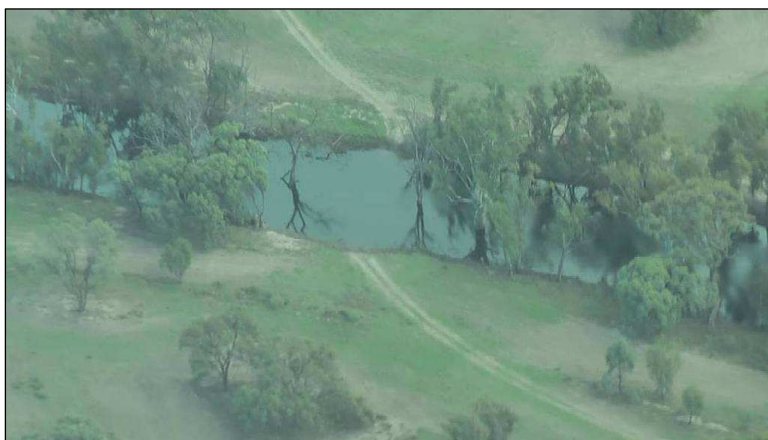




Catchment Management
Authority
Murray

Deliverability of Environmental Water in the Murray Valley

*Report to Murray Group of
Concerned Communities*



May 2012

Final Report

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Cover Photograph

Flooded access point on Mill Post Creek, a "flood runner" on private property between the Yallakool Creek and Wakool River. © 2012 Murray Catchment Management Authority. Photographer: David Clarke

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EXECUTIVE SUMMARY

1. Using 2009 as a baseline year, the Draft Murray Darling Basin Plan currently proposes to recover an additional 2,750GL per year for the environment. A large proportion of this water is expected to be recovered from the Murray Valley.
2. Due to a number of local delivery constraints within the Murray Valley, concern has been raised by the community regarding the deliverability of large volumes of environmental water without third party impacts.
3. This report aims to help identify the significance of localised third party impacts associated with the deliverability of environmental water in the Murray Valley and highlights the need for further consultation and investigation to better understand these delivery constraints.
4. Although many of the major delivery constraints such as the Barmah Choke are well known, there are several other more localised delivery constraints (e.g. flooding of private property or low level bridges) that appear not to have been considered by Murray Darling Basin Authority (MDBA).
5. In response to community concerns, Craig Knowles (MDBA Chairman) gave a commitment that if the local community identified and documented some of these constraints that this information could be considered by MDBA modellers as part of the further development and review of the Draft Murray Darling Basin Plan.
6. On Friday 23 March 2012 (six days after the Edward River minor flood peak passed Deniliquin) flight observations demonstrated a number of third party impacts, particularly on the Wakool River, Yallakool Creek, Colligen Creek and Niemur River (see flight photographs from video footage – pages 11 to 14).
7. Over 90 water delivery constraints have been recorded in a Preliminary Summary of Murray Valley Water Delivery Constraints.
8. Numerous third party impacts at flow rates less than minor flood levels at various locations within the Murray Valley have been identified. This includes:
 - a. Significant access issues within the Bullatale Creek when flows in the Murray River downstream of Yarrowonga Weir approach 20,000ML/day.
 - i. This compares to 40,000ML/day modelled by Murray Darling Basin Authority.
 - b. Impacts to a number of public roads.
 - c. Extensive third party impacts within the Edward Wakool System as a result of flows at or close to minor flood level in the Edward River at Deniliquin.

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9. It is recommended that Murray Group of Concerned Communities considers the need for the following in the Murray Valley when consulting with the Murray Darling Basin Authority and the Federal Water Minister, Tony Bourke.
- a. Clarification regarding government's position associated with the future deliverability of environmental water and associated third party impacts (e.g. flooded access points).
 - b. Clarification regarding government's plans to further investigate the option of increased flows between Hume Dam and Yarrawonga Weir (i.e. greater than 25,000ML/day in the Murray River upstream of Albury at Doctors Point).
 - c. Clarification regarding what government considers to be an "acceptable flow" downstream of Yarrawonga Weir that does not result in unacceptable third party impacts (i.e. future management of water deliveries through the Barmah Choke).
 - i. Flow releases downstream of Yarrawonga Weir of 40,000ML/day as currently modelled by MDBA will result in significant third party impacts.
 - d. Risks associated with "over watering" key environmental areas such as the Barmah Millewa Forest associated with the delivery of large volumes of water to the lower sections of the Murray Valley (e.g. Lower Lakes).
 - e. A comprehensive flood study to identify areas of inundation under a range of flow regimes (e.g. impacts within the Edward Wakool System as a result of flows at or close to minor flood level in the Edward River at Deniliquin).
 - f. A detailed community investigation/consultation program regarding the future delivery of environmental water to identify and better understand third party impacts associated with the delivery of environmental water.
 - g. The development of a single comprehensive Murray Valley database and map for delivery restrictions within the Murray Valley including:
 - i. Delivery constraint location
 - ii. Timing issues
 - e.g. Is the magnitude of the third party impact dependant on the time of the year that the impact occurs?
 - iii. Duration issues
 - e.g. Is the magnitude of the third party impact dependant on the duration under which the impact occurs (e.g. days, weeks, months etc)?
 - iv. An assessment of the magnitude/severity of third party impacts associated with the delivery constraint.
 - h. Incorporation of new knowledge associated with water delivery constraints such as those identified in this report into modelling used to assess the Draft Murray Darling Basin Plan.
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- i. The requirement for similar activities to occur in other valleys impacted by the Draft Murray Darling Plan especially in relation to:
 - i. Goulburn Valley
 - ii. Murrumbidgee Valley
 - iii. Lower Darling Valley

INTRODUCTION

10. Using 2009 as a baseline year, the Draft Murray Darling Basin Plan currently proposes to recover an additional 2,750GL per year for the environment. A large proportion of this water is expected to be recovered from the Murray Valley.
11. Due to a number of local delivery constraints within the Murray Valley, concern has been raised by the community regarding the deliverability of large volumes of environmental water without third party impacts.
12. Although many of the major delivery constraints such as the Barmah Choke are well known, there are several other more localised delivery constraints (e.g. flooding of private property or low level bridges) that appear not to have been considered by MDBA.
13. This issue was raised by the community at a “closed” community consultation meeting held at Deniliquin on Thursday 15 March 2012.
14. In response to these concerns, Craig Knowles (MDBA Chairman) gave a commitment at this meeting that if the local community identified and documented some of these constraints that this information could be considered by MDBA modellers as part of the further development and review of the Draft Murray Darling Basin Plan.
15. This report aims to help identify the significance of localised third party impacts associated with the deliverability of environmental water in the Murray Valley and highlights the need for further consultation and investigation to better understand these delivery constraints.
16. This report will assist Murray Group of Concerned Communities (MGCC) understand, identify and quantify third party impacts associated with the deliverability of environmental water in the Murray Valley in accordance with the Draft Murray Darling Basin Plan.
17. Due to time constraints, this investigation focused mainly on the upper and middle sections of the Murray Valley (including the Edward Wakool System).
18. Accordingly, the information provided in this report should be considered preliminary and indicative only.

