SUMMARY

| Criterion | Namoi | Border Rivers | Condamine Balonne |
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| Location | The Namoi region is in north-eastern New South Wales and represents 3.8 percent of the area of the Murray-Darling Basin (MDB).<br>The region is based around the Namoi, Manilla and Peel Rivers.<br>The population is 88,000 or 4.5 percent of the MDB total, concentrated in the towns of Tamworth, Gunnedah, Boggabilla, Narrabri and Wee Waa. | The Border Rivers region is in southern Queensland and north-eastern New South Wales and represents 4 percent of the total area of the MDB.<br>The region is based around the Macintyre Brook and Dumaresq River that join the Macintyre River and continue to become the Barwon River.<br>The population is around 50,000 or 2.5 percent of the MDB total, concentrated in the major centres of Glen Innes, Inverell, Tenterfield, Stanthorpe, Inglewood, Mungindi and Goondiwindi. | The Condamine-Balonne region is predominantly in southern Queensland, but extends about 100 km southwards into New South Wales.<br>The region covers 13 percent of the total area of the MDB.<br>The region is based around the Condamine and Balonne rivers.<br>The population is 182,000 or 9 percent of the MDB total, concentrated in the centres of Toowoomba, Warwick, Dalby, Chinchilla, Roma and St George. |
| Dominant land use | The dominant land use is cattle and sheep grazing. Wheat, cotton and other broadacre crops are grown on the alluvial floodplains.<br>Around 112,000 ha were irrigated in the year 2000 with around 80,000 ha (or over 70 percent) used for cotton production. The region has one wetland of national importance, Lake Goran, adjacent to the Liverpool Plains. | The dominant land use is broad-acre livestock grazing, particularly on the tablelands. There is a shift to cropping on the slopes and plains.<br>There were approximately 75,300 ha of irrigated cropping in the year 2000. Irrigated cotton crops accounted for over 75 percent of this area. The region includes a small area of commercial forestry plantations and large numbers of farm dams and ring tanks.<br>The nationally significant wetland | Land use is dominated by cattle and sheep grazing and there are significant areas of grain. Over 112,000 ha of irrigated crops were grown in 2000 and 63 percent of this was cotton. There are several nationally significant wetlands located on the lower Balonne River system. The Ramsar-listed Narran Lake Nature Reserve (which includes Back and Clear lakes) located in New South Wales is part of large terminal wetlands of the |

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| | | Morella Watercourse/Boobera Lagoon/Pungbougal Lagoon, located 6 km south west of Goondiwindi in New South Wales, is considered to be one of the most important Aboriginal places in eastern Australia. | Narran River at the end of the Condamine system flowing out of Queensland. |
| Average Annual rainfall; % contribution to the MDB | The average annual rainfall for the Namoi region is 633 mm and modelled average annual runoff is 24 mm. The region generates about 3.2 percent of the total runoff in the MDB.<br>The average annual rainfall and runoff over the past ten years (1997 to 2006) are not statistically different to the longterm average values. A scenario based on the last ten years was therefore not modelled for the region. | The long-term average annual rainfall for the region is 641 mm. Modelled average annual runoff is 32 mm or 4.7 percent of the total MDB runoff.<br>The average annual rainfall and runoff over the ten-year period 1997 to 2006 are within 1 percent of the long-term (1895 to 2006) average values. A scenario based on the last ten years was therefore not modelled for this region. | The annual rainfall and modelled runoff averaged over the Condamine-Balonne region are 514 mm and 19 mm respectively. The region generates 8.5 percent of the total runoff in the MDB.<br>The average annual rainfall and runoff over the ten-year period 1997 to 2006 are not statistically different to the long-term average values. A scenario based on the last ten years was therefore not modelled for the region. |
| Water availability, | Current average surface water availability is 965 GL/year and a high proportion (37 percent) of this water is used.<br>Rainfall-runoff modelling with climate change projections from global climate models indicates that future runoff in the Namoi region is more likely to decrease than increase. The best estimate | Current average surface water availability is 1208 GL/year; 34 percent of this is diverted for use.<br>Current average surface water availability is 1208 GL/year of which 34 percent is diverted for use. This is a high level of use which has reduced end-of-system flows and reliability of water supply in the region.<br>Global climate models indicate that | Average surface water availability under the historical climate is 1363 GL/year. Average surface water use at the current level of development is 722 GL/year or 53 percent of the available water. This is an extremely high level of use.<br>Current monitored groundwater extraction is 160 GL/year.<br>Current average surface water |

