oakey Flood January 2011
Author :	Neil Collins
Synopsis :	*Expert advice on flooding in relation to the devastating flood which took place in Oakey on 10-11 January 2011*

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CONTENTS

GLOSSARY

backwater effect	The effect which an obstruction has in raising the surface water upstream of it.
catchment	The catchment at a particular point is the area of land that drains to that point.
hydraulic	The term given to the study of water flow in rivers, estuaries and coastal systems.
hydrograph	A graph showing how a river or creek's discharge changes with time.
runoff	The amount of rainfall from a catchment that actually ends up as flowing water in the river or creek.
stream gauge	A site along a stream where measurements of water surface elevation and or volumetric discharge (flow) are made.
velocity	The speed at which the flood waters are moving. Typically, modelled velocities in a river or creek are quoted as the depth and width averaged velocity, i.e. the average velocity across the whole river or creek section.

1 PURPOSE OF THE REPORT

BMT WBM Pty Ltd was commissioned by LGAQ on behalf of Toowoomba Regional Council (Council) to provide expert advice on flooding in relation to the devastating flood which took place in Oakey on 10-11 January 2011. This technical report provides information on:

- the characteristics of the Oakey Creek catchment and antecedent conditions that preceded the flooding;
- a description of the causative rainfall and the resultant flooding;
- the impacts of the flooding;
- previous flood studies carried out in the catchment;
- flood mitigation works currently in operation and planned in the catchment; and
- limitations to flood warning effectiveness.

The Report is being specifically prepared to assist the Queensland Floods Commission of Inquiry, as requested in their letter of 28 February 2011 to Toowoomba Regional Council (Reference: 1539303).

The Report has been prepared by Neil Collins, Principal Hydraulic Engineer with BMT WBM Pty Ltd, a firm of specialist water and environmental professionals. Neil specialises in water, in particular, flooding and stormwater management. A copy of Neil's CV is included as Appendix A to this Report.

In preparing this Report, key BMT WBM staff have drawn upon a range of technical sources and have undertaken a site visit to Oakey.

1.1 Structure of the Report

The report is structured into the following two remaining sections:

- Section 2 provides background information including a description of the local creek systems; and
- Section 3 presents an analysis of the rainfall and resulting floods of 10-11 January 2011.

It should be noted that the availability of data was extremely limited and this report can be updated and refined as and when additional data are obtained.

2 BACKGROUND

2.1 Catchment and Creek Description

Oakey is a small town located 27km north west of Toowoomba and approximately 160km west of Brisbane. It falls within the Toowoomba Local Government administrative boundary and is situated within the Darling Downs on the western slopes of the Great Dividing Range at an elevation of approximately 400mAHD. Oakey lies on the main railway line between Brisbane and Charleville and the Warrego Highway (A2) bypasses the town to the south.

Oakey Creek dissects Oakey as it runs through the centre of the town in a southerly direction. Westbrook Creek runs south of the town in a westerly direction before combining with Oakey Creek approximately 600 metres downstream of the Oakey Bypass where they continue westwards as Oakey Creek. Oakey Creek then eventually joins the Condamine River a further 70km downstream.

Upstream of Oakey the Oakey Creek is fed from the tributaries of Cooby Creek (when it spills from Cooby dam), Meringandan Creek and Gomaran Creek. Cooby Dam contains Cooby Creek Reservoir, a 23,100Ml water supply reservoir constructed in 1936. The dam does not have any release other than to water supply and a mechanism to flush water through the supply pipe to clean it. Therefore when water levels are high the dam will overspill via the spillway in an uncontrolled manner into the downstream length of Cooby Creek.

Westbrook Creek takes flow from the Gowrie Creek which itself takes flows from the East and West Creeks in Toowoomba. The Gowrie Creek catchment experienced extreme flooding on 10 January 2011.

Oakey was first settled in the 1840's when pastoralists moved to the area and is now home to around 4,000 people. Local industries are predominantly rural although the mining industry and a large army aviation base are also important local employers. Development within Oakey has encroached onto the floodplain of Oakey Creek. Four main structures cross the creek within the town. In order from upstream to downstream they are:

- Railway Bridge;
- Road Crossing at Bridge Street;
- Lorrimer Street; and
- Warrego Highway.

Furthermore there is a footbridge between Tyrell Street and Cherry Street.

2.2 Antecedent Rainfall

Oakey, and surrounding areas, including the catchment of Oakey Creek, received record rains totalling 304mm in December 2010, more than three times the average December rainfall of 93mm (Table 2-1)

Table 2-1 Oakey Rainfall statistics

Statistic	Total mm (Date/period)
December 2010 total	**304.2mm (19 days)**
Dec 1970-2008 Average total	92.9mm (8.9 days)
Dec 1970-2008 Wettest total	187.5mm (1970)
Dec 1970-2008 Wettest 24hr total	86.4mm (1st 1987)
Dec 1970-2008 Driest total	13.4mm (1977)
Jan-Dec 2010 total	842.4mm (112 days)
Jan-Dec 1979-2009 average yearly total	628.6mm (79.6 days)

Table based on information supplied by Toowoomba Regional Council

3 JANUARY FLOOD ANALYSIS

3.1 Rainfall

Heavy regional rainfall across south east Queensland in early January 2011 saturated the creek catchments causing the creeks to swell. In the Oakey area the period from the 6 to 12 January experienced significant rainfall with the heaviest falls occurring between 9 and 11 January. Table 3-1 gives daily rainfall totals for gauges located within and in close proximity to the Oakey Creek catchment.

