

GRANTHAM FLOODS COMMISSION OF INQUIRY

Submissions on behalf of the 'Grantham Families'

1. Twelve residents of Grantham died in the devastating flooding of that small town. Many others lost their homes and possessions or businesses and livelihoods. The twelve deaths occurred in a very small area.¹
2. These twelve deaths constituted almost half of all the deaths from flooding in South East Queensland.² The flooding of Grantham was a giant flood event. It was a giant flood for all of the Lockyer valley, but in a very small area of Grantham twelve people died.
3. It is very important for the people of Grantham, for the people of the Lockyer Valley and for all Queenslanders to understand the reasons why so many people died by drowning - in or near their own homes - in an historic town that had withstood many prior floods.



4. The Commission of Inquiry appears to have resolved five key issues of concern to the residents of Grantham:
 - I. The time of the devastating surge of flood waters into Grantham;
 - II. The degree to which proper consideration was given to the eye-witness testimony of residents in the initial investigation;
 - III. When the bunds on the western side of the Grantham quarry were built;
 - IV. The contribution of the quarry bunds to the flooding of Grantham; and
 - V. The adequacy of the initial investigation into the reasons for those twelve deaths in Grantham.

¹ Exhibits 83, 135, and 136

² Coronial report of the State Coroner Michael Barnes dated 5 June 2012

5. The resolution of those issues by the evidence heard by this Commission can be summarized in the following way:
 - I. The residents have been shown to be correct in their evidence of the timing of the flood waters into Grantham;
 - II. There was a failure by the initial investigation to give proper weight to the residents' eye witness testimony and to resolve conflicts in the evidence by seeking out objective sources of evidence. This was starkly illustrated by the Commission's successful use of phone records to determine the actual time at which the SES arrived at the outskirts of Grantham on the afternoon of 10 January 2011;
 - III. The evidence demonstrated that the bunds on the western side of the Grantham quarry were built after 1998 and predominantly in the mid 2000s;
 - IV. On the evidence heard in this Commission, there was some contribution of the bunds on the western side of the Grantham quarry to the manner of the flooding, but it was not likely to have been significant. This evidence went against the previously strongly held beliefs of some residents of Grantham. However it must be understood that these beliefs were in the context of concerns about the effects of mining in this oxbow that existed long prior to the 2011 floods and were shared by the local council. It was only in this Commission that hydrology evidence was properly tested against the eye witness accounts – the Commission having given them a credence hitherto not given to those accounts. The Commission also provided a forum – both within the hearings and in detailed and respectful briefings of the concerned residents – in which the hydrological evidence and its testing against 'lived experience' could be properly understood by the residents and by the broader community; and
 - V. The evidence demonstrated that the QPS officers assigned to assist the coroner (Taskforce Galaxy) had the resources and intention to investigate the cause of the deadly flooding of Grantham through the use of experts and to relate that investigation back to the eye witness accounts which had been taken. Had that occurred, the community concerns, which have been so strongly felt, would have been likely to have been assuaged at a much earlier time.
6. This submission will review each of those matters in turn, and also summarise the evidence of crucial eye witnesses to the flooding in Grantham itself.
7. The submission will also consider the expert evidence and the degree to which there is necessarily uncertainty about modelling very large flood events.³
8. Finally this submission will consider the lessons that can be learned from this flood.

³ [50] of Dr Stefan Szykaski's addendum report (ex 163)

Issues I & II – the timing of the flood waters entering Grantham, the investigation of that issue and the treatment of eye witness testimony generally.

9. The SES statements⁴ claimed that at 3pm it was not possible to enter Grantham due to flood waters. The statements and testimony of residents to this Commission⁵ maintained that this was not correct. When the SES statements were examined, it was clear that the entirety of the timing evidence came down to a single handwritten entry in an SES attendance sheet. In the context of this deadly flood event, the time at which any official effort had first been made to warn the residents of Grantham was a very important piece of evidence.
10. Commission investigators took the step of seeking phone records between the SES coordinator and the SES volunteer Mrs Fifoot. These phone records demonstrated that the time was out by an hour. When Mrs Fifoot was shown these phone records, she readily accepted that she had made a mistake in completing the attendance sheet when using 24 hour timing.⁶ A combination of Mrs Fifoot's evidence and the phone records made it clear that the SES had only contacted Mrs Fifoot at 3.51pm and that she would have arrived at Grantham to warn people some time well after 4pm.
11. The simple way in which this issue was resolved can be contrasted with the distress that was caused by the failure to take this investigative step.⁷ The only reason for failing to take this investigative step was preference by the prior investigators (at some point in the investigative chain) to accept evidence from official or quasi-official sources, and to ignore or discount evidence coming from affected citizens.⁸
12. Disturbingly this phenomenon was also present in the way the Local Disaster Management Group (LDMG) dealt with contemporaneously received witness accounts.
13. At the time of the floods, the retired police sergeant Bernard Wilce was acting Officer-in-Charge of Gatton police station. Wilce was a member of the LDMG and was present in the LDMG command room at Gatton. He gave evidence of being aware of calls from civilians and himself taking calls from civilians.⁹ Each of these callers was reporting massive flooding on the watercourse leading down to Grantham.
14. By way of example at 2.50pm, Wilce spoke to a non-police witness who reported extreme flooding at the Helidon end of the Gatton Bypass with a motor vehicle having

⁴ SES Acting Assistant Commissioner Peter Jeffrey's affidavit of 29 July 2015, and the statements of SES volunteers Kathleen Carillo (2/12/11), Annette Fifoot (2/12/11), Shane Engel (2/12/11), and Gary Dorr (2/12/11).