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| | 2030 climate scenario is a 6 percent reduction in mean annual runoff. The extreme estimates (from different climate models under high global warming) range from a 31 percent reduction to a 39 percent increase in mean annual runoff.<br>Under the best estimate 2030 climate there would be a 5 percent reduction in water availability, an 8 percent reduction in end-of-system flows and a 1 percent reduction in surface water diversions overall. | runoff in the region is more likely to decrease than to increase by 2030. The best estimate (median) 2030 climate would cause a 9 percent reduction in average annual runoff. For high global warming the range of possibilities is from a 28 percent reduction to a 20 percent increase in average annual runoff; for low global warming the range of possibilities is from a 9 percent reduction to a 5 percent increase.<br>Under the best estimate 2030 climate average water availability would be reduced by 10 percent, end-of-system flows by 12 percent and diversions by 2 percent. | availability is 1363 GL/year, comprised of 1305 GL/year in the Condamine-Balonne and 58 GL/year in the Nebine. The current level of use for the entire region is extremely high as 53 percent (722 GL/year) of the average available surface water is diverted for use (Condamine-Balonne 55 percent and Nebine 11 percent). The high level of use in the Condamine-Balonne has significantly reduced end-of-system flows.<br>Under the best estimate (median) 2030 climate average annual runoff would be reduced by 9 percent. The extreme estimates (which come from a high global warming scenario) range from a 20 percent reduction to a 26 percent increase in average annual runoff.<br>Under the best estimate 2030 climate, average surface water availability in the Condamine-Balonne and Nebine systems would be reduced by 8 and 11 percent respectively. Average surface water diversions would be reduced in the Condamine-Balonne and Nebine systems by 5 and 6 percent respectively, or 4 |

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| | | | percent for the entire region. |
| Use | The region uses 2.6 percent of the surface water diverted for irrigation in the MDB. Surface water diversions were around two-thirds of total water use in 2000/01 and around one-third of total water use in 2003/4. Current average water availability is 965 GL/year and 37 percent of this water is used. This use is comprised of surface water diversions (260 GL/year) and streamflow losses induced by groundwater use (99 GL/year). This is a high level of use. | The region uses 4.4 percent of the total surface water diverted for irrigation in the MDB and 2 percent of the total groundwater resource that is extracted in the MDB. Major water storages constructed since the late 1960s enable irrigated agriculture on the plains. Over 90 percent of the water used for irrigation is diverted from surface water resources. However, groundwater use is high in some parts of the region. There is a high level of surface water diversion in the Border Rivers region which has reduced reliability of supply in the region and end-of-system flows. | The region uses 3 percent of the surface water diverted for irrigation in the MDB and about 10 percent of the total groundwater used in the MDB. |
| Regulated or Unregulated | Flows in the Namoi River are highly regulated: Split Rock Dam regulates 93 percent of inflows and Keepit Dam regulates 77 percent of inflows Keepit and Split Rock dams store water for irrigation supply. | Major water storages constructed since the late 1960s enable irrigated agriculture on the plains. River flows are highly regulated – Glenlyon Dam regulates 88 percent of inflows and Pindari Dam regulates 70 percent. | There are no major on river storages in the catchment. |
| Groundwater use | The region has the highest level of groundwater development in New South Wales and one of the highest levels of groundwater | There is a high level of groundwater development near the Dumaresq River that is expected to reduce groundwater levels and streamflow in | Monitored groundwater extraction in the Condamine-Balonne region for 2004/05 is 160 GL/year and 97 percent of this occurs in the Upper |