Table 3-1 Daily Rainfall totals to 9am in January 2011

Rain Gauge (BoM ref)	6th	7th	8th	9th	10th	11th	12th	13th	14th
Cooby Creek Dam (041512)	11.8	30	21.8	4.2	96	127	25	0	0
Doctors Creek (041024)	20	31		10.6	85.6	126.4	14.6	1.4	0
Goombungee PO (041037)	28.2	24	>	>	96	100.4	31.6	0	0.3
Oakey Aero (041359)	50.4	10.2	11	4.2	64	78.8	6.2	1.6	2.2
Pechey Forestry (040170)	42.8	28.2	>	>	>	253.6	26	0	0

Data obtained from Bureau of Meteorology website.

The symbol '>' indicates that rainfall total has been added to the following day.

It can be seen from Table 3-1 that the heaviest rainfall occurred between 9am on the 9 Jan and 9am on 10 Jan. Due to earlier wetting of the catchment much of this rainfall will have become runoff finding its way into the creek system.

The rainfall total recorded at Cooby Creek Dam on the 11 January was the highest daily total recorded at the gauge since records began in 1990.

3.2 Flooding

Between 10 and 11 Jan 2011 Oakey experienced flooding as Oakey Creek burst its banks. No flood level or flow data was available for use in this report[1] but anecdotal evidence records levels under the railway bridge at 5.45m at 5:30am on January 10 after which levels receded[2]. Later, during the afternoon of the 10 January levels began to rise again, peaking at 9:30pm before receding. On the 11 January at 1pm levels reportedly peaked at 7.5m with both the bridge on Bridge Street and the railway bridge overtopping. Furthermore it was noted that the railway embankment had a damming effect[3].

[1] Oakey District Office is not aware of any records being kept of Oakey Creek levels in Oakey or any other place along the creek to its headwaters at Cooby Dam.
[2] Information supplied by Toowoomba Regional Council
[3] Information supplied by Toowoomba Regional Council

The flooding in Oakey creek was caused by very heavy rainfall generating excess runoff in the upper catchment of Oakey Creek. This would have included flood flows from Gomaren and Meringandan Creeks along with any overspill from Cooby Creek Reservoir (see section 3.2.1). The flooding in Oakey was likely exacerbated by high flood levels in the Westbrook/Gowrie Creeks to the south of the town causing water levels to back up in Oakey Creek (Section 3.2.2).

3.2.1 Cooby Creek Reservoir

As mentioned in Section 2.1 Cooby Creek Reservoir and its associated dam were constructed for water supply purposes and serve no intended function as a flood mitigation asset. Due to large amounts of rainfall in the catchment above Cooby Creek Reservoir the levels rose and began to overtop the spillway on the 9 January at 19:23. Water continued to overtop for approximately 20 days with the peak overspill recorded by dam operators as occurring at 07:43 on Jan 11.

A summary of dam observations for all 3 water supply reservoirs (Cooby, Cressbrook and Preseverance) in Toowoomba Regional Councils administrative area has been supplied by Council for use in this report. Only Cooby Creek Reservoir is located within the catchment area that drains to Oakey and so observations for this reservoir as supplied by Council are given in Table 3-2.

Table 3-2 Cooby Creek Reservoir – Key Observations, January 2011

Time/Date	Event
17:30 Jan 07 2011	Cooby tunnel valve closed
08:50 Jan 08 2011	Manager of Water Operations sends email that Cooby is at Alert Level 1
08:33 Jan 09 2011	Manager of Water Operations sends email that Cooby is at Alert Level 1 and rising.
16:38 Jan 09 2011	Emergency Action Plans activated for 3 dams.
17:00 Jan 09 2011	Water Services Dam Event Management Room activated at the James Cook Centre (Toowoomba)
17:30 Jan 09 2011	Cooby Creek recording over 4 m flow at inflow site
17:45 Jan 09 2011	Downstream residencies (within 5km) to be contacted
18:00 Jan 09 2011	Disaster Coordination Centre contacted to advise that Cooby expected to be above flood spill way by midnight
18:45 Jan 09 2011	Observed that Cooby is rising at 290mm/hr
19:23 Jan 09 2011	Cooby Dam begins spilling – Spill Level is 478.54 mAHD
22:10 Jan 09 2011	Confirmation that downstream residents (within 5km) notified
03:30 Jan 10 2011	Reservoir Level at 479.32mAHD (+0.78m)
14:15 Jan 10 2011	Cooby Reservoir Level 479.27mAHD (+0.73m)
16:00 Jan 10 2011	Cooby Reservoir Level 479.90mAHD (+1.36m)
21:00 Jan 10 2011	Cooby Reservoir Level 479.55mAHD (+1.01m)
03:00 Jan 11 2011	Cooby Reservoir Level 479.20mAHD (+0.66m)
03:15 Jan 11 2011	Cooby Reservoir Level 479.30mAHD (+0.76m)
07:13 Jan 11 2011	Cooby Reservoir Level 480.06mAHD (+1.52m)
07:43 Jan 11 2011	Cooby Reservoir Level 480.09mAHD (+1.55m) PEAK LEVEL – Flow estimated at 258m3/s.
09:15 Jan 11 2011	Cooby Reservoir Level 480.0mAHD (+1.46m)
13:30 Jan 11 2011	Cooby Reservoir Level 479.56mAHD (+1.02m)
19:00 Jan 11 2011	Cooby Reservoir Level 479.39mAHD (+0.85m)
21:15 Jan 11 2011	Cooby Reservoir Level 479.23mAHD (+0.69m)
04:00 Jan 12 2011	Cooby Reservoir Level 479.01mAHD (+0.47m)
16:00 Jan 12 2011	Cooby Reservoir Level 478.76mAHD (+0.22m)
06:20 Jan 13 2011	Cooby Reservoir Level 478.68mAHD (+0.14m)
15:00 Jan 13 2011	Cooby Reservoir Level 478.65mAHD (+0.11m)
18:03 Jan 15 2011	Cooby Reservoir Level 478.62mAHD (+0.08m)
11:37 Jan 16 2011	Cooby Reservoir Level 478.60mAHD (+0.06m)
07:45 Jan 20 2011	Cooby Reservoir Level 478.64mAHD (+0.10m)
07:30 Jan 21 2011	Cooby Reservoir Level 478.64mAHD (+0.10m)
Jan 29 2011	Cooby Reservoir Level 478.53mAHD Below Flood Spill Level

