



Department of **Water**
Government of **Western Australia**

Analysis and response to public submissions

Section 46 Review of Ministerial
Conditions on the Groundwater
Resources of the Gnangara Mound

Department of Water

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Department of Water

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1 Introduction

This report is the Department of Water's response to the public submissions relating to the Department's *Review of Ministerial Conditions on the Groundwater Resources of the Gngangara Mound* (herein referred to as the *Review*), released for public comment on 7 January 2008. A total of 16 public submissions were received.

The *Review* proposes amendments to the conditions set by the Minister for the Environment under Ministerial Statement No. 687 *Gngangara Mound Groundwater Resources (including Groundwater Resource Allocation, East Gngangara City of Swan)*. These conditions were set for the management and abstraction of groundwater for public and private water supply from the Gngangara Mound.

The terms of reference for the *Review* were stipulated in the request from the Minister for the Environment to the Environment Protection Authority (EPA) provided in September 2007 (Appendix A). The EPA was requested to review the conditions set under Ministerial Statement No. 687, specifically addressing the following:

- whether the water level criteria for any environmental monitoring site should be removed or varied, including as a result of changes to environmental values which have occurred at the site since the criteria were originally set;
- whether the water level criteria for any environmental monitoring site should be removed or varied due to water levels at the site being predominantly affected by climate variation rather than abstraction; and
- advice on environmental matters related to the Gngangara Mound that should be considered during development of the GSS.

During the course of the *Review*, representatives of the Department of Water and Department of Environment and Conservation (DEC) briefed the Environmental Protection Authority on four occasions (June, August, October and December) to consider options and direction for the environmental conditions. The department also provided briefing papers to the EPA summarising the proposed changes to implementation conditions.

The conditions set under Ministerial Statement No. 687 can only be modified through a formal review. As has been discussed in the *Review*, the formal review of conditions is part of a broader range of actions to improve water resource management on the Gngangara Mound, including the draft Gngangara groundwater areas water management plan (draft for public comment was released 19 March 2008), Gngangara Sustainability Strategy (due for completion in 2009) and the next Gngangara groundwater areas water management plan to be developed under the Water Resources Act (due for finalisation in 2011).

The draft Gngangara groundwater areas water management plan consolidates the Department of Water's management approach in the period prior to completion of the Gngangara Sustainability Strategy (GSS). The GSS is a multi-agency approach to

resolving a number of land management and use issues that currently impact on the water resource of the Gngangara Mound. Through this process a series of options for the future of the Mound will be put to the community. The aim of the GSS is to determine a long term sustainable goal for water resource use. This sustainability goal will, in turn, inform the development of the next Gngangara groundwater areas water management plan.

1.1 History of Ministerial Conditions on the Mound

The Gngangara Mound covers an area of approximately 2 200 square kilometres. It is a large shallow groundwater system which is bounded by the Swan River in the south, Gingin Brook and Moore River to the north and extends inland to the Darling fault (Figure 1). The aquifer is recharged by rainfall and it discharges on the edges of the Mound to streams, rivers and the coast.

The Mound supports a variety of ecosystems, including wetlands and large areas of groundwater dependent native vegetation. Changes in the depth to groundwater (increased or reduced groundwater levels) as a result of changes to recharge or abstraction may impact significantly on these ecosystems.

The first conditions on abstracting groundwater and protecting the environment on the Mound were set by the EPA in 1988. These conditions were reviewed in 1995 highlighting the importance of climate as a factor influencing groundwater levels.

The current Ministerial water level criteria determined either in 1995 or 1997 are static water levels set for the end of summer and spring. These static water levels were developed to protect the ecological, social and economic values at the particular site.

In September 2001, the Water and Rivers Commission requested that the Minister for the Environment consider a review of the existing Ministerial conditions. The Minister for the Environment subsequently asked the EPA to “inquire into and advise on changes to the existing Ministerial conditions” under section 46 of the *Environmental Protection Act, 1986*.

The Ministerial water level criteria have not been reached for up to half the criteria sites over recent years. These conditions relate to water levels in wetlands and bores.

Table 1 Number of non compliances with Ministerial conditions between 1998 and 2007

Year	Number of non compliances		
	Wetland	Vegetation	Total
1998	5	5	10
1999	7	3	10
2000	6	2	8
2001	5	3	8
2002	4	4	8
2003	10	7	17
2004	7	9	16
2005	10	7	17
2006	10	3	13
2007	12	8	20

1.2 Summary of Review Findings

The *Review* found that the general trend of decline in annual rainfall since the mid 1970s has been a significant factor in the non-compliance with the water level criteria conditions. Groundwater abstraction, land use changes and land management changes have also contributed to declining water levels.

The *Review* recommended removal of five conditions where sites have been cleared and ecological values are not recoverable. It also recommended removal of four conditions where modelling and water licence mapping shows that groundwater abstraction is not a factor in water level decline.

At the remaining 28 criteria sites water abstraction is considered to have had some contribution to water level decline and it is recommended that these sites be retained as Ministerial water level criteria sites. At all of these remaining 28 criteria sites declining rainfall, pines, native vegetation and land use changes also contribute to water level decline.

Through the development of the draft Gngangara groundwater areas water management plan, the department has introduced a number of measures to reduce abstraction from the Gngangara system. Firstly, a comprehensive review of allocation limits was undertaken, resulting in reduction in allocation limits in many areas. This has reduced the total water available for use – both public and private. Secondly, the department as worked with the Water Corporation to develop new contingency

sources which will ease pressure on Gngangara during the period that the Southern Seawater Desalination Plant is being developed. However, given the influence of rainfall on groundwater levels, it is anticipated that in the absence of a substantial increase in rainfall, a large proportion of water level criteria sites will continue to be breached.

The Department of Water considers that this expected breaching should be interpreted as an indication and recognition that the water balance on the Gngangara Mound is being affected by multiple factors. As a result, the development of an integrated approach that considers these multiple factors, which is being addressed through the GSS, is essential to the long term management of the Gngangara Mound.