⁵ Lisa Spierling (T 52-53), Wayne Lack (T 195.35), Francis King (T 178, 181-182)

⁶ T 818.12

⁷ Exhibits 137 and 138 (affidavits of Martin Warburton and Lisa Spierling respectively which address term of reference (e)), T 1060 (Martin Warburton), T 1063-1065 & 1068-1069 (Lisa Spierling)

⁸ This was again demonstrated in the 29 July 2015 affidavit of SES Acting Assistant Commissioner Peter Jeffrey that showed that no further investigation whatsoever was considered by the SES when served a notice by this Commission despite the obvious inadequacy of the evidence as to when the SES took action.

⁹ T 860-870

been washed from the highway and into the Lockyer Creek. After Wilce spoke to this witness again to confirm his account,¹⁰ he reported this information to the members of the LDMG. In paragraph 34 of his statement he stated that, *"on receipt of this information members of the LDMG were very doubtful of the accuracy of the reports."*

15. In relation to that evidence in his statement, Wilce was then asked the following:

*"So, given the reports from citizens, repeated reports from citizens of extreme flooding, why would anyone in the LDMG be "very doubtful" of the accuracy of these reports?---I have no idea."*¹¹

16. Even though the safety of the residents of the flood-prone town of Grantham was one of the main reasons the LDMG existed, the LDMG did not act on any of these reports or even give consideration to acting upon them. The SES did not send anyone to Grantham until after 3.51pm. There was no consideration given to making telephone calls to the people of Grantham to warn them based on the information received.
17. This can be contrasted with the call made at a much earlier time by Mayor Jones to a person he knew in Grantham to warn them because of his concern for their safety.¹²
18. It might be said that it is difficult to know how the residents would have reacted to warnings. However, it is reasonable to think that if a warning had come from an official source it would have been acted upon. Conversely, the lack of any official concern or warning is likely to have the opposite effect – that is reducing any concerns that might have arisen from reports heard from other non-official sources.
19. This issue is particularly emphasised because it evidences the way in which the very first eye witness accounts of this flood were undervalued or ignored.

Issue III – the timing of the building of the bunds

20. Dr Starr's evidence was based on his stereo-analysis of aerial photographs and examination of the remnants of the bund walls on the site. He gave the opinion that the substantial bund walls on the western bank of the quarry were built between 2001 and 2008. He indicated that a comparison between 1997 and 2001 aerial photographs and later photographs from 2008 (and LIDAR from 2010) demonstrated that the bund walls which existed by 2010, did not exist in 1997 or 2001.¹³