Data obtained from Toowoomba Regional Council 11/04/2011

Once overflowing the dam would have simply spilled water at the equivalent rate at which it was entering the reservoir. i.e. this would be akin to natural flow conditions before the dam was in place.

Based on available data, peak overtopping flows from Cooby Dam (on 11 January) would have reached Oakey after the peak flood levels were recorded due to the length of travel time through the catchment. Furthermore if Cooby Dam was not present then it is probable that the peak flow from Cooby Creek would have occurred earlier and this could have exacerbated the flooding at Oakey. Therefore the attenuation effects from the reservoir are likely to have been beneficial to the town.

It should be remembered however that Cooby Creek is one of several tributaries contributing floodwater into Oakey Creek. For example, downstream of Cooby Creek Reservoir Meringandan Creek joins Cooby Creek and the relative influence of any overtopping flows from the dam diminish.

In summary there is no evidence to suggest the presence or operation of the dam made the flooding situation worse at Oakey and it would have actually reduced the impact of the initial flooding through storage of additional water early into the event.

3.2.2 Westbrook/Gowrie Creek Backwater Effects

High water levels in Westbrook Creek to the south of Oakey are likely to have increased levels in Oakey Creek through Oakey due to backwater effects. The closest stream gauge on the Westbrook Creek to Oakey is actually on the Gowrie Creek, a major tributary of Westbrook Creek. This gauge is located approximately 7km upstream of Oakey.

Figure 3-1 plots the recorded gauge levels[4] between 8 and 14 January 2011. It can be seen that there are three notable peaks occurring at:

- Peak 1: 20:40 on 9 January (4.17m);
- Peak 2: 16:40 on 10 January (4.87m) (note that due to gauge failure this may not be the actual time of peak);
- Peak 3: 09:00 on 11 January (4.18m).

In the data supplied by BoM it is noted that the previous record peak level recorded at this gauge was 3.5m in November 1995. All three peaks of the January 2011 flood are therefore significantly above this level although it is reiterated that these levels have yet to be validated by BoM. Based on gauge data, the flood at Oakey was a severe to extreme event.

The Gowrie Creek drains runoff from the Great Dividing Range encompassing the city of Toowoomba which experienced extreme flash flooding in the early afternoon of January 10 2011. Cranley gauge in Toowoomba is located approximately 30km upstream of the Gowrie Creek gauge at Oakey. This gauge failed during the peak flood but an estimated time of peak flow was at 14:30 on January 10.

The magnitude of the flash flood will be evidenced in the Oakey gauge at Gowrie Creek as one of the two latter flood peaks. Based on a simple analysis of average travel times between the gauges travel

[4] Gauge levels have been supplied by DERM as 'unvalidated' levels and as such have not be subjected to rigorous quality appraisal.

times would be 3.86m/s for Peak 2 and 0.45m/s for Peak 1. Based on the flashy nature of the flooding it is probable that faster travel time to Peak 2 in Figure 3-1 corresponds to the floodwave from Toowoomba. This assumption is reinforced by noting the steep rate of rise of Peak 2 (which actually caused the gauge to fail) which is in accordance with the observed severe flooding that caused the loss of life and damage in Toowoomba.

In conclusion the second peak shown in Figure 3-1 is the remanent of the flash flooding at Toowoomba. Based on estimated velocity (3.86m/s) this peak would have arrived at the confluence of Oakey and Westbrook Creeks (7km downstream of the gauge) approximately 30 minutes later putting the time of arrival at 17:10 on January 10. This means that the flood peak will have passed by the confluence with Oakey Creek before the peak flood was experienced on Oakey Creek itself (around 11:30 on January 11).

The third peak however is likely to have reached the confluence of the Oakey Creek at around 09:30 on 11 January which is close to anecdotal estimates of the timings of the peak flood on Oakey Creek. This is likely to have exacerbated the flooding in Oakey.

3.3 Flood Impacts

Oakey experienced 128 homes inundated by floodwater on 11 January[5]. At least 10 businesses and community/sporting organisations were also affected. Affected streets included Kent Street, Taylor Street, Lorrimer Street, Beale Street, Fitzpatrick Street and the industrial area to the north west of the railway. Over 40 residents the Queensland Country Womens Association (QCWA) House Aged Care facility were evacuated and 40 other residents were taken to Toowoomba by bus. Many others self-evacuated.

Queensland Fire and Rescue Service arranged for Swift Water Rescue trained staff to be deployed in Oakey to assist with evacuations. The Oakey Cultural Centre was used as an assembly point for evacuation with the first evacuees arriving at around 10:30am on 11 January. There was no loss of life at Oakey.