The department anticipates that the GSS will resolve key land and water management issues within the context of a drying climate. Given the multiple agencies involved in land and water management on the Gngangara Mound, the department also anticipates that following the GSS process, there will be agreement between agencies on accountability for management and monitoring.

A complete revision of environmental criteria and accountability, with particular focus on the development of new climate-relative criteria is therefore not proposed at this time but is considered a necessary post-GSS activity for the Department of Water.

Following the analysis of submissions received, the department has revised decisions with respect to those sites recommended for removal due to the influence of abstraction (see Section 3.2). The department now recommends that a total of seven sites criteria sites be removed. The department will however continue to monitor groundwater levels and vegetation condition at those sites to add to the long term data set that exists. Information collected will provide important data for future hydrogeological assessments of groundwater levels across the Gngangara Mound.

In the period prior to the finalisation of the GSS and development of a water management plan built on the outcomes of the GSS, the department recommends that the remaining 30 sites be retained based on existence of environmental and other values. As a result of retaining these sites and in the absence of significant changes in rainfall, the department acknowledges that it is highly likely that it will be non-compliant with water level criteria for this interim period.

As part of the *Review* the department also reviewed Ministerial conditions and procedures and proponent commitments. The department recommended rationalising the administrative criteria for conditions and commitments that have previously been met by the department and its predecessors leading to a simplification of the reporting and auditing process.

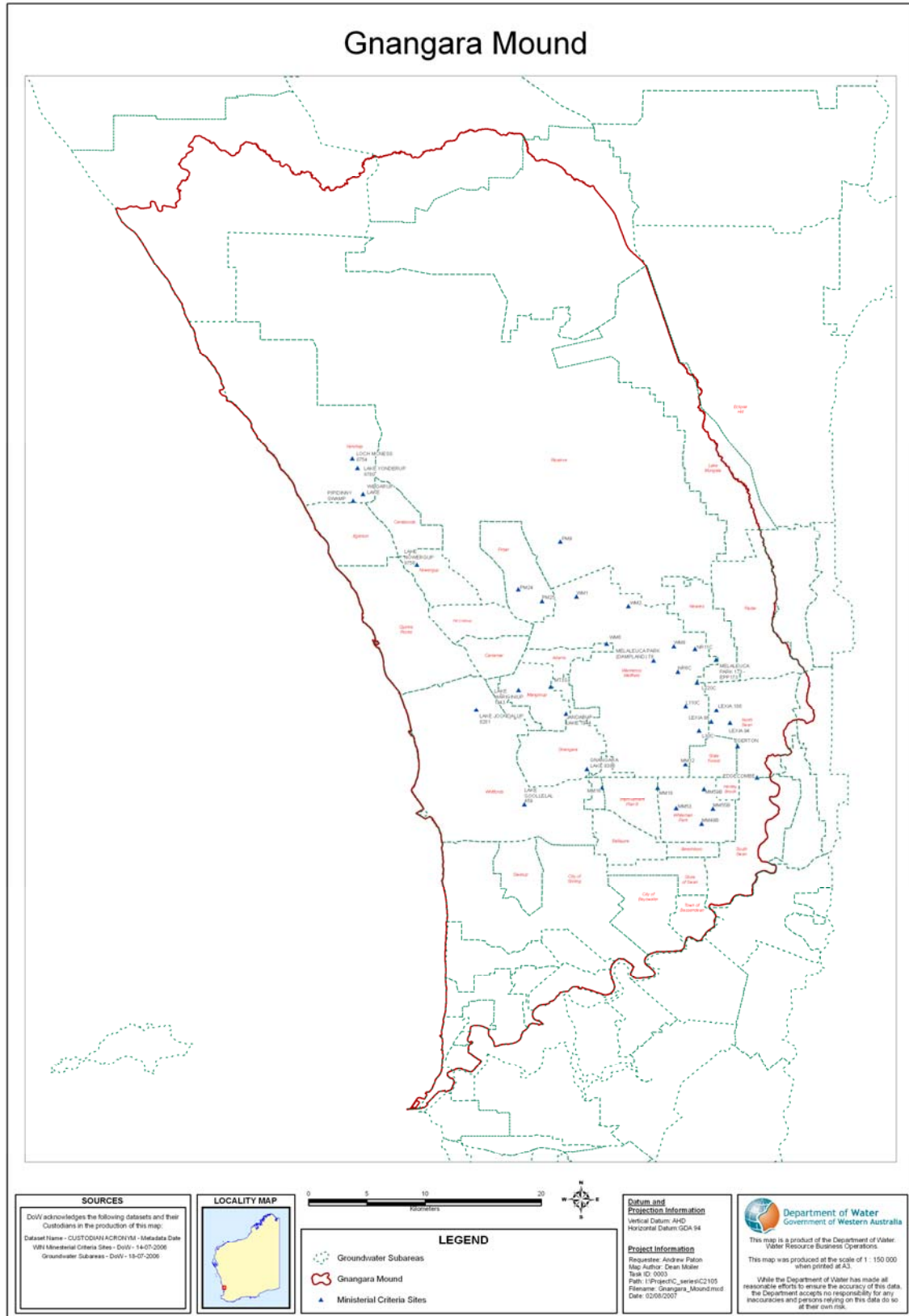


Figure 1 The Gnangara Mound showing Groundwater management areas, groundwater management subareas and Ministerial criteria sites

2 Consultation - process and reporting

2.1 Notification

As per EPA instructions the Section 46 Review was communicated through a notification process.

Notification letters were sent to government agencies, the CEO of each relevant LGA, the Water Corporation and other major stakeholders as well as other interested parties.

The document was submitted to the EPA and released for a public review period of 4 weeks from 7 January 2008, closing on 4 February 2008. The Department, on behalf of the EPA placed advertisements inviting people to make a submission on this proposal. This was placed in both state and local newspapers in the week commencing 6 January 2008. The Department also released a media statement.