PROJECT METHODOLOGY

19. Due to the short timeframe required to complete this report, the focus of this investigation has been placed mainly on the mid sections of the Murray Valley, including the Edward Wakool System.
20. Murray CMA wrote to fifteen stakeholders to assist with the preliminary identification of known water delivery constraints and associated impacts within the Murray Valley.
 - a. National Parks and Wildlife Service
 - b. Merran Trust
 - c. Wakool River Association
 - d. A Colligen Creek/Niemur River landholder representative
 - e. Wakool Shire Council
 - f. Deniliquin Shire Council
 - g. Murray Shire Council
 - h. Bullatale Trust
 - i. Tuppal Creek Community Water Land Care Advancement Group
 - j. State Water Corporation
 - k. Murray Lower Darling Customer Service Committee
 - l. Office of Environment and Heritage (NSW)
 - m. Forests NSW
 - n. Murray Irrigation Limited
 - o. State Emergency Service
21. This list of stakeholders is not comprehensive. It does however provide a strong basis to understand the broad nature of the problem across the Murray Valley.

ISSUES ASSOCIATED WITH EXISTING FLOOD CLASSIFICATIONS

22. The NSW State Emergency Service uses the following flood classifications. Of these it is only the minor and moderate flood levels that are likely to be most relevant:

a. Minor Flooding

i. Causes inconvenience. Low-lying areas next to water courses are inundated which may require the removal of stock and equipment. Minor roads may be closed and low-level bridges submerged.

b. Moderate Flooding

i. In addition to the criteria for minor flooding, the evacuation of some houses may be required. Main traffic routes may be covered. The area of inundation is substantial in rural areas requiring the removal of stock.

23. A list of minor, moderate and major flood levels as shown on the Bureau of Meteorology website in the Murray Valley is detailed in **Appendix A**¹.

24. While it is understood why this information could be used to set constraints in models (e.g. flow rates equal to minor flood levels) it is not valid to assume that flows at or just below minor flood levels do not result in significant third party impacts (e.g. landholder access and/or flooding of private property).

25. By way of recent example, a minor flood peak of 4.76m (about 18,800ML/day)² occurred in the Edward River at Deniliquin from a natural flow event on Saturday 17 March 2012 that resulted in significant third party impacts.

a. This compares to the minor flood level of 4.60m (about 18,000ML/day).

26. On Friday 23 March 2012 (six days after the Edward River minor flood peak passed Deniliquin) four people flew over parts of the Edward-Wakool System to assess the impacts, particularly on the Wakool River, Yallakool Creek, Colligen Creek and Niemur River. These people were:

a. David Clarke (Murray CMA - Catchment Coordinator Strategic Water Projects)

b. Shane McNaul (Wakool River Association representative)

c. Dennis Gleeson (Colligen Creek/Niemur River landholder representative)

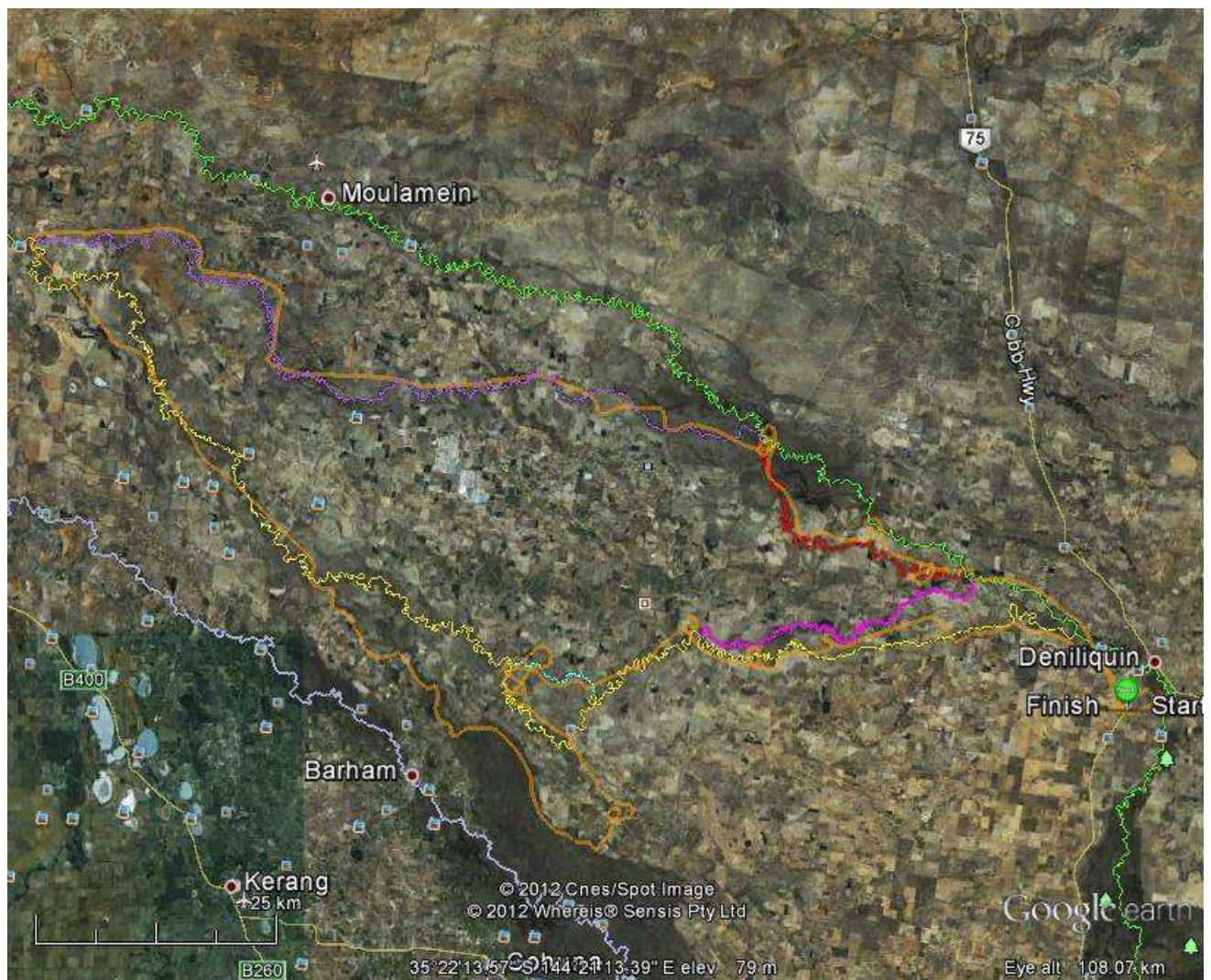
d. Nigel Whetenhall (Whetenhall Air Services Pilot)

¹ Data sourced from Bureau of Meteorology Website (www.bom.gov.au)

² Data sourced from NSW Water Information website (www.waterinfo.nsw.gov.au)

27. The following map outlines the flight path taken by the aircraft.

- a. Orange Line – Flight Path (start and finish at Deniliquin Airport)
- b. Green Line – Edward River
- c. Red Line – Colligen Creek
- d. Purple Line – Niemur River
- e. Yellow Line – Wakool River
- f. Pink Line – Yallakool Creek
- g. Light Blue Line – Merribit Creek



28. A key observation of this flight was a number of third party impacts from flooding of private property and infrastructure (e.g. access points).

29. The following photographs have been extracted from video footage that was taken on the flight.

- a. Flooded access point on Mill Post Creek, a “flood runner” on private property between the Yallakool Creek and Wakool River.