¹⁰ T 862.38

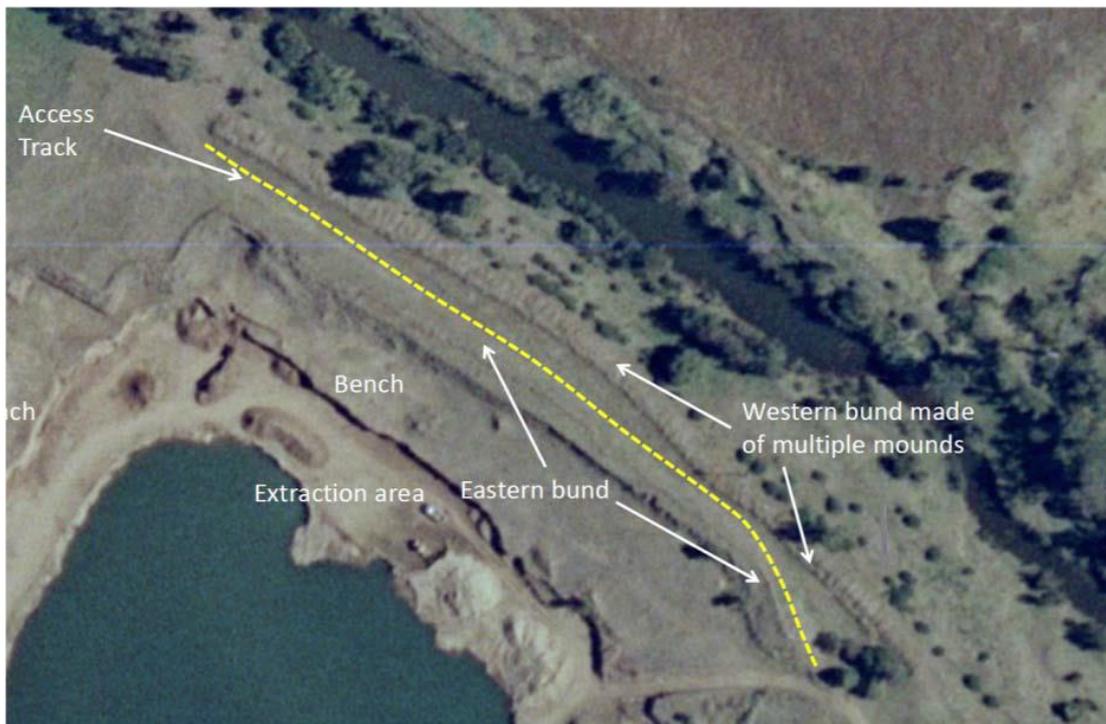
¹¹ T 863.03

¹² T 973 - 974

¹³ T 1013 and exhibit 131 and 132



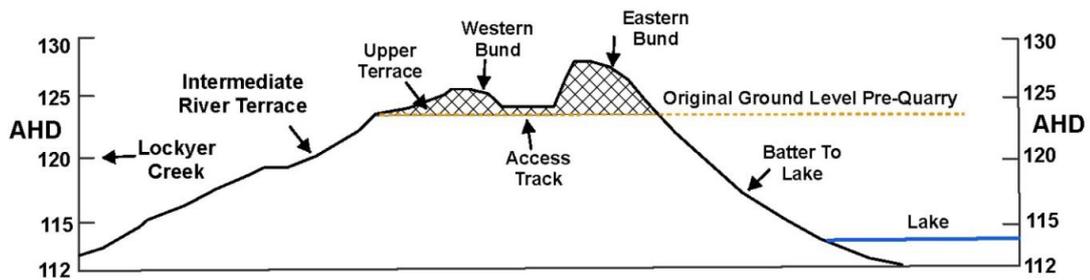
'Enlargement of 1997 air photo showing western levee – note no bunds either side of the access track.



'Enlargement of 2001 air photo showing western levee – note multiple mounds of earth on west side of the access track.

21. Mr Anthony McIntosh's evidence was that it was in about 2005 that the level of the walls on the western side of the quarry pit *"was being raised much higher."*¹⁴ Dr Starr's assessment of the state of the bunds on the western side of the quarry is set out in a schematic way in the first plate of his report.

¹⁴ T 513.07



‘Schematic cross-section through western levee, Grantham Quarry’.

22. It is submitted that even without any other evidence, an examination of the aerial photographs from 1997 onwards clearly demonstrate a build up of the very substantial earth walls on the western side of the quarry pit. In light of these photographs, Mr McIntosh’s evidence and Dr Starr’s opinion, no conclusion other than that the bund walls on the western side of the quarry were built after the Wagner companies acquired the quarry is tenable.
23. As discussed further below, those bunds were built contrary to conditions of use for the site and without permission being sought from any governmental instrumentality at any level.
24. The evidence of Dennis Wagner and other senior staff of the Wagner companies does no more than demonstrate that senior management simply did not know that very large earthworks adjacent to banks of Lockyer Creek were being constructed in contravention of the conditions of use for the site.

Issue IV – (a) the expert evidence regarding the flooding; and (b) the reasons behind the belief that the Grantham Quarry had a significant effect in the flooding of Grantham

(a) The expert evidence regarding the flooding

25. On 10 January 2011, floodwaters began to build up behind a bottleneck in the Lockyer Creek. That bottleneck was caused by a combination of the topography of the quarry oxbow and the earthen walls that had been built on the western bank of the quarry.¹⁵ A massive body of water¹⁶ pooled upstream of the quarry oxbow – it was not that no water could get through that tightened bend – it was that not enough of the water in Lockyer Creek could get through.
26. There were two further features of the quarry oxbow that combined with the bank heights to define the point at which waters broke the banks and headed directly east towards the centre of Grantham. These features were a ‘kink’ in the creek just north of

¹⁵ T 1205, 1257.20 (evidence of Dr Macintosh)

¹⁶ T 1203.45, 1205-1209 (6.3 gegalitres)

the batching plant and then a 'pinch' point just south of the batching plant.¹⁷ The batching plant stood on higher land.¹⁸