2.2 Public Information Session

As part of the process for the release of the review, the department arranged a stakeholder information session. All stakeholders to whom a copy of the review document was sent received an invitation to attend the session. This session was held on 16 January 2008. This session gave an opportunity for the department to provide additional information on the Review or clarification on issues raised through the Review.

Interested parties who attended the information session included: officers from the offices of Giz Watson MLA and Paul Llewellyn MLA; members of the Conservation Council of WA; the Water Corporation; Department of Environment and Conservation; Department of Agriculture and Food; Edith Cowan University; Forest Products Commission; City of Cambridge; and Town of Cambridge.

2.3 Submissions

As per EPA guidelines, submissions were accepted through a number of mechanisms including electronic by email or through website in addition to facsimile, hard copy posted or delivered.

A total of 16 submissions were received by the EPA and forwarded on to the Department for response. In Section 3 and Appendix B the Department responds to each of the major issues raised.

3 Analysis and response

Analysis of submissions highlighted several common issues raised through the public submissions period. A large number of the issues and points raised fell outside of the terms of reference of this review as specified by the Minister's request to the EPA. These include:

- Perth Integrated Water Supply Scheme (IWSS)
- Modelling
- Replacement of sites recommended for removal with equivalent sites
- Application of the precautionary principle
- Climate change
- Awaiting outcomes/findings of the Gnamangara Sustainability Strategy
- Future Management
- Licensing
- Flaws with current Ministerial criteria
- Location/Hydrogeology
- Timing of the release of the *Review*
- Agreement with the findings of the *Review*
- Various miscellaneous issues and general comments

In some cases several of the submissions raised the same point or made similar comments to the main issues falling within the terms of reference. These have been combined and addressed in detail in Sections 3.1 and 3.2. A full summary of all the submissions received and the department's responses to each can be found in Appendix B. Where the issue has been dealt with in detail in Section 3.1 or 3.2, the reference back to Sections 3.1 and 3.2 is made.

3.1 Response to main issues

It should be noted that there is some overlap in the issues raised in the submissions. All quotes are cited verbatim from the submissions.

Perth Integrated Water Supply Scheme

“Changes to management of this groundwater resource have major implications for the IWSS, particularly if water allocations available to the Water Corporation are reduced as a result. The resource contributes approximately 60% of the IWSS supply and significant changes to the established allocation approach would increase the risk of severe restrictions and accelerate the need for alternative replacement sources. (Water Corporation)

“...Overall reductions create issues in terms of either restriction levels, or placing pressure on other sources, and these constrain the extent of the ability of the Water Corporation to respond.” (Water Corporation)

“Prior to the implementation of the GSS, it will be essential for the Water Corporation to maintain access to up to 165Gl/yr if needed, to offset possible low inflows to the hills sources. If allocations from the Mound are reduced in order to minimise the extent of non-compliances with water level criteria that may be in place following consideration of the s46 review, there will be a significant increase in the risk of more severe watering restrictions. (Water Corporation)

“As a result of the historical and contemporary investigation programs, the Water Corporation wellfields have been deliberately located, configured and operated to minimise drawdown impacts in areas of sensitive GDEs. As a result, Water Corporation abstraction impacts on the environmental values of the Gnangara Mound are small compared to those from other factors.” (Water Corporation)

Department response

The significance of the Mound as a source of water for the IWSS is recognised in the *Review* however determination of a long term sustainable goal for water allocation will be undertaken as part of the GSS.

This review considered the appropriateness of current Ministerial Criteria sites as indicators of overall resource condition. It assessed all the factors that may affect water levels across the Mound, the cumulative impacts of these factors and the implications of this for environmental risk/health. These factors include land use, climate, public and private abstraction. It was found that there are a number of sites where abstraction is not the main factor influencing water levels.

Decisions on the allocation of water prior to the completion of the GSS are also not part of the *Review* but have been made as part of the draft Gngangara groundwater areas water management plan.

PRAMS Modelling and CDFM

Basing the removal of sites on the outcomes of modelling may be inappropriate due to the uncertainties in the modelling:

1. The modelling package (PRAMS) appears to use a scale of 500m x 500m at a regional level to assist in the management of sites at a local scale. The PRAMS model may not adequately cater for the smaller scale local effects of abstraction, land use or climate change at a site specific level.
2. The ability of the package to detect and predict threshold effects caused by hydrological changes is unknown. Several critical sites on the Gngangara Mound have shown such threshold changes, where a hydrological non-linearity has arisen as a result of complex interactions. For sites where such non-linearities have occurred, we believe that it may not be possible to attribute priorities to the causal determinants and triggers. In other words, any or all factors responsible for groundwater changes, like fire in organic sediments, exposure of burnt sediments to high temperatures, altered non-wetting nature of the sediments, vegetation regenerating after fire, as well as regulated and unregulated groundwater abstraction, decline in rainfall, and the effects of pine plantations may be responsible for an important component of groundwater declines, and all can be the subject of management responses”.

“We also note that this modelling has not been the subject of a wide public dissemination.” (Horwitz and McKay, Edith Cowan University)

“FPC notes that one of the modelling scenarios considered in the recent study by Vogwill et al. 2007 is the immediate removal of pines from the mound. While this scenario may provide an indication of the impact of such a strategy, FPC is concerned that such a scenario is impractical from both legal and practical perspectives. There is a State Agreement for the supply of wood to Wesbeam over a 25 year period and it would be virtually impossible to liquidate the plantation resource immediately.

