Lachlan Operational Drought update

Adrian Langdon, Executive Manager, System Operation
Murray Darling Basin

Northern Basin feeds into the Barwon Darling and includes valleys from Macquarie north

Basin Plan extraction target 3,468 GL

Southern Basin feeds into the Murray and includes valleys from Lachlan south

Basin Plan extraction target 7,450 GL
Southern Valley
Situation
Lachlan system inflows vs allocations

Allocations to extractive users (GS & HS) has been 25.9% of total inflows over this period.

- Long Term Average Inflow (1,212 GL)
- Last 10 Year Average Inflow (851 GL)
- Last 6 Year Average Inflow (740 GL)

70% of long term average
61% of long term average
Murrumbidgee system inflows vs allocations

Allocations to extractive users (GS and Supplementary) has been 30% of total inflows over this period.

- 82% of long term average
- 64% of long term average
Murray System Inflows vs Allocation

- Last 10 Year Average Inflow (5,076 GL)
- Last 6 Year Average Inflow (3,360 GL)

66% of 10 year average
Northern Valley Situation
Macquarie system inflows vs allocations

Allocations to extractive users has been 17% of total inflows over this period.

Combined inflows in 2017-18 was 42GL. Allocations made from 2016 floods.

74% of long term average
47% of long term average
Allocations to extractive users (GS and Supplementary) has been 16% of total inflows over this period.

- **Long Term Average Inflow (870 GL)**
- **Last 10 Year Average Inflow (689 GL)**
- **Last 6 Year average inflow (261 GL)**

79% of long term average
30% of long term average
Extractive users (GS and Supplementary) have taken 22% of total inflows over this period.

<table>
<thead>
<tr>
<th>Year</th>
<th>Long Term Average Inflow (1,141 GL)</th>
<th>Last 10 Year Average Inflow (713 GL)</th>
<th>Last 6 Year average inflow (298 GL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-10</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
<tr>
<td>10-11</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
<tr>
<td>11-12</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
<tr>
<td>12-13</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
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<tr>
<td>13-14</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
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<tr>
<td>14-15</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
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<tr>
<td>15-16</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
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<tr>
<td>16-17</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
<tr>
<td>17-18</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
<tr>
<td>18-19</td>
<td>1,141 GL</td>
<td>713 GL</td>
<td>298 GL</td>
</tr>
</tbody>
</table>

62% of long term average
26% of long term average
Border Rivers system inflows vs allocations

Last 10 Year Average Inflow (966 GL)
Balonne flows upstream of St George

- Long term average inflow (1112 GL)
- 10 Year average inflow (1666 GL)
- 6 Year average inflow (266 GL)
Barwon-Darling Flows versus Extractions

Extractive users have taken 12% of total inflows over this period.
Why are we in this situation?
NSW Rainfall
1 May 2018 – 30 April 2019

Australian Bureau of Meteorology

Rainfall Decile Ranges

- Highest on Record
- Very Much Above Average
- Above Average
- Average
- Below Average
- Very Much Below Average
- Lowest on Record

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ID code: AWAP
Issued: 03/05/2019

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Maximum temperature
1 May 2018 – 30 April 2019
How do inflows to our dams compare to previous droughts?
Comparison of drought inflows – Wyangala Dam

Wyangala Drought Inflows for 44 Months Starting in November

Cumulative Inflows in GL

No of Months

- Nov 1900 - Jun 1904
- Nov 1943 - Jun 1947
- Nov 1979 - Jun 1983
- Nov 2001 - Jun 2005
- Nov 2016 - Jun 2019 (32m)
Comparison of drought inflows – Burrinjuck Dam

Comparison of drought inflows - Burrinjuck Dam
Drought inflows for 24 months ending in February

Cumulative inflows in GL

No of Months
Comparison of drought inflows – Burrendong Dam

Drought inflows for 36 months

Comparison of Drought Inflows - Burrendong Dam (Drought Inflows for 37 Months Starting in December)
Comparison of drought inflows – Keepit and Split Rock Dams

Drought inflows for 24 months
Comparison of drought inflows – Copeton Dam

Drought inflows for 18 months starting in January

- Jan 1918 - Dec 1919
- Jan 1993 - Dec 1994
- Jan 2008 - Dec 2009
- Jan 2009 - Dec 2010 (50th %)
- Current Drought Jan 2017 - Dec 2018

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Comparison of drought inflows – Pindari Dam

Drought inflows for 24 months
What is deliverable in Lachlan River in 2019-20?
Delivery Efficiency