- b. Flooded access point on Box Creek on private property just downstream of the Wakool - Deniliquin road bridge over the Wakool River.



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- c. Flooded private property near a privately owned weir on Bookit Creek.



- d. Flooded private property along Christies Creek (a “flood runner”) near Merribit Creek.



- e. Flooded private property (irrigation land) near Thule Creek.



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- f. Flooded private property along the Niemur River downstream of the Barham Moulamein Road (Note: These photographs were taken prior to the arrival of the flood peak in this area).



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- g. Flooded private property along the Niemur River upstream of the Barham Moulamein Road.



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30. Third party impacts as a result of “minor flooding” can be both positive from an environmental perspective and negative from an infrastructure/access perspective.
 31. Landholders have different perceptions of what constitutes a positive or negative which varies based on their personal experiences, including the timing and duration of the event.
 32. It is clear however that third party impacts associated with environmental water delivery events in the Murray Valley similar to the March 2012 natural event exist and are generally not well documented or understood.
 33. The magnitude of third party impacts significantly varies not just with location but also timing and duration.
 - a. For example, a Landholder may not “mind” if an access bridge is temporarily flooded for a short period of time (e.g. to access stock) as long as they know in advance and can plan their activities accordingly.
 - b. Another example might be that a landholder may not “mind” if an access bridge is temporary flooded during the period that a crop on the other side of the river is growing but is likely to be highly concerned if they cannot access their crop during critical periods such as crop sowing or harvesting.
 34. A key example of community concern regarding the future delivery of environmental water in the Murray Valley is detailed in MDBA supporting documentation to the Draft Murray Basin Plan³ which includes the following site specific flow indicators for the Edward River at Deniliquin.
 - a. *18,000 ML/Day for a total of 28 days (with a minimum duration of 5 consecutive days) between June & December for 25% of years*
 - i. Equivalent to minor flood level in the Edward River at Deniliquin.
 - b. *30,000 ML/Day for a total of 21 days (with a minimum duration of 6 consecutive days) between June & December for 17% of years*
 35. As the photographs from the flight over the Edward Wakool System demonstrate (see above), a minor flood event at Deniliquin (about 18,000ML/day) results in significant inundation of private property and infrastructure further downstream.

³ Murray Darling Basin Authority 2012, *The proposed ‘environmentally sustainable level of take’ for surface water of the Murray–Darling Basin: Method and outcomes*, MDBA publication no: 226/11, Murray Darling Basin Authority, Canberra (page 214).

HUME DAM TO YARRWONGA WEIR

36. Regulated channel capacity of 25,000ML/day in the Murray River at Doctors Point (between Hume Dam and Albury) is a well known delivery constraint within the Murray Valley.
37. Negotiations to increase the level of this flood easement would require significant time and resources.
38. The decision to establish flood easements up to 25,000ML/day in the Murray River at Doctors point could potentially set a precedent for the delivery of “high flows” regarding third party impacts for landholders further downstream such as within the Edward Wakool System.
 - a. In this case there was a clear decision by government to purchase flood easements to allow flooding to occur on private property up to 25,000ML/day in the Murray River at Doctors Point.
 - b. This raises the question of the need for the establishment of flood easements in some locations for regulated flows in excess of regulated channel capacity in the Murray Valley downstream of Yarrawonga Weir.
39. As a starting point, a range of infrastructure impacts were identified in a preliminary report completed by GHD for MDBA⁴ which considers flows up to 40,000 ML/day in the Murray River at Doctors Point.
40. Given that current modelling for the Draft Murray Darling Basin Plan assumes the current constraint of 25,000ML/day in the Murray River at Doctors Point, this investigation has not focused on the Hume to Yarrawonga section of the Murray Valley.
41. Despite this, it is currently unclear what modelling work has been completed to assess the potential benefits of higher water deliveries (e.g. 40,000ML/day) in the Hume to Yarrawonga reach of the Murray River.
42. The benefits of increased water deliveries in the Murray River at Doctors Point above 25,000ML/day are indicated in supporting documentation to the Draft Murray Darling Basin Plan which states:
 - a. *Constraining flows to 25,000ML/d at Doctors Point significantly limits the delivery of regulated flows to all floodplain indicator assets along the Murray.*⁵

⁴ Murray River Action Group Landholder Impact Survey Report – November 2011 (GHD)

⁵ Murray Darling Basin Authority 2012, *The proposed ‘environmentally sustainable level of take’ for surface water of the Murray–Darling Basin: Method and outcomes*, MDBA publication no: 226/11, Murray Darling Basin Authority, Canberra (page 48).

BARMAH CHOKE

43. The Barmah Choke (section of the Murray River within the Barmah Millewa Forest) is both a major and well known delivery constraint within the Murray Valley.
44. A recent study by MDBA⁶ has confirmed that river channel capacity through the Barmah Choke has effectively remained “*relatively constant*” at 10,600ML/day downstream of Yarrowonga Weir in recent decades.
45. Once releases downstream of Yarrowonga Weir exceed 10,600ML/day, regulators into either the Barmah (Vic.) and/or Millewa Forest (NSW) need to be opened to avoid negative impacts associated with uncontrolled overbank flow.
46. Improved management practices in recent years were implemented with the intent of limiting unseasonal flooding in the Barmah Millewa Forest (e.g. summer period) which results when flows exceed channel capacity through the Barmah Choke.
47. It is also understood that when small unseasonal releases are required into the Barmah Millewa Forest that these releases are made to either the Victorian or NSW side of the river on an annual rotating basis.
 - a. The aim of this to enable at least one side of the forest to have an extended drying phase over a twelve month period.
48. Once flows exceed about 15,000ML/day, releases need to commence on both the NSW and Victorian side of the Murray River.
49. As a result of significant delivery constraints such as this, community concern relates to the risk of over watering of key environmental sites such as the Barmah Millewa Forest in order to deliver large volumes of water to lower sections of the Murray River.
50. This report has therefore developed a Preliminary Summary of Murray Valley Water Delivery Constraints (see **Appendix B** and **Appendix C** for further details) which includes a list of over 90 sites.
 - a. Many of these constraints indicate adverse third party impacts at the higher flow rates identified in the Draft Murray Darling Basin Plan.
51. A considerable amount of additional time and resources would be required to develop a comprehensive list of water delivery constraints within the Murray Valley.
52. One of the most significant constraints identified as part of this investigation is third party impacts that occur within the Bullatale Creek once flows in the Murray River downstream of Yarrowonga Weir approach 20,000ML/day.

⁶ Fact Sheet 2: The Barmah Choke Study – Investigations Phase (<http://www.mdba.gov.au/files/publications/TLM-2010-Barmah-Choke-FS2-20100316.pdf>)

53. This compares to the following supporting documentation to the Draft Murray Darling Basin Plan.

- a. *Under baseline conditions, flows through the Barmah Choke are modelled as a maximum flow constraint downstream of Yarrawonga of 10,600ML/d during summer and 22,000 ML/d during spring when flooding of the Barmah forest may be desirable.*

As part of modelling to inform the Basin Plan, MDBA has adopted a flow threshold of 40,000 ML/d during key periods to enable environmental flow to enter Barmah Millewa forest as well provide environmental water for downstream sites.⁷

54. Further details regarding third party impacts this flow regime would have on landholders associated with the Bullatale Creek is provided in a letter from Bullatale Trust (see **Appendix D** for details).