“Additionally rapid removal of the plantation would likely create significant issues for the management of the land area. FPC suggests that modelled scenarios should have both a theoretical and practical focus.” (Forest Products Commission)

“It is widely recognised that the accuracy of modelling using PRAMS for prediction at a local scale has significant limitations, as the local error factor may be in the order of metres. This level of accuracy may be critical in the ecologically important superficial groundwater system. Also the model lacks sufficient fidelity to represent many of the key processes at a scale which is concurrent with the management of biodiversity assets.... However, few DoW documents outline

these shortcomings of PRAMS in local planning.” (Department of Environment and Conservation)

“...We have concerns for the applicability of broad regionally-based groundwater models being used to demonstrate high degrees of predictability at fine resolutions. (Conservation Council of WA)

“...it is felt that removing criteria from the sites proposed would be better left until after further modelling has been conducted. Additionally, removing Ministerial criteria from sites at this time based on climate as the predominant effective factor may serve as a precedent for further criteria site removal following further modelling.” (Froend et al., Edith Cowan University)

Department response

The department concurs that PRAMS is a regional model and subsequently cannot provide detailed information for local scale management objectives, which require smaller grid sizes, higher resolution conceptual models and higher quality calibration.

As part of the GSS, the department is developing local scale sub-regional models of the Gnamptu Mound area and local scale models (LAMS) around wetlands. LAMS will be developed at a scale of 50 to 100 metre grids around the following wetlands and will provide quantitative tools to assess land and water use impacts on the environment and groundwater systems:

- Lake Mariginiup
- Lake Nowergup
- Lake Bindiar
- Lexia and Melaleuca Park.

The models will provide sufficient resolution and reliability for assessing environmental, licensing and trading issues, with results that can be shown to be valid. These local area models will be used to refine and improve PRAMS so that the impact on wetlands due to changes in the superficial aquifer can be determined.

The department also concurs that PRAMS is not able to model the complex interactions between multiple changes. The decision-support framework being developed as part of the GSS should provide greater management guidance.

Whilst interpreting modelling outputs, consideration was given to the constraints set through scenarios modelled. Results were extrapolated for individual sites based on the changes in regional water level as predicted for the grid and surrounding grids in which sites are located. This was taken into consideration when assessing results of PRAMS for each site. Outcomes were cross checked with other methodologies as well as licensing data and information to determine the predominant cause of groundwater level decline at each site. The department has only requested changes

to sites where it can be confidently stated that the cause of decline was not abstraction.

With regard to the pines removal scenario, the department acknowledges that the scenario is unrealistic. However, running this scenario provides the department with an indication of the relative impact of pines on groundwater levels.

Replacement of sites recommended for removal with equivalent sites

“The authors of this submission believe that criteria sites should be review, some removed, and new sites added to maintain representation of potential impacted sites. The review of Froend et al (2004a, b & c)... highlighted a vast array of potential GDEs that are not currently monitored and arguably of higher ecological value than some existing criteria sites. Keeping this in mind, we note that whilst The Department has requested that a number of sites now be excluded as criteria site, there have been no recommendations as to replacing those sites with sites of equal or higher ecological values in order to maintain representativeness of GDEs across the Mound. Currently it is felt that vulnerable GDEs are under represented and that an adequate array of criteria sites needs to be represented across the entire area of the resource.” (Froend et al., Edith Cowan University)

“The Department of Water has not considered adding potential Ministerial Criteria sites. When an ecosystem is in stress, more compliance is required, not less. Certainly some criteria sites have suffered from a lack of coordinated management oversight, but removing the sites and not replacing those sites with appropriate nearby vegetation transects is very short-sighted. (Conservation Council of WA)

“The recommendations to remove Ministerial criteria from nine identified sites, and eleven more in the next tranche must be rejected by the EPA. More Ministerial Criteria sites must be added by way of Section 46 review process.” (Conservation Council of WA)

“Your public review does not call for alternatives and should have.” (Member of the public)

Department response

The department is undertaking a Perth Shallow Groundwater Systems (SGS) Investigation and in collaboration with DEC, will as part of the GSS, identify new sites that can potentially become Ministerial criteria sites. Sites currently being investigated as part of the SGS Investigation have been selected from recommendations made in Froend *et al.* (2004a, b and c) and the hydrogeological review by Rockwater (2004).

The department also recognises that monitoring of static water levels may not be the best indicator of the impacts of change on the Mound. Development of other monitoring methodologies is underway as part of the next Gngangara groundwater areas water management plan. It would be premature to add new sites before these processes are completed.

While additional sites could be monitored, the department considers that statutorily sound and justified climate dependent criteria could not be established for further sites at this time.

Application of the Precautionary Principle

Several submissions touched on the belief that the precautionary principle should be applied in the light of climate change and that on this basis Ministerial criteria sites should not be removed.

“Specifically the Department of Water states its ‘approach aims for sustainable management of the groundwater resources in the context of the current land use and climate’. Later it states ‘The Department of Water has requested changes to conditions to reflect the current climate and land use’. Basing future sustainable management on current climate and current land use is a perpetuation of past management failures. The Precautionary Principle has been abandoned.”
(Conservation Council of WA)

“It is unclear how removing sites with high ecological values, such as Loch McNess and Lake Yonderup, will better integrate their management with that of groundwater abstraction.
It is felt that maintaining all criteria sites for the interim period while the longer term sustainability management approach for the whole system is developed would be a more prudent and cautious path. Such a path... would allow a more thorough investigation as to the sustainable use of the groundwater resource across the whole system.” (Froend et al., Edith Cowan University)

It is felt that a precautionary approach should be taken for the management of the whole Gngangara Mound resource and as such the 4 sites recommended for removal for this reason should have criteria retained until at least a full review can be undertaken as part of the *Water management plan of the Gngangara groundwater area* and the GSS.” (Froend et al, Edith Cowan University)

Department response

Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values. Nine of these sites have been recommended for removal on the basis that they do not assist in monitoring the impacts of abstraction on ecological values. In the case of five of the sites, there has been extensive

clearing and ecological values are considered not recoverable. In the case of four of the sites modelling and water licence mapping shows that groundwater abstraction is not a factor in water level decline.