Key:
- Major Towns
- River System
- Weirs
- % Daily flow loss per km
  - <0.1%
  - 0.1 - 0.25%
  - 0.25 - 1%
  - >1%
- Dams
- Water Bodies

FLOW DIRECTION

LACHLAN VALLEY

LOCALITY DIAGRAM

0 45 90 135 180
0 50 100 Kilometers

N

Carcoar Dam
Wyangala Dam
Historical Inflows to Wyangala

Long Term Average Wyangala Dam Inflows 719 GL
Current Resource Breakdown

May 2019

An additional 181,000ML is required prior to making any new AWD.
Inflows Analysis

Combined Inflows - Analysis

- Blue line: Pre 2004 used in resource assessment
- Red line: Essen Req Only

Cumulative Combined Inflows in GL

- Jul-17
- Jul-18
- Jul-19
- Jul-20
- Jul-21
Inflows Analysis – What is Deliverable

Combined Inflows - Analysis

- Pre 2004 used in resource assessment
- Essen Req Only
- Series2
- Pre2004Inflows Starting in Jul 19 and Jul 20
- Series4
- Inflow sequence repeated similar to May17 to Apr 19

1. Observed inflow from May 17 to Apr 19 repeated 63%
2. Pre 2004 inflows continued 55%
3. Pre 2004 inflows repeat in Jun 19 and Jul 20 30%

Essential requirements
# Lachlan Resource Assessment Check – end of April 2019 Assessment

<table>
<thead>
<tr>
<th>Inflow Period Assessed</th>
<th>No of months</th>
<th>Inflows Assumed</th>
<th>Dam inflows GL</th>
<th>Trib inflows GL</th>
<th>Total inflows GL</th>
<th>Compare Dam inflow to Stats pre 2004</th>
<th>Compare Dam inflow to Stats post Millennium</th>
<th>% of carryover deliverable</th>
<th>Operations in 2019-20 Under drought stage</th>
<th>Operations in 2020-21 Under drought stage</th>
<th>Operations in 2021-22 Under drought stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>*May 19 to May 21</td>
<td>25</td>
<td>Pre 2004</td>
<td>137.5</td>
<td>86.3</td>
<td>223.8</td>
<td>99% May 1981</td>
<td>99% May 1981</td>
<td>55%</td>
<td>Stage 2</td>
<td>Stage 3</td>
<td>Stage 1</td>
</tr>
<tr>
<td>May 19 to May 21</td>
<td>25</td>
<td>Pre 2004 inflows repeats in Jul 19 and Jul 20 and not Jul 21</td>
<td>73.8</td>
<td>31.9</td>
<td>106 + 6 =112</td>
<td>50% of pre 2004 DOR for 25 months from May 19</td>
<td></td>
<td>30%</td>
<td>Stage 2</td>
<td>Stage 4</td>
<td>Stage 4</td>
</tr>
<tr>
<td>May 19 to May 22</td>
<td>37</td>
<td>May 17 to Apr 19 repeated starting May 19 &amp; May 21</td>
<td>439.7</td>
<td>145.3</td>
<td>585</td>
<td>Dam inflow drier than 99%</td>
<td></td>
<td>63%</td>
<td>Stage 2</td>
<td>Stage 2</td>
<td>Stage 2</td>
</tr>
</tbody>
</table>

**Additional stats on inflow scenarios – since last AWD in August 2017**

| Aug 17 to May 2021    | 46           | Actual to Apr 19 & pre 2004 from May 19 & continues | 382            |               |                               | 766 GL May 1983 50% of pre 2004 DOR | 545 GL May 2005 70% of Milen’m DOR | 55%                                        |                                        |                                        |                                        |
| Aug 17 to May 2022    | 58           | Actual to Apr 19 & May 17 to Apr 19 repeated starting May 19 & May 21 | 684            |               |                               | 1237 GL May 1942 55% of pre 2004 | 671 GL May 2007 101% of Millennium DOR | 63%                                        |                                        |                                        |                                        |
Storage Depletion Curve
Based on End of April RA

Lachlan Operations in 2018-19, 2019-20 and 2020-21 and Forecast Dam Levels

- Normal Operations with Water Saving Measures
- Drought Stage 3 Operations

Wyanga Dam Level (%)

- Dam Level
- All CO used in 19-20
- Restricted CO in 19-20
Lachlan Total Sales Vs Essential Req

Envelop curve ER(GL) = 14% * reg.sales(in GL) + 180GL

Under Drought Contingency Plan
Under Critical Water Ops

WaterNSW
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