55. Another key point has been the identification of a number of public roads that are flooded at levels below minor flood level at various points within the Murray Valley.

⁷ Murray Darling Basin Authority 2012, *The proposed 'environmentally sustainable level of take' for surface water of the Murray–Darling Basin: Method and outcomes*, MDBA publication no: 226/11, Murray Darling Basin Authority, Canberra (page 49).

LOWER MURRAY

56. Generally speaking, as the Murray River has a substantially larger channel cross section in the lower reaches of the Murray River, much higher flow rates are required before significant third party impacts such as flooding of private property are experienced.
57. For this reason, this investigation has focused on the upper and middle sections of the Murray Valley only.

RECOMMENDATIONS

58. It is recommended that Murray Group of Concerned Communities considers the need for the following in the Murray Valley when consulting with the Murray Darling Basin Authority and Federal Water Minister, Tony Bourke.
- a. Clarification regarding government's position associated with the future deliverability of environmental water and associated third party impacts (e.g. flooded access points).
 - b. Clarification regarding government's plans to further investigate the option of increased flows between Hume Dam and Yarrawonga Weir (i.e. greater than 25,000ML/day in the Murray River upstream of Albury at Doctors Point).
 - c. Clarification regarding what government considers to be an "acceptable flow" downstream of Yarrawonga Weir that does not result in unacceptable third party impacts (i.e. future management of water deliveries through the Barmah Choke).
 - i. Flow releases downstream of Yarrawonga Weir of 40,000ML/day as currently modelled by MDBA will result in significant third party impacts.
 - d. Risks associated with "over watering" key environmental areas such as the Barmah Millewa Forest associated with the delivery of large volumes of water to the lower sections of the Murray Valley (e.g. Lower Lakes).
 - e. A comprehensive flood study to identify areas of inundation under a range of flow regimes (e.g. impacts within the Edward Wakool System as a result of flows at or close to minor flood level in the Edward River at Deniliquin).
 - f. A detailed community investigation/consultation program regarding the future delivery of environmental water to identify and better understand third party impacts associated with the delivery of environmental water.
 - g. The development of a single comprehensive Murray Valley database and map for delivery restrictions within the Murray Valley including:
 - i. Delivery constraint location
 - ii. Timing issues
 - e.g. Is the magnitude of the third party impact dependant on the time of the year that the impact occurs?
 - iii. Duration issues
 - e.g. Is the magnitude of the third party impact dependant on the duration under which the impact occurs (e.g. days, weeks, months etc)?
 - iv. An assessment of the magnitude/severity of third party impacts associated with the delivery constraint.

-
- h. Incorporation of new knowledge associated with water delivery constraints such as those identified in this report into modelling used to assess the Draft Murray Darling Basin Plan.
 - i. The requirement for similar activities to occur in other valleys impacted by the Draft Murray Darling Plan especially in relation to:
 - i. Goulburn Valley
 - ii. Murrumbidgee Valley
 - iii. Lower Darling Valley

APPENDIX A – SUMMARY OF MURRAY VALLEY FLOOD LEVELS

59. The following table outlines Murray Valley flood levels listed on the Bureau of Meteorology website (www.bom.gov.au).

Location	Minor Flood Level	Moderate Flood Level	Major Flood Level
Murray River at Albury	4.30m	4.90m	5.50m
Murray River at Corowa	3.80m	5.90m	8.60m
Murray River at downstream Yarrawonga Weir	6.40m	6.70m	7.80m
Murray River at Tocumwal	6.40m	6.70m	7.30m
Murray River at Echuca Wharf	93.50m	93.90m	94.40m
Murray River at Torrumbarry	7.30m	7.60m	7.80m
Murray River at Barham	5.50m	5.80m	6.10m
Murray River at Swan Hill	4.50m	4.60m	4.70m
Edward River at Deniliquin	4.60m	7.20m	9.40m
Edward River at Moulamein	4.60m	5.20m	6.10m
Murray River at Wakool Junction	8.80m	10.50m	11.50m
Murray River at Boundary Bend	8.00m	8.50m	9.00m
Murray River at downstream Mildura Weir	36.00m	37.50m	38.50m
Murray River at Wentworth (Lock 10)	32.08m	32.68m	33.88m

60. More detailed information about flood impacts associated with these levels is available from NSW State Emergency Service which currently includes a draft set of Key Operations Considerations Tables that provide an overview of key consequences at communities along the Murray Valley.

APPENDIX B – PRELIMINARY SUMMARY OF MURRAY VALLEY WATER DELIVERY CONSTRAINTS

61. The following table identifies a number of well known delivery constraints within the Murray Valley, along with a number of locally known constraints based on the personal experience and knowledge of landholders and other stakeholders.
62. This table includes a mix of both positive (e.g. environmental) and negative (e.g. infrastructure) third party impacts.
63. This table should be considered indicative only and is **not** a comprehensive list of delivery constraints within the various streams identified.
64. A considerable amount of additional time and resources would be required to develop a comprehensive list of water delivery constraints within the Murray Valley. This includes following up on some of the incomplete information identified in this table.
65. For privacy reasons, contact names, numbers and email addresses (where available) provided to Murray Catchment Management Authority have been excluded from this report.

Site No.	Stream Name	Constraint Location	Third Party Impact	Flow Rate/Level At Which Third Party Impact Occurs
1	Murray River	Doctors Point	Landholder flood easements exceeded	25,000ML/day in Murray River at Doctors Point
2	Murray River	Barmah Choke	Barmah Millewa Forest flooding. (Note: Above 15,000ML/day flooding occurs on both the NSW and Victorian side of the forest).	10,600ML/day in Murray River downstream of Yarrowonga Weir. (Note: Above 15,000ML/day flooding occurs on both the NSW and Victorian side of the forest).
3	Murray River	Tocumwal Beaches	Access to beaches denied.	20,000ML/day in Murray River downstream of Yarrowonga Weir
4	Murray River	Swan Lagoon (Perricoota State Forest)	Water from the Murray River channel enters Swan lagoon. Refreshes lagoon, could trigger localised ecological responses.	17,500 ML/day in Murray River downstream of Torrumbarry Weir

5	Murray River	Perricoota & Koondrook State Forests	<p>Water from Swan Lagoon starts to enter the forest through Burrumbarry Creek and runners. Depending on the magnitude of the water flows this can result in restricted access to many sections of the forest. It can also result in interruptions to harvest operations, 30I community firewood collection permits, road maintenance, noxious weed treatment, pest control, animal control, recreational access, hunting permits, grazing permits and apiary permit access. Flooding of the forest also results in significant environmental responses which can result in blackwater events downstream of the forest.</p>	20,000 ML/day in Murray River downstream of Torrumbarry Weir
6	Murray River	Perricoota, Koondrook, Campbell's Island State Forests	<p>Impacts persist for some time after flow rate has dropped. Following reduction in flow rate, movement of water through the forest, and localised drying period, significant works required for roading (water damage to roads and crossings, vehicle damage). Noxious weed & pest treatments required – potential spread of seed and germination of dormant seed stimulated by flooding event.</p>	22,000 ML/day in Murray River downstream of Torrumbarry Weir