While the department supports the precautionary principle, it does not believe it is appropriate to maintain statutory conditions for sites which are in effect outside the department's capacity to maintain ecological values due to land use change or predominantly climatic factors.

At the remaining 28 criteria sites water abstraction is considered to have had some contribution to water level decline but declining rainfall, pines, native vegetation and land use changes also contribute to water level decline. Although there is still considerable uncertainty as to the interplay between various contributing factors, the department considers that these 28 criteria sites should be retained. The department considers that the retention of these sites is consistent with the precautionary principle.

The department is continuing, and in some cases enhancing, monitoring at Ministerial sites recommended for removal. Additionally monitoring is continuing at a large number of other sites across the Gngangara system. All data recorded will continue to add to a valuable data set and feed into the GSS and future planning processes.

The department recognises that basing future management on current climate would not be appropriate. The *Review* represents one step on an ongoing process. It takes into account current climate. Outcomes of the GSS will provide guidance on monitoring under future climate scenarios.

Climate Change

"The Gngangara Mound groundwater system and the groundwater dependent (and other) ecosystems are undergoing a process of natural change in response to the declining rainfalls of the last three decades. This process will continue under all future climate and abstraction scenarios except with a return of the very wet period..." (Water Corporation)

"The lag in biological response to climate change suggests there would be further change even if climate stabilised in its current state. The potential further drying of climate in the regions can be expected to extend the changes to environmental values. This needs to be clearly recognised in any review of environmental conditions, with a primary difficulty being the lack of certainty about the expected extent of climate change and the characteristics of future climate that affect groundwater systems and environmental values."

"The notion of maintaining environmental values at pre-existing levels is considered inappropriate within the dynamics of the current and expected change."

The implications of maintaining pre-existing environmental values for Water Corporation allocation quotas and licensing decisions related to private water users is substantial. The Water Corporation believes that a modified approach that recognises the impact of climate change on environmental values should be developed and implemented as soon as practicable.” (Water Corporation)

“Maintaining GDEs as criteria sites can only help in the understanding and management of the Gngangara Mound resource, especially in the face of a changing climate. To put forward that sites should be removed as criteria sites because factors other than abstraction are more likely to be affecting them, would seem to go against the philosophy of managing for cumulative impacts.” (Froend et al., Edith Cowan University)

“Development of methodology to underpin new climate relative criteria and subsequently determination of relative climate criteria should be completed prior to the removal of Ministerial conditions from sites on the grounds of changing climate.” (Froend et al., Edith Cowan University)

Department response

Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts on ecological values.

The issue of changes to environmental values in the face of climate change is beyond the scope of the *Review* but is being addressed within the GSS and in the department’s next Gngangara groundwater areas management plan.

Awaiting outcomes of the Gngangara Sustainability Strategy

“...Such a multi-agency approach (GSS) will be welcomed as it is felt that the current lack of inter agency cooperation has allowed degradation to occur – without any single agency taking responsibility for the degradation.” (Froend et al., Edith Cowan University)

“As the Department of Water states on p. xvii and 7, a full review of existing environmental conditions would be better undertaken when the Water management plan and the GSS is complete. Therefore it would appear that the best time to review the inclusion of sites as criteria site based on environmental

conditions would be after a full review and not prior...” (Froend et al., Edith Cowan University)

“It appears that this process and review is pre-emptive in terms of the work being conducted on the GSS. This is the primary reason to limit the removal of conditions to administrative and operational ‘tidying up’.” (Town of Cambridge)

“As long as we continue to draw water from the Gngangara Mound resource, GDEs remain at risk of losing environmental values. The authors of this submission however also recognise that the Gngangara Mound resource is an important water supply for public and private use. However, environmental impacts need to be monitored and impacts assessed against acceptability criteria. We do applaud the DoW in accepting that criteria sites do need to be reviewed, however the public perception at this time (prior to the completion of a very public GSS) is that the DoW is reducing commitments before a more considered decision is made on the strategic management of the Gngangara Mound resource and environment.” (Froend et al., Edith Cowan University)

Department response

The department anticipates that through community input the GSS will guide a more sustainable approach to land and water management and monitoring within the context of a drying climate. Given the multiple agencies involved in land and water management on the Gngangara Mound, the department also anticipates that the GSS will guide inter-agency agreement on accountability for management and monitoring.

A complete revision of environmental criteria and accountability, with particular focus on the development of new climate-relative criteria is therefore not proposed at this time but is considered a necessary post-GSS activity for the Department of Water.

Prior to the completion of GSS, however, the department has recommended that nine (9) criteria sites be removed. This recommendation is done on the basis that some of these sites no longer provide a picture of the impacts of abstraction on ecological values due to either a loss of ecological values or on the basis that groundwater abstraction is not a factor in water level decline at those particular sites.

Future management

“The deterministic nature of the water level criteria, the shortcomings in the underlying science and the influence of factors beyond the control of the DoW all suggest that any criteria should be in the form of aspirational targets (or situations to be avoided). Any accountability of the DoW should relate to the actions it is taking within its powers, to achieve those targets, and whether they are reasonable (best endeavours), rather than whether the targets are specifically reached.” (Water Corporation)

“Strongly recommend that industry, interest groups and government agencies are consulted as part of your development / assessment process for the new review. Also, that any planned changes to access for significant users of the resource are negotiated and implemented in an equitable and transparent manner.”

(Department of Industry and Resources)

“The current environmental regulation of management of the Gngangara Mound groundwater systems needs modification to address the issues of:

- The importance of the Gngangara Mound as a water supply source for public and private purposes (social and economic values)
 - Climate change, variability and the stochastic nature of the primary influence
 - Limiting DoW accountability to the influences that lie within its powers to control
- Defining accountabilities for areas in which the Department of Water has no jurisdiction but which have a major impact on the Gngangara Mound, such as land use and management.” (Water Corporation)

“The objectives of the proposed approach to management discussed in Section 3... are based on the goal of protecting existing values of GDEs from abstraction and land use impacts. This goal does not recognise the natural dynamic nature of the Gngangara Mound hydrologic and ecological systems and the changes that may be imposed through future climate change that may be well beyond the impacts of groundwater abstraction.”