27. Just above the higher ground of the batching plant was an area with lower banks and lower land area behind the banks. Due to the rising waters (from the ponding behind the quarry oxbow, and the effects of the 'kink' and the 'pinch') it was here that the water broke through and began to head due east towards Grantham.
28. That low point is in comparison with the levels of landscape to the North and South of that break-out point. The lowest point is formed by a dip on Quarry Access Road¹⁹, but this lowest point is itself only a dip within a general depression in the land levels in this vicinity.
29. The landscape to the North of the low point is natural, but the land to the south is where the batching plant stood. However Dr Macintosh's evidence is that even had the batching plant stood at a lower level, this would have made almost no difference to the direction and intensity of the breakout at the relevant point.
30. The land falls away over flat land from the breakout point towards the town of Grantham. The railway embankment meant that this water did not have any escape route to the north. The break-out from the oxbow then met two other bodies of water - from Lockyer Creek to the South and from Sandy Creek from the North.
31. Lower lying areas of land resulted in higher velocity levels and terribly destructive flooding. The hydrological conclusion appears to be that in flood waters that rose as rapidly as the flood waters did on 10 January 2011, the topography of the oxbow and the land leading into Grantham creates a risk of dangerous flooding. The hydrological evidence shows that the way the flooding occurred was affected by the man-made features within the quarry oxbow, but those man-made features did not cause the intense, deadly flooding of Grantham.
32. It should be borne in mind that this was an open question until the work of this Commission resolved it. The original DHI report²⁰ demonstrates that the contrary view – that the man-made features significantly altered the behaviour of the flood event – was an open one on the evidence up until that point, even to an expert with the credentials of Dr Szykarski.

(b) The reasons behind the belief that the Grantham Quarry had a significant effect in the flooding of Grantham

33. From the commencement of mining within the oxbow in Lockyer Creek above Grantham, the potential risk of changes in the pattern of flooding of the low-lying town of Grantham was recognized.

¹⁷ T 1182-1184, 1246-1248 (evidence of Dr Macintosh)

¹⁸ Ex 53, Figure 3A in Golder Associates Geo Technical Report dated 28/7/15 (David Starr)

¹⁹ T 1245.10

²⁰ Ex 145

34. In a letter to the Water Resources Commission on 3 June 1981 J English wrote:²¹

“Can the Commission assure there will be no increase in build up of flood waters around Grantham due to the change in the Lockyer Creek because of this mining.”

35. Based on the advice of the Water Resources Commission, the Gatton Shire Council sought to guard against these problems by imposing two key conditions upon the use of the site for mining in its conditions of approval dated 20 October 1981:

“9. The buffer zone between Lockyer Creek and any excavated area to be 40 metres except where pegged to retain the natural water exit on the south east corner in case of flooding the lower terrace. The buffer zones in all cases are to be left in their natural state, they are not to be used for storage of materials, overburden, sand or gravel. All buffer zones are to be permanently marked.”

10. Overburden is not permitted to be placed so as to form a levee bank, unless approval is obtained from the Water Resources Commission.”²²

36. Each of those conditions was in force on 10 January 2011.²³ However the operators of the quarry were obeying neither of those conditions when the Lockyer Creek began to rise.²⁴

37. Contrary to those conditions, the buffer zones had *“not been left in their natural state”* and overburden had been *“placed so as to form a levee bank”*. A more than 300 metre 3-4 metre tall earth wall had been built along the western edge of the quarry pit (‘the eastern bund’).²⁵ A smaller, but still substantial earth wall (‘the western bund’) had been built closer to Lockyer Creek running parallel to the eastern bund.

38. It is therefore unsurprising that after the flood Grantham residents raised concerns about whether these massive earthen walls had been involved in the flooding.

39. Those community concerns after the 2011 flood were founded, at least in part, on six matters:

- The walls were not natural;
- The Wagner companies built the walls after the purchase of the site;

²¹ Statement of Ian Flint of 24/7/15

²² Ex 51 & page 548.39 of Commission hearing transcript, annexure 10 to the statement of Ian Flint, CEO of the Lockyer Valley Regional Council dated 24/7/15 (ex 94).

²³ Statement of Ian Flint of 24/7/15 in IF-2 at p 16-19 (ex 94) and T 904.37, 909.37.

²⁴ T 1046 (Dr Starr’s evidence that the earthworks on the western bank were closer than 40m to Lockyer creek) and T 1279.35 (Dr Macintosh’s evidence that the walls operated to prevent the overland flow of water and hence acted as a levee)

²⁵ Figures 2 and 2A of the Golder Associates report (Dr Starr) T 1279.17

- There was a reported claim by Wagner company representatives that the walls were natural features of the land;
 - There was a failure (at local and State governmental levels) to control this unregulated building contrary to the conditions of use for the site;
 - There had been historical concerns that the wall (or other changes on the quarry site) could cause damaging flood in Grantham; and
 - The quarry walls did operate as levee banks.²⁶
40. Each of these six matters was true. Additionally, by 2014, the DHI report of Dr Szyllarski had raised real concerns about the adequacy of the SKM hydrology report.
41. Given these matters, it was crucial that this Commission determine the effect of the quarry wall on the flooding at Grantham. That important goal has been achieved.
42. However it is also very important to recognise that those same matters mean that:
- The quarry operators were in breach of their conditions, and had no knowledge of what effect this would have;
 - It seems that the owners of the quarry had no real idea of what earthworks were being done at the quarry; and
 - The fact that the unregulated building of the quarry walls did not have a substantial effect on the flooding of Grantham was a matter of luck not design.
43. It is respectfully submitted that the Commission’s report should make this clear. It is not a stale issue. It is not an issue that is just restricted to the earthworks at the quarry. There is evidence that unregulated and uncontrolled changes have been made to Lockyer Creek in many locations even after the 2011 and 2013 floods: *‘Potential Impacts of levee construction in the Lockyer Valley’*, Thompson C, Croke J and Dent C., paper tendered at the 7th Australian Stream Management Conference (page 113) (**attached**).