[5] BMT WBM, Toowoomba Flood Report, April 2011
[6] Information supplied by Toowoomba Regional Council

4 SUMMARY OF FINDINGS

In summary, our investigation has found the following:

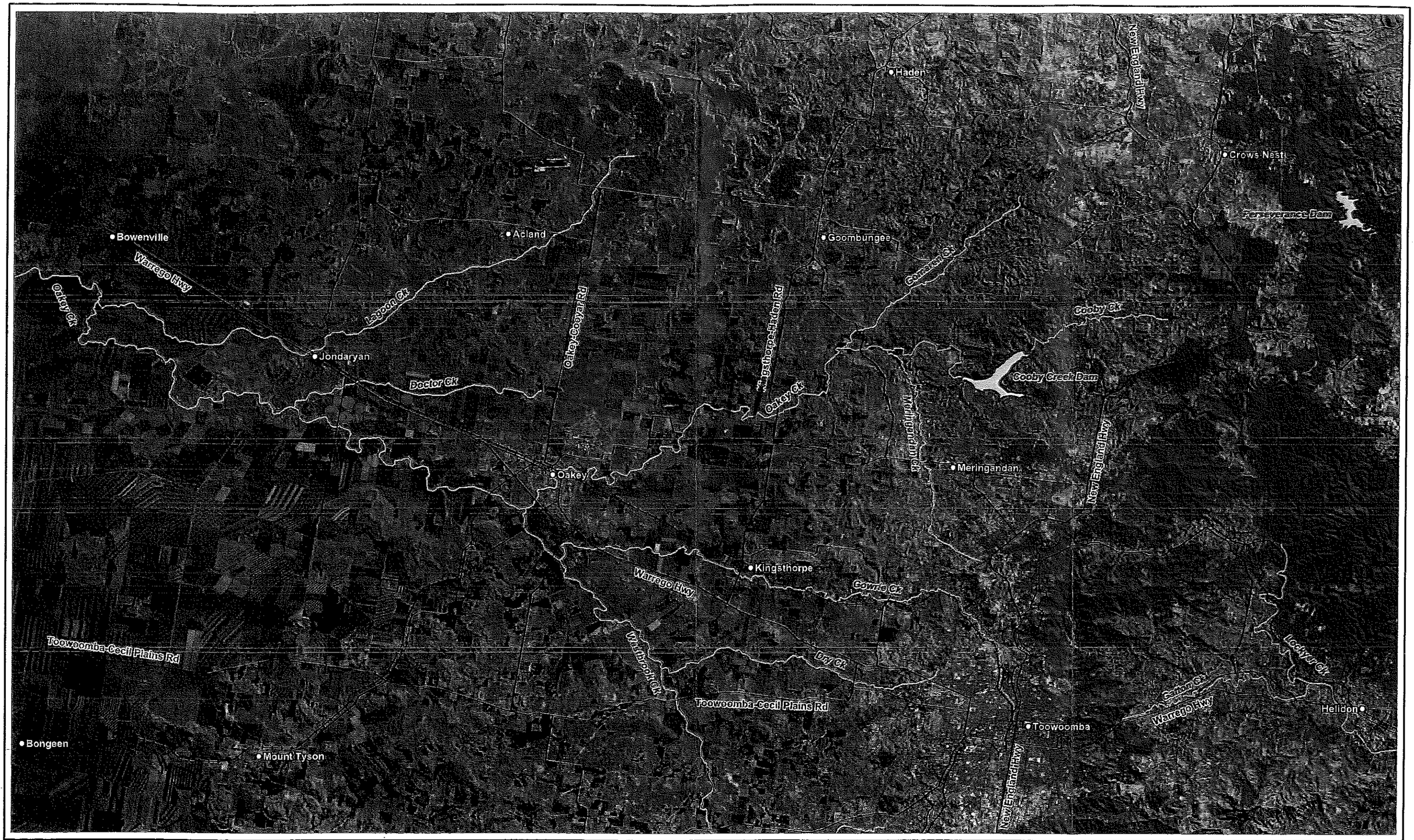
1. Upper catchment rainfall in the main tributaries of Oakey Creek, including Gowrie Creek, was the main cause of the flooding at Oakey. This rainfall was extreme at the edge of the escarpment.

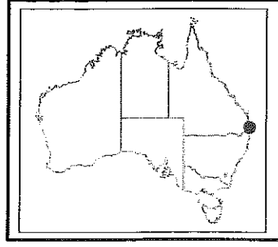
2. Flooding at Oakey occurred on 9, 10 and 11 January with all three floods exceeding the previous record peak for the Gowrie Creek gauge just upstream of Oakey.

3. The largest peak flood occurred on 10 January and was 1.5m higher than the previous highest recorded flood.

4. Cooby Dam filled and overtopped during the flood events of 9 to 11 January. This is a water supply dam without a flood mitigation compartment. There is no evidence to suggest that the presence or operation of the dam made the flooding worse at Oakey than it would have otherwise been.

5. Effective evacuation was carried out and there was no loss of life. 120 homes and at least 10 businesses and sporting organisations were flooded.