“The management goals should also reflect the importance of the Mound as a major groundwater source for a range of uses, and the need to manage it to achieve a balanced outcome between the competing uses, including environment.” (Water Corporation)

“The Water Corporation believes that the structure of the Ministerial conditions needs to be modified to recognise several important aspects related to regulation of management of the groundwater resource by the DoW. The aspects needing to be considered are:

1. Recognition of the limitations of groundwater licensing as the primary management tool available to the DoW to enable the Ministerial conditions to be satisfied.
2. The extent to which the DoW can be held accountable for groundwater levels given the range of influences beyond its control that have varying levels of effect on the groundwater systems and water levels. Significant factors include the dynamic and changing nature of GDEs and the uncertain prognosis in terms of the expected rate and extent of climate change.
3. The need to consider the social and economic aspects of water management as well as the environmental aspects, and the importance of the Gngangara mound as a public and private water supply source in particular.

The Water Corporation believes that it is important that these issues be considered in developing management framework under the GSS. (Water Corporation)

“It may also be true that the criteria assessment methods and process need to be revamped. Minimum water table levels alone are an (overly) simplistic method of representing change in the hydrologic parameters relevant to the surface and aquifer ecology. Criteria based on the state/condition of biotic attributes should be integrated to represent impacts more accurately.” (Froend et al., Edith Cowan University)

Department response

The *Review's* terms of reference was restricted to reviewing existing criteria sites on the basis of ecological values and relative impacts of abstraction.

The significance of the Mound as a source of water for the IWSS is recognised in the *Review* however determination of a long term sustainable goal for water allocation will be undertaken as part of the GSS. It is anticipated the GSS will assist in resolving land use and water management issues. This in turn will inform a new approach to monitoring the condition which recognises the dynamic nature of groundwater levels on the Mound.

The department notes that suggestions made on future management and will consider these and the findings of the GSS, in its future Gnamangara groundwater areas water management plan.

3.2 Response to specific issues

Sites recommended for removal as Ministerial criteria sites due to a loss of ecological values

The majority of submissions disagreed with the removal of (any) Ministerial Criteria sites citing the need to take a precautionary approach or await the outcomes of the GSS. Submissions were also received that supported the recommendation of removing specific sites due to a loss of ecological values. In a number of cases an alternative site was called for.

PM25

“PM25 is cleared, does not have an associated vegetation transect and is relatively close to Ministerial criteria site PM24...” (Department of Environment and Conservation)

No specific objections were received to the recommendation of removing PM25 as a Ministerial criteria site. The department recommends that the EPA support the removal of PM25 as a Ministerial criteria site. The department will continue to monitor groundwater levels to add to the long-term data set that exists for this site.

Lake Gngangara

“Given the extensive pine area to the east of this lake, and the public water supply bores also just to the east of it, it is hard to believe that the effect of these things over the decades that they have been there is not the main cause of the loss of this site’s ecological values, rather than climatic change”.

“If this wetland has indeed lost its groundwater related ecological values and its management objective have been irreversibly compromised, it raises the issue of what this area should be used for in the future. This is something which the GSS study could address.” (City of Wanneroo)

“The Lake Gngangara site is heavily degraded, has lost significant ecological-recreational values and does not have an associated vegetation transect. DEC supports its removal as a Ministerial criteria site without replacement.”
(Department of Environment and Conservation)

“... it was also recognised in Froend et al (2004a) that new ecological values exist in the area with the surrounding bushland supporting priority flora. We would contest then the citation in The Department’s review that Froend et al (2004b) reported groundwater related ecological values have been lost. Further, while no EWRs were proposed for Lake Gngangara in Froend et al (2004b) due to the lack of a vegetation monitoring transect; nor was the site listed as being one at which there had been a severe decline or complete loss of ecological values related to groundwater dependence...”

“...healthy, mature *Melaleuca preissiana* persist along the Lake with mixed sedges and *Astartea fascicularis* occurring in the understorey. This would indicate that groundwater dependent systems do persist in the area... ...we feel that it would be prudent to maintain Lake Gngangara as a Ministerial criteria site at this time.” (Froend et al., Edith Cowan University)

PRAMS modelling and CDFM both indicated that climate is the predominant factor influencing groundwater levels at this site. Abstraction and land use are also factors influencing groundwater levels at this site.

The site is heavily degraded, ecological values have deteriorated and significant recreational values have been lost. There is also no associated vegetation transect. The department considers it best to focus efforts on sites with reasonable and representative ecological and social value that can be maintained and enhanced. Lake Gngangara does not fit this category. This position is also supported by DEC.

The department recommends that the EPA support the removal of Lake Gngangara as a Ministerial criteria site. The department will continue to monitor groundwater levels to add to the long-term data set that exists for this site.

WM6

"Site WM6 is on private property, is cleared and does not have an associated vegetation transect... .. there is the very long term 'Neaves' vegetation transect established by Dr Libby Mattiske up gradient of this bore that could be considered as a replacement for WM6 if a new bore was established and calibrated during Stage Two of the GSS (SGS) Investigation" (Department of Environment and Conservation)

"... It is therefore questioned whether this criteria site should be removed, or rather a new monitoring bore be established in a better site in relation to the vegetation monitoring transect." (City of Wanneroo)

"... it is felt that WM6 should be relocated or replaced as recommended in Froend et al (2004b) rather than removed completely as a Ministerial criteria site" (Froend et al., Edith Cowan University)

New sites are currently being investigated as part of the SGS Investigation. This investigation will provide valuable information that will assist in future revision of Ministerial criteria sites. The department does not consider that statutorily sound and justified climate dependent criteria could be established for new sites at this time.