7	Murray River	Perricoota Escape into Murray River	Water back up into Perricoota escape to Bunnaloo township	6m in Murray River at Torrumbarry Weir
8	Murray River	Campbell's Island State Forest	Water from the Murray River cuts main access roads which impacts Forests NSW, local landholders and the public.	24,000 ML/day in Murray River downstream of Torrumbarry Weir
9	Murray River	Perricoota, Koondrook, Campbell's Island State Forests	Water enters forest through additional places along the river (overbank events) which results in additional access problems and complete forest closures.	24,000 ML/day in Murray River downstream of Torrumbarry Weir
10	Murray River	Various forest locations	Access to Forest areas/Tourism restricted.	4.88m in the Murray River at Barham
11	Merran Creek	Norm Frankling's property	Access bridge cut off	350ML/day in Merran Creek at Frankling's Bridge
12	Merran Creek	Tumble Down Waddy Bridge	Local flooding	3m on bridge gauge
13	Merran Creek	Erigen Creek Rubble Weir	Weir overtopped	300ML/day in Merran Creek
14	Merran Creek	St Helena Regulator	Drop bars in St Helena Regulator overtopped	300ML/day in Merran Creek
15	Merran Creek	Lake Tooim	Water enters Lake Tooim which includes 4 unregulated licences	300ML/day in Merran Creek

16	Merran Creek	Coobool Siding Rd/Officers Rd	Access cut at Bridge and Culvert structures	4.88m in the Murray River at Barham
17	Merran Creek	Fountain Rd/ Nacurrie South Rd/ Ficken Rd/ Drysdale Rd	Access cut at Bridge and Culvert structures	4.88m in the Murray River at Barham
18	Waddy Cutting (part of the Merran Creek System)	Cutting from Murray River to Waddy Creek	Scouring of Waddy Cutting	200ML/day in Waddy Cutting
19	Waddy Creek (part of the Merran Creek System)	Officers Road	Officers Road Flooding	3.7m in Waddy Creek at Waddy Bridge
20	St Helena Creek (part of the Merran Creek System)	Millers Bank	Millers Bank Overtopped	150ML/day downstream of St Helena Regulator
21	Coobool Creek (part of the Merran Creek System)	Coobool Creek Road Crossing	Overtop road crossing	150 to 200ML/day downstream of St Helena Regulator
22	Coobool Creek	Marundra Rd	Access cut at Bridge and Culvert structures	4.88m in the Murray River at Barham
23	Mallan Creek	Coobool Island Rd	Access cut at Bridge and Culvert structures	4.88m in the Murray River at Barham
24	Tuppal Creek	20km downstream of Tocumwal	Bridge cut off	6.4m in Murray River at Tocumwal
25	Tuppal Creek	35km downstream of Tocumwal	Low level crossing cut off (includes fire track access)	6.0m in Murray River at Tocumwal
26	Tuppal Creek	37km downstream of Tocumwal	Water contained in banks	6.0m in Murray River at Tocumwal
27	Tuppal Creek	37km downstream of Tocumwal	Land inundated / bridge cut off	6.2m in Murray River at Tocumwal
28	Tuppal Creek	40km downstream of Tocumwal	Pipe crossing cut off	5.9m in Murray River at Tocumwal

29	Tuppal Creek	50km downstream of Tocumwal	Drive through track cut off	5.9m in Murray River at Tocumwal
30	Tuppal Creek	10km upstream of junction with Edward River	Drive through track cut off	6.0m in Murray River at Tocumwal
31	Tuppal Creek	5km upstream of junction with Edward River	Pipe crossing cut off	N/A
32	Bullatale Creek	Bullatale Creek	Numerous access points along the Bullatale Creek cut off	20,000ML/day in the Murray River downstream of Yarrawonga Weir.
33	Bullatale Creek	17km West of Tocumwal on the Lower River road	Access crossings cut off	4.93m in Murray River at Tocumwal
34	Bullatale Creek	30km West of Tocumwal on the Lower River Road	Access Crossings cut off	4.93m in Murray River at Tocumwal
35	Bullatale Creek	PC, VH & DC Reid	1388 hectares cut off. 453 hectares unsuitable for grazing.	N/A
36	Bullatale Creek	Aratula (Joy & Stewart Scott)	Access cut off	6m in Murray River at Tocumwal
37	Native Dog Creek	Aratula (Joy and Stewart Scott)	Access to 1668 hectares cut off	6m in Murray River at Tocumwal
38	Native dog Creek	16 and 30 kilometres West of Tocumwal on the Lower River road	Access crossings cut off	5.23m in Murray River at Tocumwal
39	Taylors Creek	30km West of Tocumwal on the Lower River Road	Access Crossings cut off	6.1m in Murray River at Tocumwal
40	Aljoes Creek (near Edward River at Deniliquin)	Lawson Syphon Road	Closed road sign on Lawson Syphon Road	4.0m in Edward River at Deniliquin
41	Gulpa Creek	Gulpa Offtake regulator	Forest flooding from the Gulpa Creek cuttings	350ML/day in Gulpa Creek at Gulpa Creek Offtake

42	Edward River	Edward Offtake regulator	Forest flooding downstream of the Edward River Offtake	1,600ML/day in Edward River at Edward Offtake
43	Edward River	McLean Beach Caravan Park (Deniliquin)	Inundation	4.7m in the Edward River at Deniliquin
44	Edward River	Paringa Caravan Park (Deniliquin)	Inundation	N/A
45	Edward River	Riverside Caravan Park	Inundation	7.3m in the Edward River at Deniliquin
46	Edward River	North Deniliquin Drain	Close both doors at Hay Road to prevent further back filling of the drain. At this point water will have backup to upstream of the Conargo Road, McEwans Road drainage outfall with back to drainage on Q696 (lowest inlet on the North Deniliquin Drain)	N/A
47	Edward River	North Deniliquin Drain	Flood water runs over escape doors	9m in Edward River at Deniliquin
48	Edward River	Moulamein 4 Escape	Doors on escape need to be closed one km downstream from the Moulamein 3 escape close to the River	8m in Edward River at Deniliquin
49	Edward River	Dahwilly 1 Escape	Back up into escape on two landholdings, requires escape door to be closed.	5m in Edward River at Deniliquin
50	Edward River	Dahwilly 5 Escape	Only 300mm free board before flood water exceeds escape	8.3m in Edward River at Deniliquin
51	Edward River	Wera Forest	Tumudgerry Creek Regulator opened	2,700ML/day in Edward River downstream of Stevens Weir (can't be operated over 3,000ML/day)