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| | extraction in the MDB.<br>Groundwater use in the region is 15.2 percent of the MDB total.<br>Groundwater use in 2004/05 was 255 GL – similar to surface water diversions and thus around half of total water use.<br>Continued use at current levels will lower watertables and reduce streamflow<br>About three-quarters of groundwater extraction is from the Upper and Lower Namoi Alluvium Groundwater Management Units (GMU).<br>Extraction from the Lower Namoi Alluvium GMU currently exceeds the long-term average extraction limit (LTAEL) due to supplementary licences with entitlements that decrease to zero by 2015. (The reduction in entitlements to the LTAEL level is funded by the New South Wales and Australian governments under the 'Achieving Sustainable Groundwater Entitlements' program). However, the LTAEL for the Lower Namoi Alluvium GMU is greater than total average recharge and therefore | the future. Climate change by 2030 is expected to reduce surface water availability by about 10 percent.<br>Projected increases in groundwater use are unlikely to be sustainable and would further reduce streamflow; reductions would be most apparent during low flow periods.<br>Continued groundwater use at current levels is expected to cause reductions in groundwater levels and streamflow.<br>Current groundwater use in the region is around 34 GL/year. Over one-third of this is from the Border Rivers Alluvium (BRA) groundwater management units (GMU) on either side of the state border. This represents three-quarters of the recharge to these GMUs which is a high level of development. This level of use is expected to cause large reductions in groundwater levels which will require responses from groundwater users and managers to reduce extraction.<br>Flows in the Dumaresq River are affected by groundwater extraction from the BRA GMU as over half the groundwater recharge is river leakage. Prolonged extraction at | Condamine catchment. This volume is primarily based on metered use. Actual groundwater use in the Upper Condamine is thought to be around 25 percent higher. Groundwater extraction is on average 18 percent of the total water diverted (surface) or extracted (groundwater) for use in the region and 61 percent of the total in years of lowest surface water diversion. Current extraction in 15 of the 22 groundwater management units (GMUs) in the region is more than double the average potential rainfall recharge. Extraction in six of these GMUs is more than five times the average potential rainfall recharge. Long-term extraction at these levels is unlikely to be sustainable although alternative (but unquantified) recharge sources may, in some cases, support this level of use.<br>In the area of the Upper Condamine that is modelled for groundwater, extraction (currently 47 GL/year) exceeds recharge by 38 percent and recharge is historically exceeded in more than 90 percent of years. Groundwater |

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| | extraction at this level cannot be sustained over the long term. Continued extraction at this level will lead to large reductions in groundwater levels requiring responses from groundwater users and resource managers. The long-term average extraction limit for the Upper Namoi Alluvium GMU represents 95 percent of total average recharge – a very high level of development. The Miscellaneous Alluvium of the Barwon Region GMU is very highly developed and the Peel River Alluvium GMU is moderately developed. Historical groundwater use has impacted, and will continue to impact, on streamflow in the tributaries of the Namoi River. The lower Namoi River has changed from a river that gained water from groundwater prior to development to one that now loses considerable streamflow volumes to groundwater The current level of groundwater extraction in is expected to eventually reduce average streamflow by an additional 36 | current levels will change the Dumaresq River from one which gained water from groundwater to one which loses water to groundwater. The net change is expected to cause a streamflow reduction of 9.6 GL/year. Half of this impact is likely to eventuate by 2020. Future water planning should consider these surface-groundwater exchanges. Current groundwater extraction in the Miscellaneous Alluvium of the Barwon Region GMU exceeds recharge; this is a very high level of development. Development is low in the other GMUs in the region. | extraction in this area thus needs to be reduced considerably to be sustainable in the long term. The ultimate impact of the current level of groundwater extraction on streamflow across the entire region is estimated to be a reduction of 30 GL/year. However, it is likely to be several decades before this impact would be fully realised. Rainfall recharge to groundwater could either increase or decrease as a result of climate change. However, the change would not exceed 10 percent and the impact of this on groundwater resources would be minor in comparison to the impacts of groundwater extraction. Groundwater extraction in the region is expected to decrease in the future. |