LEGEND

- Major Watercourse
- Main Road
- Railway

Title:
Locality Map

Figure: 5-1

Rev: A

N

0 3.75 7.5km

Approx. Scale

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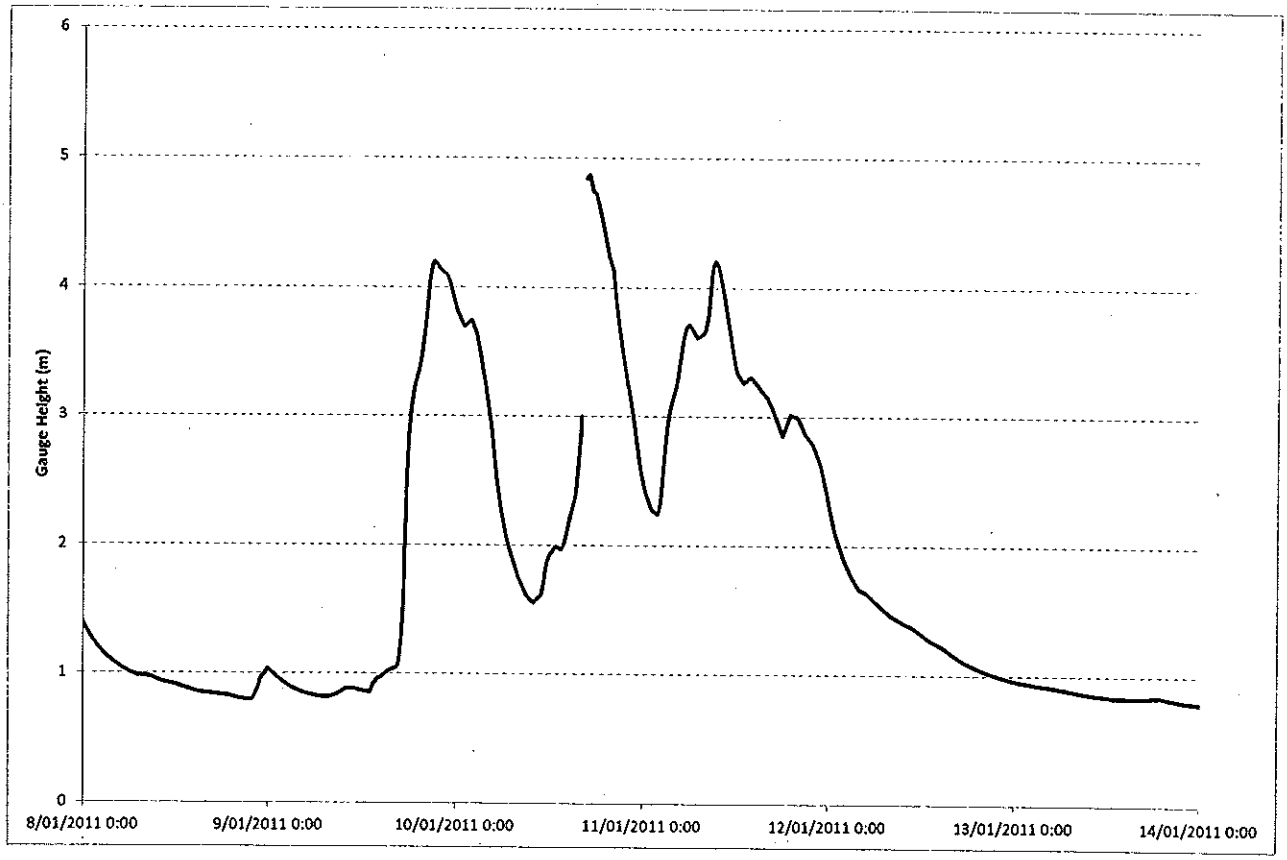
Filepath : I:\B18317_I_BRH Toowoomba JET\DRG\FLD_016_110412 Oakey Location Map.wor

5 FIGURES

Figure 5-1 Stage Hydrograph of Gowrie Creek at Oakey (422332)



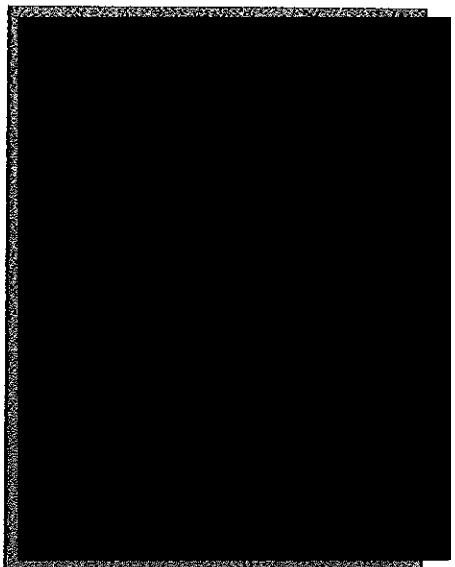
APPENDIX A: CURRICULUM VITAE OF NEIL IAN COLLINS

BMT WBM

A part of BMT in Energy and Environment

Neil Ian Collins

Position	Principal Hydraulic Engineer – Expert Services
Years of Experience	31
Professional Affiliations	PIANC NPER-3 RPEQ
Qualifications	Master of Science Engineering, University of Queensland Bachelor of Engineering (Civil) University of Queensland
Recent Employment Profile	2010 to Present BMT WBM Pty Ltd – *Principal Hydraulic Engineer - Expert Services* 2007 to 2010 Gilbert & Sutherland Pty Ltd – *Principal Hydraulic and Water Resources Engineer* 2004 to 2007 Cardno Lawson Treloar – *Director, Queensland Manager* 1993 to 2004 Lawson Treloar - *Director*



Areas of Expertise

Hydraulics, Hydrology and Water Resources

Provision of Expert Witness Services in Flooding, Stormwater, Quality Control and Coastal Engineering

Career Overview

Neil is BMT WBM's Principal Hydraulic Engineer; part of the Expert Services team, based in our Brisbane office. He has 31 years experience and is an acknowledged expert in the P+E, Land Court and Supreme Court of Queensland in flooding, water quality and coastal processes. He was also the independent hydraulic expert to the Queensland Government for the North Bank project. Neil has worked on major infrastructure projects as an Hydraulic Specialist including Sydney Third Runway, Sydney Harbour Tunnel, Gateway Bridge and Arterial and several coal ports in Queensland and in Indonesia, power stations in Queensland and Thailand, hydro-electric schemes in PNG and port dredging management at Cairns, Townsville, Weipa and Mackay.