52	Edward River	Weraï Forest	Niemur Regulator and Reed Bed Regulator opened	2,900ML/day in Edward River downstream of Stevens Weir (can't be operated over 3,000ML/day)
53	Edward River	Weraï Forest	Broad overbank flows into Weraï Forest	4,000ML/day in Edward River downstream of Stevens Weir
54	Wakool River	Homeleigh	Low level bridge overtopped strands stock and prevents access from Brassi island, potentially prevents harvesting crops etc.	Approx 250 – 400ML/day
55	Wakool River	Widgee Station	Low level bridge overtopped strands stock and prevents access from Brassi island, potentially prevents harvesting crops etc.	Approx 200 – 400ML/day
56	Wakool River	Safes Block	Low level bridge overtopped strands stock and prevents access from Brassi island, potentially prevents harvesting crops etc.	Approx 200 – 250ML/day
57	Wakool River	Peter Basham	Access over Box Creek D/S Wakool Deni Rd cut off. Impacts stranding stock and potentially prevents harvesting crops etc.	Approx 600ML/day
58	Wakool River	Talkook Station - Cobram Creek – Unreg Stream	Splits the south west portion of Talkook STN also allows unreg pump to be utilised	Approx 930ML/day from Deni Rd end
59	Wakool River	Mclay Lane/ Greenhill Lane	Access cut at culvert structures	4.5m in Edward River at Deniliquin
60	Wakool River	Bookit Island Wakool 7.5km upstream Wakool-Barham rd (409045)	Access bridge cut off	1.77m (540ML/day) in Wakool River at Wakool-Barham Road (409045)
61	Wakool River	Bookit Island Wakool 6.5km upstream Wakool-Barham rd (409045)	Access bridge cut off	Only at extreme flood levels

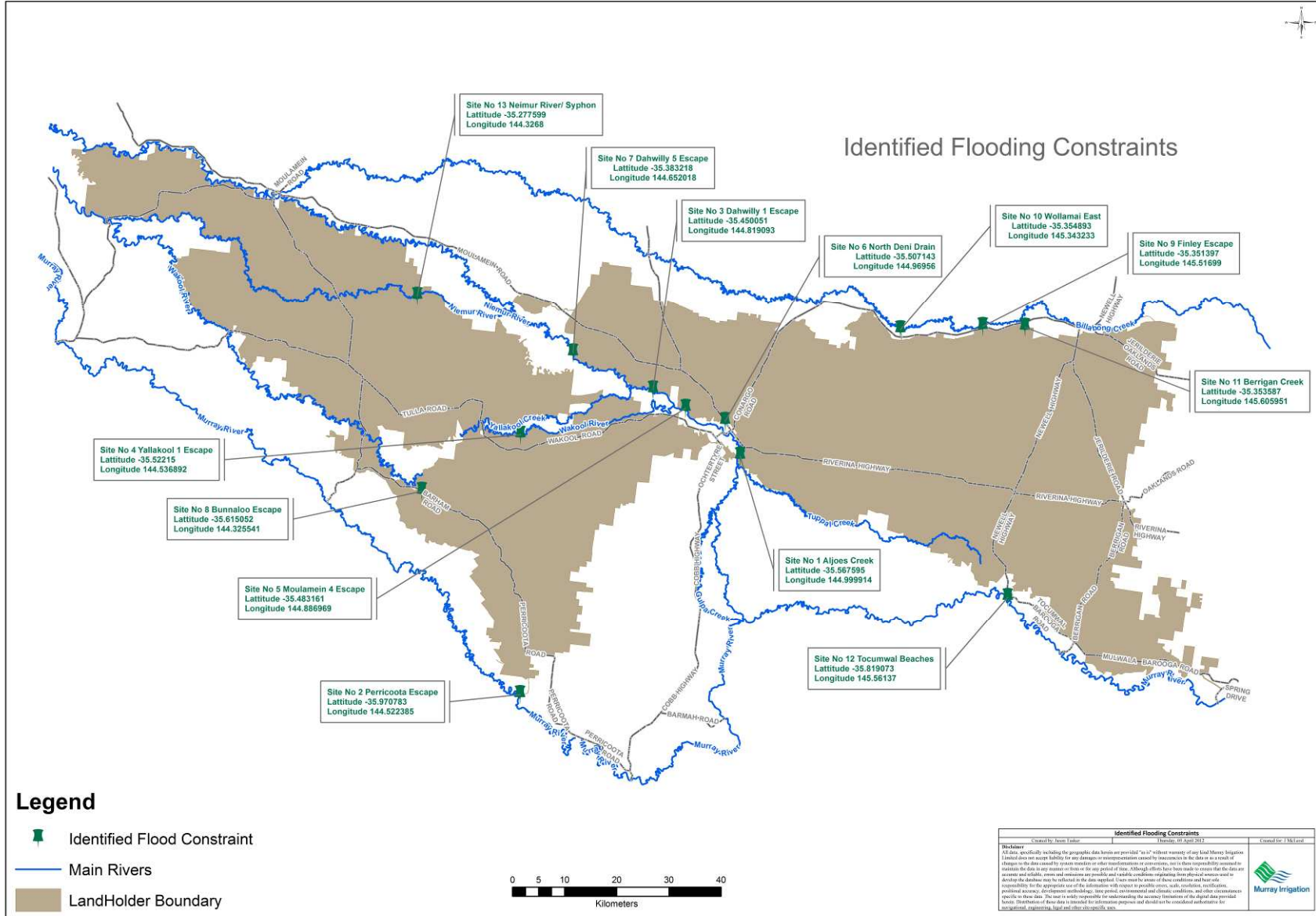
62	Wakool River	Tilga Wakool 4.25km upstream Wakool-Barham rd (409045)	Access bridge cut off	2.40m (1,110ML/day) in Wakool River at Wakool-Barham Road (409045)
63	Wakool River (backwater)	Tilga Wakool 4.5km upstream Wakool-Barham rd (409045)	Pipe crossing cut off	N/A
64	Wakool River	Bunaloo Escape	Escape door is closed to stop water backing up the drain to the Barham/Deniliquin Road	N/A
65	Wakool River	Yallakool 1 Escape	Drop bars required to be placed in the escape to avoid landholding flooding on either side of the levee	6m in Edward River at Deniliquin
66	Shaws Creek (Wakool flood runner)	Shane McNaul's property (Cummins)	Access over Shaws Creek cut. If water rises another 0.9 from mid April 2012 levels about 100ha of irrigated land is inundated.	0.9m of water over the crossing as at mid April 2012.
67	Black Dog Creek (Small creek exiting the Wakool river into the Yallakool ck)	Widgee 6.4km upstream of Wakool Deniliquin Road	Drive through track cut off (stock access)	60-100ML/day in Wakool River
68	Black Dog Creek (Small creek exiting the Wakool river into the Yallakool ck)	Widgee 5km upstream of Wakool Deniliquin Road	Drive through track cut off (stock access)	60-100ML/day in Wakool River
69	Bookit Creek (anabranh of the Wakool River)	Bookit Island - 8km upstream of Wakool-Barham Road (409045). Bookit 5km upstream from Wakool mouth	Access bridge cut off	1.85m (600ML/day) in Wakool River at Wakool-Barham Road (409045)
70	Bookit creek (anabranh of the Wakool River)	Bookit Island - 6km upstream of Wakool-Barham Road (409045). Bookit 2km upstream from Wakool mouth	Access bridge cut off	4.0m (4,200ML/day) in Wakool River at Wakool-Barham Road (409045)