Issue V – the cessation of the Taskforce Galaxy investigation into the cause of the Grantham flooding

44. Inspector Isherwood gave evidence that a taskforce was set up by the Queensland Police Service to assist the Coroner to investigate the 22 known deaths and three suspected deaths from drowning in the South-East Queensland flooding in January 2011. As previously noted, Grantham formed a particularly important part of that investigation because nearly half of all deaths from flooding occurred in a small section of the town of Grantham.
45. The initial scope of Taskforce Galaxy’s investigation was *“very broad to capture all available evidence pertaining to any matter that could have been seen to have contributed to the cause of death of persons as a result of the flood event.”*²⁷

²⁶ T 1279.35

²⁷ T 787.45 – 788.03 and paragraph 6 of Isherwood’s statement of 17 June 2015

46. However after the creation of the Queensland Floods Commission of Inquiry, the scope of Taskforce Galaxy was very much reduced.²⁸
47. Taskforce Galaxy requested a 'dispensation' from the Queensland Floods Commission of Inquiry to look at two areas – one being rainfall and the other being the response of emergency services.²⁹
48. However other than those two areas where permission was given by the Queensland Floods Commission, Taskforce Galaxy was limited in what it could investigate.³⁰
49. Inspector Isherwood agreed that had the scope of Taskforce Galaxy not been reduced, the QPS taskforce would have investigated the cause of the flooding of Grantham which resulted in twelve deaths of residents including whether any man-made feature of the landscape had caused a change to the pattern of flooding which resulted in any of those twelve deaths.³¹
50. An inquest would have been the ideal mechanism to ensure a focus on Grantham because an inquest is only concerned with the deaths that were caused, not with other matters. Twelve deaths in a small area of a small town would – it can reasonably be inferred – have become a key focus.
51. It is inevitable that such a focus would have revealed local concerns about the quarry wall in particular and likely resolved the questions that are now being considered more than four years later.
52. The tasks that Inspector Isherwood's team would have undertaken were precisely the sort of tasks that this Commission has now done, including:
 - I. Taking statements and – if necessary – supplementary statements to clarify timings and observations particular to Grantham;
 - II. Obtaining telephone and other records to verify those statements and resolve any conflicts; and
 - III. Retaining experts with a particular focus on Grantham and the reasons for the flood behaviour in that town.
53. Instead, those tasks went undone until now. There is a real question as to whether the investigation into Grantham suffered as a result of the limiting of the inquest via the terms of reference for the original Floods Commission.
54. Without inviting criticism of the original Floods Commission in the way in which it carried out its very broad remit, it can properly said that the sequence of events created an important gap that has only now been filled.

²⁸ T 790

²⁹ T 789.42

³⁰ T 792.22

³¹ T 793-796

55. The impact of this gap cannot be understated. This Commission has seen first hand the damage that unanswered questions can do to a community attempting to recover from a massively traumatic event.
56. The passage of time without the resolution of these issues has been very difficult for the residents of Grantham. The large number of public submissions also demonstrates how significant an issue this was for the people of the Lockyer Valley and for Queenslanders generally.
57. It must also be noted that the passage of time has inevitably made this investigation harder than it would have been closer to the time of the flood. Memories fade, records are harder to obtain and views can become entrenched.
58. An unrestricted coroner's inquiry which would necessarily have zoomed in on a one kilometre area where twelve people died would have sought to find out the reasons for the localised nature of the large number of deaths. The evidence shows that Taskforce Galaxy had the resources and commitment to do what the Commission has now done.
59. With the best will in the world, no other inquiry emerged – until now – with that sort of focus. There is a lesson in that.

Summary of the eye witness accounts of the arrival of the surge of flood waters into Grantham

60. In sworn evidence and through witness statements, the Commission has been told of the sudden consequences of that surge of water into Grantham. Those accounts are both harrowing and inspiring. What is striking is the commonality of the fact that the killing floodwaters in Grantham were unexpected in terms of speed, height and their direction from the West.