Summary of Major Projects

- Lauderdale Quay, Hobart – Coastal Hydraulics, Water Sediment Quality for IIS on a Major Marina Residential Reclamation Project.
- Brisbane Airport - International Terminal Drainage Design.
- Sydney Harbour Tunnel - Hydraulics Engineer for Immersed Tube Tow and Placement.
- Sydney Third Runway - Hydraulic Model Testing, Sea Wall Design and Environmental Management.
- Gateway Arterial - South East Freeway to Lytton Road - Civil and Hydraulic Design Manager.
- Gateway Bridge - Hydraulics and Approaches Services Relocations.
- Trade Coast Central - Flooding Review for BCC.
- Oak Flats to Yallah RTA Freeway Hydraulics.
- Kedron Brook Flood Impacts due to Airtrain.
- Tully and Murray River Floodplains Hydraulic Analysis and Modelling, for Drainage Scheme Design includes Large MIKE11 Modelling, with over 40 Bridges and 200 Channels.
- Expert Review - Mossman Daintree Road, Saltwater Creek Crossing: Independent Review of the Hydraulic Design of two Large Bridges.
- Hydraulic Design of Rock Armouring Works for the Barron River Bend at Cairns Airport.
- Eastern Corridor Study - Hydraulics and Hydrology investigation for Department of Transport.
- Relief Drainage Scheme Design for Albion Windsor Area Brisbane (Capital cost $2 million).
- Tarong Power Station - Design of Earthfill Dam (max. 23m height), Ash trench, Stormwater Diversion Channels.

Professional History

BMT WBM Pty Ltd

Principal Hydraulic Engineer providing expert witness services in flooding, stormwater, quality control and coastal engineering.

Gilbert & Sutherland Pty Ltd

Wet 'n' Wild, Sunshine Coast – site and soil assessments, input to and review of AGE groundwater assessment, conceptual stormwater quality assessment, hydraulic and flooding assessments including yield, medli modelling for onsite and input to S&B water balance, contamination investigation.

- Stockland, Twin Waters – Flooding Assessment
- Mackay Boat Harbour – Wave Investigation
- Bourton Road, Alkira – Flooding and Stormwater Management Plan
- The Glades, Robina – Water Quality Compliance and Inspection Report

Expert Services:
2007: Truloff Pty Ltd -v- Gold Coast City Council
2008: Jimboomba Turf Co Pty Ltd -v- Logan City Council
2008: Lechaim -v- Gold Coast City Council
2008: Sunnygold International Pty Ltd -v- Brisbane City Council
2008: Bon Accord -v- Brisbane City Council
2008: Blue Eagle -v- Beaudesert Shire Council
2008: Brian Paddison -v- Redland Bay Shire Council
2008: Monarch Nominees -v- Brisbane City Council
2008: Kunda Park Pty Ltd -v- Maroochy Shire Council
2008: Owl Projects & Hyder -v- Gold Coast City Council
2008: Port Pacific Estates Pty Ltd -v- Cairns Regional Council
2008: Joanne Shepherd & Ors -v- Brisbane City Council
2009: Lenthalls Dam, Hervey Bay
2009: Testarossa -v- Brisbane City Council
2009: Heritage Properties & Ausbuild -v- Redland City Council
2009: Samantha Skippen -v- Miriam Vale Shire Council
2009: Anthony Wan Pty Ltd -v- Brisbane City Council
2010: Over 25 appeals in progress this year

Professional History (cont)

Cardno Lawson Treloar
Sovereign Waters, Wellington Point - flooding, tidal exchange and water quality management.

EMP Water Quality Management Plan preparation and site stormwater management, including hydrodynamic, advection/ dispersion and catchment pollutant yield modelling for:
- Emerald Lakes Project, Carrara
- Glenwood Estate, Mudgeeraba
- 'The Glades' (Greg Norman Design Course), at Robina
- Sovereign Waters, Wellington Point
- Pacific Palisades, Gavin
- Freshwater Valley Estate, Cairns
- Carrara Golf Course Re-development, Carrara
- The Broadwater Development, Mudgeeraba
- Over a Dozen Major Residential Development Projects.

- Full Two-dimensional (MIKE 21) Floodplain Modelling for Cairns Airport Inundation, Nerang River Floodplain and Martins Creek, Maroochydore.
- Noosa River System Flood Study: Includes full G.I.S. Interfacing, Colour Inundation Plan Production and MIKE11 Modelling.
- Detention Basin Design for Development Consulting, Calamvale, Brisbane: Hydrologic and Hydraulic Design using RAFTS.
- Hydraulic and Water Quality Design, Lucinda Drive Main Drain, Port of Brisbane, including Catchment Pollutant Runoff Management.
- Moreton Bay College Flood Investigation: MIKE11 Analysis of Flooding, Including Culvert and Channel Diversion Options.
- Input on EIS Report on Water Quality for Freshwater Valley Development, including EMP.
- Townsville Port Road and Rail Access Study - Hydraulics.
- Freshwater Creek Flooding, for Main Roads, included Bridge and Culvert Sizing and Positioning of Channel Training Works. (RORB/RUBICON).
- Mountain Creek Flooding Investigation Examination of 1992 Floods using detailed Hydrologic/Hydraulic Modelling and Design of Mitigation Works.