71	Bookit creek (anabranh of the Wakool River)	Bookit Island - Wakool 5km upstream of Wakool- Barham Road (409045). Bookit 1.5km upstream from Wakool mouth	Access bridge cut off	1.95m (670ML/day) in Wakool River at Wakool-Barham Road (409045)
72	Bookit creek (anabranh of the Wakool River)	Tilga - 4.5km upstream of Wakool-Barham Road (409045). Bookit 300m upstream from Wakool mouth	Access bridge cut off	N/A
73	Bunna Creek (anabranh of the Wakool River)	Wakool River anabranh about 6km downstream of the Barham Moulamein Rd Bridge	Access	N/A
74	Yallakool Creek	Pat and Bill Hayes	Low level pipe access overtopped. Strands stock and prevents access to Brassi island, potentially prevents harvesting crops etc.	Thought to be somewhere around 450 – 500ML/day
75	Yallakool Creek	12km upstream of mouth into Wakool	Access bridge cut off	Estimate 600ML/day on Yallakool
76	Mill Post Creek	100m from Yallakool mouth	Pipe crossing damage (erosion of structure)	N/A
77	Mill Post Creek	1km from Wakool mouth	Inundation of access crossing	N/A
78	Porthole Creek	Cadell – Edgar Pickles	Low level crossing overtopped. Cuts off land between Wakool River and Porthole / Cobram Creek, potentially strands stock	N/A
79	Colligen Creek	Wera Forest	Runners and Lagoons start to breakout at approx 800ML/d	Approx 800ML/day in the Colligen Creek downstream of Colligen Creek Offtake
80	Niemur River	Northern Branch Canal about 1km downstream of the Niemur Syphon	The first of a series of Murray Irrigation floodway structures is opened (more details available from Murray Irrigation Limited)	4.9m in Edward River at Deniliquin
81	Niemur River	Ron Russ	Niemur goes overbank inundating a large percentage of Russ property. Lowest point on the Niemur	Thought to be approx 500 ML/day as a start point (needs to be ground truthed)

82	Finley Escape	Finley Escape outfall into Billabong Creek	Inability to deliver water on behalf of third parties (i.e. State Water) or environmental water. Inability of landholders to drain landholdings potentially causing economic loss due to crop loss. Murray Irrigation is restricted in the operation of internal supply escapes and rainfall rejection flows.	10.5m in the Billabong Creek at the Finley Escape downstream gauge
83	Wollamai East Stormwater Escape	Wollamai East Stormwater Escape outfall into Billabong Creek	Inability of landholders to drain rainfall causing economic loss from crop loss. Murray Irrigation is restricted in the operation of internal supply escapes and rainfall rejection flows.	Billabong Creek is flooded when this occurs. No gauges available to determine the height that this occurs.
84	Murrain Yarrein Creek	Balshaw Rd/ Maddy Rd/ Morton Rd	Access cut at Bridge and Culvert structures	4.5m in Edward River at Deniliquin
85	Murrain Yarrein Creek	Pike Pike Rd / Nacurrie North Rd	Access cut at Bridge and Culvert structures	4.5m in Edward River at Deniliquin
86	Cochran Creek	Rangemore Rd/ Beemellon Rd / Jerry Rd	Access cut at Bridge and Culvert structures	4.5m in Edward River at Deniliquin
87	Jimmaringle Creek	Rangemore Rd	Access cut at Bridge and Culvert structures	Approx capacity culverts 150ML/day
88	Yarrein Creek	Fraser Rd/ Amor Rd/ Dhuragoon Rd/ Gorey Rd	Access cut at Bridge and Culvert structures	Approx capacity culverts 150ML/day

89	Barker Creek	Sandy Bridge Rd/ Colenso Park Rd	Access cut at Bridge and Culvert structures	Barker Creek
90	Berrigan Creek Escape	Berrigan Creek Escape outfall into Wangamon Creek/Billabong Creek	Inability of landholders to drain rainfall causing economic loss from crop loss. Murray Irrigation is restricted in the operation of internal supply escapes and rainfall rejection flows.	Influenced by D/S levels within the Billabong Creek and Aulgudgerie Weir. Influenced by flow in the Wangamong Creek which are the result of rainfall events many kms upstream
91	Wollamai Escape	Wollamai Stormwater Channel Escape into Forest Creek	Inability of landholders to drain rainfall causing economic loss from crop loss. Murray Irrigation is restricted in the operation of internal supply escapes and rainfall rejection flows.	Directly influenced by the levels in the Billabong Creek. Flows into the Forest Creek are regulated.
92	Waugorah Creek System	Waugorah Rd	Access cut at Bridge and Culvert structures	Murrumbidgee River Minor Flood Level

APPENDIX C – MAP OF MURRAY IRRIGATION LIMITED IDENTIFIED FLOODING CONSTRAINTS



APPENDIX D – LETTER FROM BULLATALE TRUST

BULLATALE CREEK WATR TRUST
72 Junction Street
Deniliquin NSW 2710

03 58821142 / 0428 984570

prairie@deni.net.au

11th April 2012

Mr David Clarke
Murray Catchment Management Authority
Victoria Street
Deniliquin NSW 2710

RE: System Constraints – Murray Darling Basin Plan

Dear David

The Bullatale Creek Trust represents the interests of landholders along the Bullatale Creek.

We are writing to express concerns about the proposed Murray Darling Basin Plan, in particular, the ability of the Authority to develop robust plans that meet the needs of the environment in conjunction with social and economic values.

It is unfortunate that the development of the Basin Plan has not been made in consultation with regional communities. Such an approach would have delivered an enhanced ability to deliver a basin plan that had community support and enabled the input of local knowledge.

There are numerous examples where the members of the Trust have assisted Government agencies in planning processes. For example the Central Murray Floodplain Plan, where the knowledge of local landholders, was critical in determining historical flood heights and water flow behavior.

A key failing of the development of the MDBA Basin Plan, is the lack of local input and therefore opportunities to facilitate valuable discussions on plan development, environmental solutions and risks associated with proposed environmental flows.

The MDBA draft plan proposes environmental flow regimes that will significantly impact on the personal and business interests of landholders in the region. Documents have easily identifiable knowledge gaps, particularly in regard to the natural system constraints upstream of the Barmah choke.

Primarily the MDBA have focused on identified system constraints (easements) between Hume and Yarrowonga, negotiated over many years in relation to the delivery of regulated flows.

The MDBA have not however identified **natural system** constraints below Yarrowonga and therefore, in the development of the Basin Plan, have made some incorrect presumptions.

The Basin Plan proposal to deliver environmental flows targets along the Murray system, poses significant risks to the Trust landholders.

The first is how environmental targets will be met within existing regulated flow regimes while also meeting human needs, SA monthly entitlement and irrigation supplies:

- within normal regulated of 25,000 m/d Hume to Yarrowonga
- within 10,500 (Millewa choke) and 8,500 (Barmah choke)

System constraints in respect of regulated flows mean that not all of the MDBA environmental targets can be met at the same time meeting the needs of other river users.

The second is by the MDBA planning to deliver environmental flows above regulated flow scenarios. Initial discussions suggest increasing easement levels of 25,000ml/d between Hume and Yarrowonga.

Under this scenario, raising easements between Hume and Yarrowonga, does not negate the responsibilities of the MDBA in terms of landholders below Yarrowonga, where no such easements are in place.

The third scenario is for the MDBA to top up natural river inflows entering the Murray below the Hume Dam. Such scenarios will raise the height of the Murray River at Tocumwal beyond regulated conditions, thus leading to third party impacts.

Flows of 20,000 ML/d at Tocumwal will cause property access issues for downstream landholders in certain parts of the catchment. At this level, tourism is also impacted eg at Tocumwal, where major tourism beaches are cut off, or are under water.

For landholders in areas where creeks leave the Murray and flow through to the Edwards, Murray River levels at this point can cause properties to be cut in ½ leading to livestock, cropping and weed management impacts.