The department recommends that the EPA support the removal of WM6 as a Ministerial criteria site. The department will continue to monitor groundwater levels and vegetation condition at the Neaves vegetation transect, to add to the long-term data set that exists for this site.

Edgecombe Seepage

"... Edgecombe Seepage is a unique wetland habitat that is highly disturbed and cleared. There appears to be no appropriate alternative site and no ecological reason to continue to include it as a Ministerial criteria site (Department of Environment and Conservation)

"Edgecombe Seepage is described by The Department as highly disturbed and as having experienced declining fauna abundance and diversity, however ecological values may recover with improved conditions (Froend et al, 2004a). Therefore Froend et al (2004a) determined that ecological values were retained at the site due to the mosaic of habitats likely to support diverse fauna populations. There appears to be no mention in Froend et al (2004b) of lost values due to clearing and earthmoving activities."

"While revised EWRs were not determined... .. the reason for this is that there is no vegetation monitoring transect at the site and revised EWRs were not given for any site without a monitoring transect."

"Mound springs are entirely dependent on the groundwater resource for habitat, biophysical process and consumptive use. We therefore do not support the recommendation that Edgecombe Seepage be removed as a Ministerial criteria

site. Further, as abstraction does impact on this site we feel it is imperative that Ministerial criteria be retained and The Department continue to report against these criteria.” (Froend et al, Edith Cowan University)

The decline in ecological condition and subsequent loss of values as a result of clearing and earthmoving activities were reported during personal communications with Dr. B Knott (2007), who monitors the ecological values of the site for the department annually. The site is highly disturbed and cleared and there is no ecological reason to continue to include it as a Ministerial criteria site (DEC submission). The department recommends that it focus efforts on sites with reasonable and representative ecological and social value that can be maintained and enhanced. Edgecombe seepage does not fit into this category. The department recommends that the EPA support the removal of Edgecombe Seepage as a Ministerial criteria site.

MM49B

“MM49B is cleared, does not have an associated vegetation transect and monitoring of the vegetation complex is Whiteman Park is replicated on four other Ministerial criteria sites.” (Department of Environment and Conservation)

“... agree that MM49B should be removed as a criteria site, as suggested in Froend et al (2004b) its replacement with site GD10 should be considered after an investigation as to the representativeness of this site.” (Froend et al., Edith Cowan University)

The department recommends that the EPA support the removal of MM49B as a Ministerial criteria site. The department will continue to monitor groundwater levels to add to the long-term data set that exists for this site.

Sites proposed for removal as Ministerial criteria sites as water levels are predominantly affected by climate or land use and not abstraction

Loch McNess

“Loch McNess is well north of the commercial bore fields and north of the horticultural zone around Carabooda... .. does not oppose its removal.” (Department of Environment and Conservation)

“Unless abstraction is reduced, Loch McNess will end up like Lake Gngangara or Lake Wilgarup”.

“Local records of rainfall would help decide which effect climate change is having. Investigation of the ground water levels to the north of Loch McNess and east of Two Rocks will give an indication of why the water levels at Loch McNess are dropping.” (Member of the Public)

“Froend et al did not make any recommendations as to summer absolute minimum water levels for vegetation as there was no established vegetation transect at Loch McNess at the time of investigation.”

“... given the excellent condition of the vegetation at Loch McNess, the current (pre-2004) water regime may be adequate to maintain vegetation values and that WAWA (1995) EWRs were likely to be appropriate.”

“While public abstraction does not appear to be an influence on water levels at Loch McNess according to CDFM and PRAMS modelling, it is felt that until the SGS investigation is completed; a suitable monitoring bore established at the new vegetation transect; and it is known whether there is a correlation between bore and staff gauge levels against which to measure criterion levels, Loch McNess should remain as a criteria site.” (Froend et al., Edith Cowan University)

In light of the uniqueness of Loch McNess and the recent sudden declines in water levels (which have occurred again in the 2007-08 summer) the department recommends that Loch McNess be retained as a Ministerial criteria site at least until SGS Investigations at the site are complete. This differs from the department’s original submission which requested that Loch McNess be removed as a Ministerial criteria site because abstraction was not considered to be a factor affecting groundwater levels at this site. It is now thought that sudden water level declines at Loch McNess may be a result of regional groundwater level decline. As abstraction influences groundwater levels in the region, the department can no longer confidently conclude that abstraction is not a contributing factor at Loch McNess.

Lake Yonderup

“... well north of the commercial bore fields; however, it is only just north of the large commercial horticultural area off Old Yanchep Road...”

“DEC and the Yanchep Caves Recovery Team have some concerns about the horticultural use adversely impacting on the southern Yanchep Cave TEC. If this site was to be retained as a Ministerial criteria site, there would be a need to bring together the gauge and the vegetation monitoring site at this site. DEC is not comfortable to support its removal...” (Department of Environment and Conservation)

“The three lakes Lock McNess, Lake Yonderup and Lake Wilgarup I feel are all interconnected along with Pipidinny Swamp. Pipidinny Swamp and Lake Wilgarup have been dry for some time. Monitoring bores are required at Lake Yonderup as quickly as possible, also accurate recording of rainfall at these sites.” (Member of the Public)

No recommended level is provided in Froend et al (2004b) as the vegetation monitoring transect is located some 750m south of the staff gauge (not north as mentioned in review) and is not influenced by surface water. ...given the excellent condition of wetland vegetation surrounding the Lake Yonderup basin the then (2003) current water regime was likely to be adequate to maintain

vegetation values, and therefore EWRs were likely to be appropriate.”

“While public abstraction does not appear to be an influence on water levels at Lake Yonderup according to CDFM and PRAMS modelling, it is felt that until the SGS investigation is completed; a suitable monitoring bore established at the vegetation transect; and pending calibration of the new bore and review of the EWP, Lake Yonderup should remain as a criteria site.” (Froend et al., Edith Cowan University)

The department agrees that it would be precautionary to maintain Lake Yonderup as a Ministerial criteria site until SGS Investigations at this site are complete. These investigations may refine the department’s understanding of the impact of the nearby horticultural use. In the absence of this investigation, the department can no longer confidently conclude that abstraction does not influence groundwater levels at this site. This is in contrast to the department’s original submission which requested that Lake Yonderup be removed as a Ministerial criteria site.