Expert Services:
2004: T.M. Burke Appeal
2004: East Point Mackay
2004: Dore Appeal
2004: 900 Hamilton Road, McDowall
2004: Milton Tennis Centre
2005: P&E Appeal Mount Samonsvale
2005: BCC & George Pasucci
2005: P&E Appeal 48 Comley Street Sunnybank
2005: P&E Appeal 398 Wondall Road, Tingalpa
2005: Cabbage Tree Creek Appeal
2006: 35 Suscatand Street, Rocklea Appeal
2006: Leong - v- Redland Shire Council Appeal
2006: Barry Hilson & Bach Pty Ltd - v- GCCC Appeal
2006: 57 Longhill Road Appeal
2006: 699 Bargara Road Appeal
2006: Chevellum Road Appeal
2006: 10 Karridawn Street, Nudgee Appeal
2006: Australian Hardboards Limited Appeal
2006: Dell Road and Hawkin Drive, St Lucia Appeal
2006: 106 Munro Street, Auchenflower Appeal
2006: 10 Adsett Road, P&E Appeal
2006: Saunders Creek Appeal
2006: 64, 70 & 74 Washington Avenue, Tingalpa

Professional History (cont)

Lawson Treloar

- Coastal Data Gathering and Analysis for Projects in Bali, Lombok and Malaysia.

- Pandorah Gas Project, Gulf of Papua. Neil was Responsible for Project Management of all Coastal and Oceanographic Aspects of this Project, including Preparation of the Relevant Components of EIS. This included Extreme Climate, Wind/Wave and Current Modelling.

Chevron PNG to Cape York Gas Pipeline Project, Gulf of Papua
Neil Carried out Project Management for all Coastal/Oceanographic Components of this Project, including:

- Wind/Wave Modelling
- Extremal Climate
- Bed Current Prediction
- Kumul Platform Berthing
- Endeavor Passage Landfall
- Wave, Current and Wind Data Gathering.

- Tidal Lagoon, Breakwater/Groynes, Water Quality and Quantity Management at Pecatu Indah Resort, Lombok.
- Marina and Reclamation, S-W Bali, (Putri Nyale) including Coastal Investigations and Hydraulic Design of Breakwaters and Revetments.
- Sediment Sampling and Monitoring Program for the Albatross Bay Dumpsite, Weipa, for Dept. of Transport. Job Manager for this Investigation which includes Monitoring of Movement of Material Following Dumping, and its Impact on Water Quality and Benthic Communities.
- Wellington Point Canal Estate - Coastal Hydraulic Investigation of Proposed Marina and Dredged Channel.
- Weipa, Embley Inlet Environmental Monitoring: Review and Planning for Long Term Monitoring and Assessment of Water Quality (for Comalco).
- Full 2D flooding assessments for Dept of Main Roads using MIKE 21 on Yarrabah, Cairns and Warrego Highway at Marburg.
- Current Profiling, Warrego River (1994).
- Sovereign Waters, Wellington Point - Flooding, Tidal Exchange and Water Quality Management.
- Responsible for all Flood and Water Quality aspects for several Gold Coast Projects, including Emerald Lakes, Nifsan's Glenwood and Broadlakes, including Lake, Wetland and EMP Design.
- Stream Diversion, including Sloping Drop Structure, Hydraulic Design, at 'Coops' Development, Brisbane (1993).
- Northumbria Lakes Estate, Flooding, Drainage, Gross Pollutant Trap and Trash Rack Modelling and Design (1994).
- Barron River Delta Prawn Farm I.A.S., including Flooding and Water Quality Monitoring and Modelling, using MIKE11 (1995).
- Hydraulic Manager for Cairns Airport Master Drainage Study, 1995, including Complex Hydrodynamic Flow and Catchment Management Analysis.

Expert Services:

1993: for Mulgrave Shire Council; Land Resumption Compensation Case in Land Court. (Flooding)
1993: for Mulgrave Shire Council; Development Appeal (Kamerunga Villas) in Planning and Environmental Court. (Flooding)
1994: for Pullenvale Residents Action Group, on Rezoning Appeal. (Flooding and Water Quality)
1994: for Development Consulting, on Rezoning Appeal for a Development with a Large Detention Basin at Calamvale. (Flooding and Drainage)
1994: for an Earthworks Contractor Regarding a Disputed Claim Over Levee Bank Construction at Mungindi. (Flooding)
1995: for a Developer on Bohle River Works. (Flooding and Water Quality)
1995: for Residents on Flooding, Murrumba Downs. (Flooding)
1995: for Residents on Flooding, Dayboro. (Flooding)