The fourth scenario is environmental flow targets over a set period where the target itself poses river heights, which can elevate the risks of major district floods

The region's natural major constraint is the Barmah and Millewa choke. The associated forest system once wetted up either through natural or environmental flows, changes the behavior of further flows coming from Hume Dam releases, or from tributaries inflows above Yarrowonga Weir.

The fifth factor is the relationship between relative heights of the regions total rivers. In particular the relationship between Hume Dam releases, Ovens, Kiewa or King inflows, and the Goulburn River. The combination of combined river heights, tributaries inflows, affect the behavior of individual flood events.

The MDBA has not factored flood risk management into the development of environmental targets proposed under the Basin Plan..

Key Points:

Property Access Issues

- The MDBA proposed flow objectives for environmental sites along the Murray River that cannot be met without third party impacts in the Bullatale Creek area. In particular these impacts become evident on the Bullatale Creek and Native Dog Creek at around 20,000 ml/d measured at Tocumwal
- The MDBA has recognized system constraints (current easements of 25,000m/d Hume to Yarrawonga), but failed to recognize any other third party impacts below Yarrawonga.
- Under regulated flow conditions, Hume dam releases of 25,000 ml/d do not impact Bullatale Creek properties. This is because at Yarrawonga, the Yarrawonga main channel (Vic) and the Mulwala Canal (NSW) offtakes, reduce the total regulated flow rates of 25,000 ML/d below Yarrawonga. The Victorian and NSW offtakes, in general leave regulated flows rates for the Murray system at approximately 10,500 measured at the Millewa choke. Further downstream the Murray River is constrained further with a maximum of 8,500 ml/d before water would naturally spill over the banks into the forest below.
- Under regulated conditions, the Murray River if topped up with other tributary inflows below Hume, may lead to flow in excess of 10,500 (Millewa) and 8,500 ml/ (Barmah) but this is usually managed by the use of in-forest regulators. Once flows exceed 20,000 ml/d, in forest regulators can no longer control flows, leading to uncontrolled water dispersal within the Barmah Millewa forest.
- When flows in the Barmah Millewa Forest exceed 20,000 ML/d measured at Tocumwal, Bullatale Creek properties, where land is held both sides of the creek, are impacted. This also applies to some properties along the Native Dog Creek. Water levels means properties are dissected leading to stock management issues, cropping, spraying, harvesting and other farm management issues.
- As the Barmah Millewa Forest fills, flow reversal of flood runners can occur, causing water in some flood runners to flow backwards away from the Edward River system back towards the Bullatale Creek. This can then lead to creek levels rising unpredictably, compared to recognized risks determined by river height measurements at Tocumwal
- An emerging risk is fire management. Elevated and prolonged environmental flows as proposed by the Basin Plan, will create fire management issues within the Barmah Millewa forest particularly arising from late environmental flows (late spring early summer) Fire management will become more difficult or impossible, as forest flood runners prevent access for fire management activities.

Flood risks:

- The Barmah Millewa forest system and choke constraints play a pivotal role in determining flood events, including duration, height and extent.
- If the Forest system is full, there is an increased likelihood of a major flood event, this is because as new flows enter the forest, the water cannot pass through the natural system constraints
- The township of Deniliquin can receive 50- 73% of Murray River flood flows as natural river constraints force flows away from the Murray into the Edward River system.
- Each flood event will have different influencing factors and this knowledge must be built into a flood risk management tool for management decisions in relation to environmental flows.
- The MDBA must include funding for the strengthening of regional levees that are essential to human, property and stock safety. Currently Governments have provided funding for town levees but not outside town boundaries.
- The MDBA does not have a risk management strategy for flood. This is a key gap in their planning.

Recommendation:

The MDBA and Murray CMA work to strengthen knowledge on associated risks for delivery of environmental flows.

The Chairman of the MDBA and other staff members have reassured the public that the Basin Plan **“will have no third party impacts”**, but the MDBA has not developed a risk management strategy for the delivery of environmental flows. As a matter of urgency, this should be done in the early stages of planning prior to the completion of the Basin Plan.

It is important that the MDBA recognize various factors for proposed environmental flows in relation to potential third party impacts.

1. Natural capacity constraints of the Murray River. Regional communities have built their towns, businesses and communities around the historically recognised management regimes of the Murray River of 25,000 ml/d (Hume to Yarrawonga). If the MDBA is proposing to amend historic river management arrangements this should be transparent and be subject to full planning and community consultation to ensure no third party impacts.
2. Delivery of environmental flows objectives causing third party impacts to private property, business management and/or elevated flood risks, must be part of the development of the basin plan.

The MDBA needs to consult with landholders and work with the Murray CMA to determine what solutions there are to enable additional environment flows to be delivered without third party impacts

For certain flow regimes this would mean the provision of bridges to overcome ‘property access’ issues arising from lower environmental flows. For elevated flow regimes, strengthening of regional levees must also be part of basin infrastructure projects.

The MDBA needs to include in social and economic analysis, resulting property devaluations arising from proposed environmental flows.

It must be noted that should the Basin Plan lead to increased flood risks, risks are not confined to farmers but extend to shire infrastructure, personal safety, tourism impacts and a host of related economic, social and environmental issues.

We encourage the MDBA and Murray CMA to identify solutions that can deliver multiple environmental, social and economic benefits. For example, bridges that can improve fish passage, enable continued property access and thus removing the need for continued creek crossing repairs.

Over and above a certain flow threshold, where flood risks are elevated, the MDBA should not proceed with environmental targets, as these pose unacceptable risks to human safety, private property and infrastructure. In particular, the Trust is concerned with the MDBA proposal to 'work it out over time', or alternatively cost shift the problem to the NSW.

The MDBA have promoted the concept of localism but to date that has not been evident. The Murray system has unique system constraints and the Barmah Choke must be factored into the plan's development.

The Trust is extremely concerned that the MDBA is suggesting a 'relaxation' of the Barmah choke restriction. It is unclear what this term means, but it can be presumed that the MDBA are preparing to overlook the natural constraints and therefore will ensure third party impacts.

Those who are familiar with the red gum forest also express concern about future forest health in key areas, due to over watering. The Trust is unaware of an environmental risk assessment in relation to proposed environmental flow objectives that will require certain parts of the forest to be repeatedly flooded in order to pass flow through to SA.

We encourage the CMA to consider the risks now and convey these concerns to the MDBA.

Yours faithfully

Andrew Burge
Chairman
Bullatale Creek Water Trust

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Murray Catchment Management Authority

PO Box 835 | 315 Victoria St | Deniliquin NSW 2710

T: 03 5880 1400 | F: 03 5880 1444

E: murray@cma.nsw.gov.au

W: www.murray.cma.nsw.gov.au

Document Status

Version	Author/s	Date	Amendments	Approved By:
1.0	David Clarke	4 April 2012	Preliminary Draft - Incomplete	David Clarke
2.0	David Clarke	13 April 2012	First Draft	Gary Rodda
2.1	David Clarke	20 April 2012	Photo double up in clause 31(f) corrected. Extra constraint added to Appendix C. Minor amendments.	David Clarke
2.2	David Clarke	7 May 2012	Incorporates feedback from MGCC and Murray CMA Board	Gary Rodda
3.0	David Clarke	11 May 2012	Final Report	MCMA Board