Francis King

61. Mr Francis King lived with his wife at 32 Railway St, Grantham. Both their adult sons were home with them at the time of the flooding on 10 January 2011. Mr King and one of his sons (a serving army officer) went out on to Railway St in order to move their cars. At this time there was water on Railway St, but it was only a few inches deep and creeping over the road. A video showing this was taken at about 4pm.³² The first part of this video shows very minor flows of water and no real concern by Mr King and his son. However the final part of the video shows Mr King's son urgently running towards his car. From the time that first video stopped until the water level reached above the bonnet of his son's car was less than five minutes.³³
62. There was then a second video taken when Mr King and his son were clinging to the roof of a car with the flood water at a height of about two metres and having overtopped a

³² Exhibit 27 (video 1), T 184.07

³³ T 183.40

two metre high fence along the railway.³⁴ The metadata for this video showed that it had been taken at 4.14pm.³⁵ Mr King described the force of the water as being like *“hanging on the back of a speedboat”* and that the water came in surges with the water being *“more turbulent”* after the conclusion of the second video.³⁶

63. Mr King’s testimony indicated that he observed the flood waters had come up and then down to some extent during the time he and his son reached and were clinging to the roof of a car.³⁷ He described this as *“a swell that had been over the security fence”*.³⁸ These observations were supported by the video showing debris on the other side of the railway fence after the water had fallen a small height such that the top of the fence was slightly above the water height.
64. This evidence supports Martin Warburton’s evidence of a surge of flood waters occurring raising the water height to its maximum and then a fall in the water height before it settled to its more settled full height.

Frances Arndt and Kenley Arndt

65. Mrs Frances Arndt lived with her husband Kenley at 1348 Gatton-Helidon Road. They lived next door to Danny McGuire and his family. Just before the surge of floodwaters Kenley was outside their house helping Danny McGuire put barricades out.³⁹
66. Mrs Arndt went outside the house to speak with Kenley because of a warning telephone call she had received from her daughter Kim. At this time she saw that water was rolling across the fields to the South of Gatton-Helidon road. This water was heading due North from Lockyer Creek. At the same time, there was the ‘normal flooding’ of their property from the backing up of Sandy Creek.
67. Mr and Mrs Arndt got into their large six wheel ute⁴⁰ and moved out on to the Gatton-Helidon Road to drive to the west. At this point of time there was no water on the road in front of their house.⁴¹
68. They drove west along on Gatton-Helidon Road and had got just past the cross-street Citrus Street when she described the following events:

“[I]t was just there that we hit this big wall of water and it went straight over the top of our ute and all I could see was all this black filthy water and that’s when the ute snuffed out and it just picked us up and like a cork, this big wave, and pushed us backwards up the road.”⁴²

³⁴ Exhibit 27 (video 2), T 185.30

³⁵ T 199.27

³⁶ T 188.01-.10

³⁷ T 185.30

³⁸ T 191.12

³⁹ T 89 .43

⁴⁰ T 326

⁴¹ T 91 .12

⁴² T 91 .22

69. Mrs Arndt said that water had come over the windscreen of the ute from the front as they were driving west.⁴³ At 4.07pm phone records show that Mrs Arndt made a phone call to Danny McGuire. Mrs Arndt made this call to seek Danny McGuire's help using his large fire truck. She thought that this call was made before the water hit from the west, but at a point when water from the south had reached the car doors.⁴⁴
70. At 4.09pm phone records show that Danny McGuire rang Mrs Arndt back. He told Mrs Arndt that he could not reach her ute to help her and Kenley.⁴⁵ She believed that the wave of flood water over her ute occurred after this call.
71. Mr and Mrs Arndt then remained in their ute as it was pushed backwards as the water rose to their chests in the ute. Fortunately their electric windows continued to work and they were able to escape the ute and after being washed by the flood waters, they climbed into a group of trees. They remained in those trees for three hours until they were rescued by helicopter.
72. From the time they were in those trees up until they were rescued, the flow of flood waters came from the West along the line of the Gatton-Helidon Road.⁴⁶

Daniel McGuire

73. Daniel McGuire lived at 1346 Gatton-Helidon Road. He lost his wife and two of his three children to the flood waters. The timing of his account is well identified by 000 calls. Although he suffered great trauma from those losses, his account of events combined with the timing of those 000 calls correlates reasonably well with the account of his neighbours the Arndts.
74. At 4.05pm McGuire used his Rural Fire Service Radio to call Fire Communications about the Arndts being in trouble and that he was going to assist them. The audio for that call was played to the Commission.⁴⁷ As McGuire had just commenced to drive out onto the Gatton-Helidon Road "*a wave of water*" came from the South-West and hit the fire truck that he and his family were in.⁴⁸
75. McGuire saw that this water "*went right over the truck and it started throwing the truck around, and the next minute I knew, the truck actually got spun around towards Gatton.*"⁴⁹ McGuire then made a number of calls to 000 trying to get assistance for his family as the truck was moved uncontrollably by the flood waters and began to fill with water. The first of these 000 calls was at 4.14pm⁵⁰ and this call and following calls were played to the Commission.

⁴³ T 91 .35

⁴⁴ T 92 .01

⁴⁵ T 93 .14

⁴⁶ T 95 .05

⁴⁷ T 436 .05

⁴⁸ T 436.40 – 437.09

⁴⁹ T 437.25

⁵⁰ T 438.10

76. Danny McGuire was able to save his then seven year old son Zac. Tragically he was unable to assist his wife or their other two young children. His wife Llync and his twelve year old son Garry and six year old daughter Jocelyn drowned within the cab of the fire truck.
77. Extraordinarily, Mr Maguire's focus in the aftermath of the most profound personal tragedy imaginable was to help others.