Connell Wagner

- Current Profiling, Warrego River (1994).
- Sovereign Waters, Wellington Point - Flooding, Tidal Exchange and Water Quality Management.
- Responsible for all Flood and Water Quality Aspects for several Gold Coast Projects, including Emerald Lakes, Nifsan's Glenwood and Broadlakes, including Lake, Wetland and EMP Design.
- Stream Diversion, including Sloping Drop Structure, Hydraulic Design, at 'Coops' Development, Brisbane (1993).
- Northumbria Lakes Estate, Flooding, Drainage, Gross Pollutant Trap and Trash Rack Modelling and Design (1994).
- Barron River Delta Prawn Farm I.A.S., including Flooding and Water Quality Monitoring and Modelling, using MIKE11 (1995).
- Hydraulic Manager for Cairns Airport Master Drainage Study, 1995, including Complex Hydrodynamic Flow and Catchment Management Analysis.
- Tarong Power Station. Design of earthfill dam (max. 23m height), Ash trench, Stormwater Diversion Channels.
- Callide B Power Station. Evaporation Ponds Simulation; Hydraulic Design and Stormwater Bypass Channel. Design of (25m) Ash Dam.
- Hay Point Multi-User Coal Export Facility. Design of Dams, Stormwater Drainage, Water Supply and General Civil.
- Townsville Container Terminal. Design of Stormwater Drainage and General Civil.
- Abbot Point Coal Terminal. Design of an Offshore Causeway.
- Subdivisional Design and Supervision, on over a dozen Projects.
- Bulk Sugar Terminal - Brisbane. Feasibility Studies, including Flooding.
- Gladstone Power Station. Ash Handling including Piping.
- Stanwell Power Station. Design Check on General Civil.
- Patrick Container Terminal - Port of Brisbane. Flooding and General Civil.

Expert Services:

1993: for Mulgrave Shire Council; Land Resumption Compensation Case in Land Court. (Flooding)
1993: for Mulgrave Shire Council; Development Appeal (Kamerunga Villas) in Planning and Environmental Court. (Flooding)
1994: for Pullenvale Residents Action Group, on Rezoning Appeal. (Flooding and Water Quality)
1994: for Development Consulting, on Rezoning Appeal for a Development with a Large Detention Basin at Calamvale. (Flooding and Drainage)
1994: for an Earthworks Contractor Regarding a Disputed Claim Over Levee Bank Construction at Mungindi. (Flooding)
1995: for a Developer on Bohle River Works. (Flooding and Water Quality)
1995: for Residents on Flooding, Murrumba Downs. (Flooding)
1995: for Residents on Flooding, Dayboro. (Flooding)
Expert Services for Phillips Fox; Caboolture Shopping Centre Extension Appeal in Planning and Environment Court. (Flooding)
Expert Services for Mulgrave Shire Council; Land Resumption Compensation Case in Land Court. (Flooding)
Expert Services for Mulgrave Shire Council; Development Appeal (Kamerunga Villas) in Planning and Environmental Court. (Flooding).

Papers/Publications

May 2007 QELA Conference Presentation – The Approval and Appeal Process in QLD and NSW, Experts view on soil and water issues.

Nov 2004 Publication - 'Application of Australian Runoff Quality Draft Chapter 6 – A model approach', Water Sensitive Urban Design Conference, 2004, Adelaide.

Jul 2004 'Integrated High Order Water Quality and Hydrodynamic Analysis', 8th National Conference on Hydraulics in Water Engineering, July 2004.

Nov 2002 Publication - 'Hervey Bay Storm Surge', 30th PIANC Congress, Sydney 2002.

Nov 2001 'The Use of Runoff Event Monitoring in Validating Sediment Control Measures', 9th Annual Conference, International Erosion Control Association, Nov 2001.

Nov 2001 'Specialist 2D Modelling in Floodplains with Steep Hydraulic Gradients', 6th Conference on Hydraulics in Civil Engineering, Nov 2001.

Mar 2001 'Planning Implications of New Technology in Floodplains', RAPI Conference, Gold Coast, 2001.

Nov 1999 'Best Management Practices for Water Quality Control', and 'Zero Flooding Impact Assessments; the need for full two dimensional analysis', 8th International Conf. on Urban Stormwater Drainage, 1999.

Jul 1999 'Desktop Ship Simulation for a new Port Facility in The Gulf of Papua', Coasts and Port '99.
Mar 1997 'Implications of the Nifsan -v- G.C.C.C. ruling on floodplain hydraulics', Qld Envir. Law Assoc., 1997.

Jul 1994 'What the Community Needs to Know – Approaches to Community Construction for Water Engineering Projects', I.E. Aust., Queensland Division, 1994.

Nov 1993 'Hydraulic Assessment of Floodplain Development: Case Studies', The Institute of Municipal Engineering, Goondiwindi, 1993.

Jul 1993 'Long Term Environmental Planning – Weipa Port Dredging', 11th Australasian Conf on Coastal and Ocean Engineering. Townsville, 1993.

Mar 1993 Integrated Hydrologic and Hydraulic Modelling', WATERCOMP '93. The Second Australasian Conference on Technical Computing.

Mar 1992 'Russell and Mulgrave River Catchment Management', Invited Guest speaker for Queensland River Trusts Conference, Cairns, 1992.

Nov 1990 'Recent Studies of Port Dredging and Offshore Spoil Dumps', Third Australasian Port and Harbour Conference 1990, IE Aust.

Aug 1990 'Barron River Airport Bend Study - An Exercise in Joint Numerical and Physical Modelling', Conf. on Hyd. in Civil Eng., 1990, IE Aust.

May 1989 'Comparison and Evaluation of Current Dynamic Flow Models', WATERCOMP '89. The First Australasian Conference on Technical Computing in the Water Industry, Melbourne, 1989.

May 1989 Publication - Dynamic Flow Modelling : Comparison and Evaluation of Current Models - final Report', ACADS International publication No. U-249, May 1989.

May 1988 'Comparison of Dynamic Flow Models', ACADS 2D Modelling of Flood Plains, Melbourne, 1988.

Jun 1985 'ACADS Project on Comparison of Unsteady Flow Models', ACADS workshop, Brisbane 1985.