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| | GL/year to reach the total 99 GL/year impact. | | |
| Likely future development | Likely future development of farm dams (13 percent growth) and groundwater (77 percent growth) would reduce average river inflows by 3 percent, increase streamflow leakage to groundwater by 14 percent and reduce surface water diversions by 4 percent.<br>Growth in commercial forestry plantations in the region is expected to be negligible. Total volume of farm dams is projected to increase by 19,500 ML by 2030 – an increase of 13 percent over current volume. This increase would reduce mean annual runoff by about 1.5 percent.<br>Groundwater extraction by 2030 is projected to be 450 GL/year – an increase of nearly 77 percent over current levels.<br>Groundwater use would then be 66 percent of total average water use and 94 percent of total water use in years of minimum surface water diversion. Most of the increase is expected in the New | Likely future development of farm dams would have a minor impact on water availability. Projected increases in groundwater use would be unsustainable in the long-term and would impact further on streamflow.<br>The farm dam volume in the region is projected to increase by around 13 GL by 2030. About 85 percent of the growth is anticipated to be in New South Wales where this increase would represent a growth of 14 percent over current farm dam storage. This increase would have a minor impact – a reduction of 1 percent in average annual runoff.<br>Groundwater use projections for 2030 indicate an additional 12 GL/year of extraction in the modelled portion of the BRA GMU. This level of use would lead to large reductions in groundwater levels requiring responses from groundwater users and/or resource managers to reduce groundwater extraction. Without such responses this level of use could lead to complete drying of the aquifer, thus forcing a reduction in extraction. Prolonged extraction at these levels | Future development of commercial forestry plantations is expected to be negligible, and the small projected increase in farm dam development would have a minor impact on runoff.<br>The area of commercial forestry plantations in the region is small and is not expected to increase.<br>The small projected increase in farm dam capacity across the region would have a minor impact on future runoff leading to a 4 GL/year reduction in river inflows on average. The overall impacts on streamflow and water use would be negligible.<br>Groundwater extraction is likely to decrease overall as total entitlements are revised downwards due to depletion of groundwater supplies and to groundwater quality constraints. If groundwater extraction in the Upper Condamine subcatchment were allowed to increase to current entitlement levels, the system would be severely over-allocated and additional streamflow impacts |

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| | England Fold Belt, Gunnedah Basin and Oxley Basin GMUs. Given current extraction levels, these increases would lead to very high levels of development in the Miscellaneous Alluvium of the Barwon Region and Peel River Alluvium GMUs. Determining whether these levels of development would be sustainable requires greater supporting information – particularly of non-rainfall recharge sources – than is currently available. The total eventual impact of groundwater use at projected 2030 levels would be an average streamflow reduction of 113 GL/year. Of this, 76 GL/year would be due to increases in groundwater use. The streamflow reduction would be a combination of multiple tributary inflow reductions and increased leakage to groundwater in alluvial reaches. Leakage and the larger individual inflow reductions were included in the river modelling – 71 GL/year of the total 113 GL/year. | would eventually remove up to another 9 GL/year from the river through induced leakage to groundwater. Groundwater use in other GMUs in New South Wales is expected to increase nearly 6-fold overall and 27-fold in the New England Fold Belt GMU. The total impact of this additional use on river inflows is estimated to be 30 GL/year. River modelling, with 60 percent of the potential inflow reduction due to additional groundwater use together with the minor impacts of farm dam growth, reduces surface water availability by 22 GL/year in addition to the impacts of the best estimate 2030 climate. Of this, about 55 percent is due to farm dam increases and 45 percent is due to additional groundwater use outside the BRA GMU. The predicted additional river leakage of around 9 GL/Year due to increases in groundwater use in the BRA GMU would further reduce surface water availability. | would occur. However, extraction in this area is expected to be reduced by management intervention. In the Culgoa-Balonne subcatchment (St George Alluvium, GAB Alluvial and GAB Cap Rocks GMUs) extraction is expected to increase in the future; though even an increase to current entitlement levels would be relatively small compared to total extraction in the region. Only the GAB Alluvial GMU is connected to the surface water system, and here the increases in extraction would ultimately reduce streamflow by 5 to 6 GL/year. Future development of farm dams and additional groundwater extraction would not lead to any substantial additional change in the hydrology of the lower Balonne River floodplain or the Narran Lakes system. |

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| | These increases in farm dams and groundwater use would cause a further 3 percent reduction in inflows and a 14 percent increase in streamflow leakage to groundwater. Surface water diversions would reduce by an additional 4 percent to be 5 percent lower than current volumes. The amplified impact on diversions is due to streamflow leakage to groundwater induced by additional groundwater extraction. The impact on average end-of-system flows would be a total reduction (development and climate impacts) of 11 percent. The relative level of use would then be 41 percent – this is a very high level of development and 4 percent higher than the current level. | | |