Wayne and Christine Lack

78. Mr Lack's account and photographs taken by him assist in determining the timing of the flood waters entering Grantham. Photographs 17 and 18 in the tendered series of photographs were taken at 4.09pm.⁵¹ These two photographs showed the commencement of what he described as the "second stage" of the flooding and showed a shipping container floating down Anzac Avenue.
79. Mr Lack gave evidence that the speed of the water began to change rapidly and that at about the time of photograph 25 at 4.23pm the "third wave" of water hit, raising the water level by six feet in a matter of seconds.⁵²
80. As was observed by the Commissioner during the hearing of the evidence, Mr Lack's photographs of what he described as the "third wave" accord with the evidence of Mr King about what he was experiencing as he was clinging to a tree near the railway line.
81. Mr and Mrs Lack were forced to climb up on their roof and remain there by the force and rapid rise of the flood waters. The force of the water is demonstrated by a photograph taken by Mr Lack at approximately 4.30pm on 10 January 2011,⁵³ depicting a large shed being swept towards their house.

⁵¹ Exhibit 28, WDL-3, T 197-198

⁵² T 199.05

⁵³ T 201.30, 345.25



Martin Warburton

82. Martin Warburton's account of the commencement of the flooding matches Wayne Lack's account, and one of Wayne Lack's photos in fact shows Warburton standing in front of his shop.⁵⁴
83. Warburton's evidence was that he was familiar with the general pattern of flooding in Grantham with sheet flooding coming from the backing up of Sandy Creek.
84. On 10 January 2011 the flooding was vastly different. Warburton was forced by the rapid rise of the water to climb onto the roof of his service station.
85. A critical part of his evidence was that there was a distinct rise and fall of water in the early part of the flood event. As noted, this observation by him was corroborated by the similar observation by Francis King. Warburton's evidence was that the water reached within eight inches of the ceiling of his service station, but that the level then fell, and then rose again to its more permanent peak level (which was lower than the initial surge).⁵⁵

⁵⁴ T 382 (photo 18 in the series of photos taken by Wayne Lack)

⁵⁵ T 404

Lisa Spierling

86. Lisa Spierling lived at 1384 Gatton-Helidon Road with her husband and five children who were then aged between 4 and 18 years. Like the other residents of Grantham Lisa Spierling received no official warning of what was to come. She was contacted by a neighbour Mr Wilkin who indicated that there were rising waters and so it might be prudent to move their cars.
87. Lisa Spierling was about to move her car, but was caught up in taking a call from a telemarketer when Mr Wilkin returned and shouted out a warning. Mrs Spierling and her children and the neighbour then fled. Initially the flight was in vehicles, but they were then abandoned and refuge was sought up on the railway embankment.⁵⁶
88. From that vantage point, Mrs Spierling saw the rapid rise of water into Grantham and then saw *“a big wave of water coming down the railway line”* from the west towards her.⁵⁷ Mrs Spierling and the children she was looking after had to flee down the railway line until they were eventually able to reach the relative safety of the Grantham primary school where Mrs Spierling spent the long night after the flood caring for injured residents.

Bess Fraser

89. Bess Fraser did not give evidence at the Commission. The circumstances of the horrifying and tragic deaths of her sister, her nephew and her sister’s partner are set out in her statement and through the footage shot by Mr Richardson⁵⁸ at the Grantham hotel which showed the force of the flood waters which destroyed Bess Fraser’s house and took the lives of those within it.
90. With regard to the tragic deaths of those who sheltered within their houses, the height of the flood waters becomes particularly important. The role of the QR railway embankment is relevant here and this issue will be noted in the conclusion to this submission.

Caution that must be applied to modelling of the flood events

91. An acknowledgement of the limitations of hydrological modelling is crucial to understanding Dr Macintosh’s evidence and the proper acceptance of it as the best available explanation for the flood behaviour. This may sound counter-intuitive, but the premise is that unless the limitations of modelling are accepted then apparent remnant inconsistencies acquire a significance that they may not deserve.
92. The impressiveness of modern computer modelling and the animations that can be produced are seductive. It is very important not to fall into the trap of treating a model

⁵⁶ T 59.34

⁵⁷ T 62.07

⁵⁸ T 171.20 and exhibit 26

as a 'truth machine'. As Dr Macintosh accepted, a model is only a tool. Particular limitations here are that:

- I. the 2011 flood without the quarry never happened;
 - II. the topography pre-quarry is not based on LIDAR;
 - III. the hydrograph at Helidon is uncertain; and
 - IV. there are unsatisfying explanations for the hydrograph at Gatton i.e. why Gatton was so low.
93. The purpose of this submission is not to invite the Commission to reject the modelling but to understand what it means and what it does not mean.
94. It must be recalled that the combined effect of Dr McIntosh's report and both of Dr Szykarski's reports is that there were very significant problems with the earlier work done by SKM, including:
- I. Disagreement with the shape of the crucial hydrograph at Helidon;
 - II. The failure to properly sensitivity test the model for timing of the breach and the nature of the breach;
 - III. Unexplored and unexplained inconsistencies between the SKM model output and observed flood characteristics;
 - IV. An apparent failure to model the full extent of the breach. While it now appears that the full extent was modelled the SKM report indicated to the contrary.
95. The submissions that follow about the limitations of Dr McIntosh's modelling are different from the appropriate criticisms that have been made of the original SKM report. It was so facially deficient in its 'ground truthing' and the timing of events that it could support no real confidence in its conclusions.
96. Given that SKM modelling formed the basis of the original Flood Commission's conclusions and also the overall modelling of the Lockyer Valley for flood management purposes, there has been a legitimate scepticism about the discipline of hydrological and hydraulic modelling.
97. Dr Macintosh's investigation has been exacting in its comparison between the modelling outcomes and the extrinsic evidence of the flood. However, it is not reality and it cannot match every piece of the infinitely complex real world that it is modelling.
98. The limitations of modelling need to be borne in mind most clearly in relation the impact of very local topography on flood water behaviour. The complexity of the evidence about the 'kink' and the 'pinch' in the Quarry Oxbow are good examples of this. It is submitted that the Commission's report should emphasise the effects of local features of the landscape and their consequences for the nature of the flooding.
99. An example is the photograph that is figure 4 in the initial DHI Report (ex 145). When this photograph is compared to the charts on page 83 of Dr Macintosh's report showing flow intensities (particularly that at 4.20pm), it shows that some areas upstream from

the quarry oxbow, which Dr Macintosh has marked with levels of flow intensity, were areas which were not in fact covered with any water at all.

100. Another location (again upstream of the quarry oxbow) was compared to a flow intensity diagram and again Mr Tobin SC identified that an area shown as under water in Dr Macintosh's diagram was in fact not inundated. Dr Szykarski was asked about this issue. He considered that even with those errors, the model was sufficient. This was because he regarded the water levels in the areas of interest were well calibrated. He indicated that levels near the boundary conditions of a model were more likely to be inaccurate, but this was of less concern than errors nearer the points of interest.
101. In summary, the fact that this is a computer model of reality, not reality itself, should be acknowledged so that these individual (and perhaps to some observers, discordant) features of the evidence can be understood. They do not, by themselves, constitute disproof of the modelling, but they stand as physical proxies for the uncertainty of modelling extreme flood events.

Lessons that can be learned from these flood events

102. The Lockyer creek has been heavily modified.⁵⁹ The consequences of this are unpredictable. The break-out point on the curve of the oxbow presents a great danger to Grantham in an extreme flood event. One response to this might be to raise a levee bank at that point. However the consequences of building such a levee would be difficult to predict and the expert Dr Macintosh did not recommend this.⁶⁰
103. The fact of other unregulated levee building in the Lockyer Valley was raised with Dr Macintosh. He said that, in general, unregulated levee bank building has caused grief and will continue to cause grief. He said on this subject that extreme caution had to be taken in constructing levees *"because of the effects, like all things, if you're not careful, if you put a levee bank to achieve one outcome, you'll introduce another – well solve one problem, you may introduce another problem."*⁶¹
104. At the present time, the parties are waiting on a re-modelling with the whole of the QR railway embankment removed. It is difficult to attribute any responsibility to QR given the age of the embankment, the nature of the flood and the limitations of numerical modelling at a local level.
105. Nonetheless, without attributing present day fault, there are lessons to be learnt from the modelling outputs that suggest that the railway embankment did have a material impact on flood behaviour in the area in which twelve people died.
106. Floods of this speed and size are not common but when they happen they are devastating. However, they also provide learning opportunities about our tolerance for

⁵⁹ 'Potential Impacts of levee construction in the Lockyer Valley', Thompson C, Croke J and Dent C., paper tendered at the 7th Australian Stream Management Conference (page 113)

⁶⁰ T 1254.20

⁶¹ T 1255.04

flood risk. It would seem entirely appropriate for Queensland Rail to take the modelling in this case and use it to identify where embankments – including this one – can be improved, for example, by increased use of culverts that exist elsewhere on this rail line.

107. Ultimately the efforts of this Commission have resulted in modelling of the flooding of Grantham that matches the evidence. We now have a model that experts agree represents best practice, not one that many believed – with good reason – was significantly flawed.
108. The expert computer modelling of the flood that occurred has been explained to the residents of Grantham and to the community at large through this Commission. There is no doubt that the results of that modelling are troubling. The modelling indicates that if any similarly intense flood event were to occur, then the topography of the upstream oxbow and the land leading down into Grantham mean that intense and potentially deadly flooding may be experienced again.

2 September 2015

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