NR11C

“... has no vegetation monitoring transect, is relatively close to three other Ministerial criteria sites in Melaleuca Park and is well east of the East Gngangara bore field... ... does not oppose its removal...” (Department of Environment and Conservation)

“... was chosen to ensure comprehensive representation of native vegetation which is susceptible to drawdown.” “... supports declared rare fauna and retains value as representative of undisturbed phreatophytic vegetation...” “...removing criterion at this stage may lead to over abstraction in the future which in turn may lead to significant impacts for vegetation when coupled with climate variability and land use changes.” “... precautionary approach is warranted in an area with high ecological values...” (Froend et al., Edith Cowan University)

The terms of reference for the *Review* were to identify and recommend sites for removal from Ministerial criteria where factors other than abstraction were the predominant cause of water level decline. CDFM and PRAMS modelling indicate abstraction is not a factor influencing water levels at NR11C. In addition, the phreatophytic vegetation at NR11C is well represented at other criteria sites. The department recommends that the EPA support the removal of NR11C as a Ministerial criteria site. The department will continue to monitor groundwater levels and vegetation to add to the long-term data set that exists for this site.

Lexia 94 (GNM17a)

“... well east of the Lexia bore field with two replicated Ministerial criteria sites in the Maralla Road Bushland...” “... does not oppose its removal...” (Department of Environment and Conservation)

“... while drying is negatively impacting on this Dampland, fringing vegetation is providing a range of habitat types. Of concern to these ecological values are water levels and the risk of fire.” “... recent health assessment monitoring shows that there has been increasing health in the fringing vegetation... ... with little evidence of terrestrialisation”

“... we would advise against removing Ministerial criteria from this Dampland at least until after the SGS Investigation is complete. Retaining GDEs which are primarily affected by climate change as criteria sites provides an excellent reference against which abstraction impacts can be measured at sites which are influenced cumulatively by abstraction, climate change and land use.” (Froend et al., Edith Cowan University)

The terms of reference for the *Review* were to identify and recommend sites for removal from Ministerial criteria where factors other than abstraction were the predominant cause of water level decline. CDFM and PRAMS modelling indicate abstraction is not a factor influencing water levels at Lexia 94. In addition, the phreatophytic vegetation at Lexia 94 is well represented at other criteria sites. The department recommends that the EPA support the removal of Lexia 94 as a Ministerial criteria site. The department will continue to monitor groundwater levels, vegetation and frogs at Lexia 94 to add to the long-term data set that exists for this site.

Administrative conditions

“... does not oppose these proposed amendments to Ministerial conditions and procedures or proponent commitments...” (Department of Environment and Conservation)

“Just because conditions have been met in the past is no guarantee that the conditions will continue to be met in the future...” (Member of the Public)

“... will free operational complexity of the documents and is fully supported. It is pleasing that the Department is taking a proactive approach to ensuring that its records are easy to navigate and accurate...” (Town of Cambridge)

Department response

Changes have been proposed to administrative criteria as they have been met by the Department and its predecessors to simplify reporting and auditing processes.

Appendices

Appendix A – Ministerial request for a Section 46 Review of Conditions for the Gngangara Groundwater Mound



Minister for the Environment; Climate Change; Peel

Our Ref: 24-011/27

ENVIRONMENTAL PROTECTION AUTHORITY	
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Ref No	EPIN 1640
EPA File No	190-03
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CHAIRMAN
ENVIRONMENTAL PROTECTION AUTHORITY

SECTION 46 REVIEW OF CONDITIONS FOR THE GNANGARA GROUNDWATER MOUND

Following submission of the 2000 annual and triennial reports for the Jandakot and Gngangara Mounds respectively, in which compliance and impacts on environmental condition were reported, the Water and Rivers Commission requested a review of the existing Ministerial conditions applying on the Gngangara and Jandakot Mounds. The Minister for the Environment requested the Environmental Protection Authority (EPA) in 2000 to "inquire into and advise on changes to the existing Ministerial conditions" under section 46 of the *Environmental Protection Act 1986*.

The EPA reported on the first stage of the section 46 review in November 2004, advising of limited changes that could be made based on the information available at that time. This review lead to Statement 687 being issued in September 2005 to consolidate and refine the conditions applying to the Gngangara Mound.

I understand that the Department of Water is undertaking preparation of a Gngangara Sustainability Strategy over the next three years which will provide a basis for a comprehensive review of the environmental conditions set for the mound, together with sustainable abstraction limits and an appropriate land use strategy to optimise recharge. I accept that a full review of the existing environmental conditions under section 46 of the Act would be better undertaken when this strategy is completed.

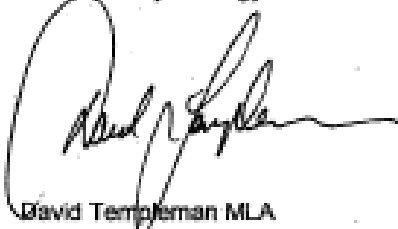
In the interim, in view of changes in climate and land use which have occurred since the conditions were set, I request that the EPA report to me, on the basis of current information, on:

1. whether the water level criteria for any environmental monitoring site should be removed or varied, including as a result of changes to environmental values which have occurred at the site since the criteria were originally set; and
2. whether the water level criteria for any environmental monitoring site should be removed or varied due to water levels at the site being predominantly affected by climate variation rather than abstraction.

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I also request the EPA to provide advice on environmental matters related to the Gwangara Mound that should be considered during development of the Gwangara Sustainability Strategy.



David Templeman MLA
MINISTER FOR THE ENVIRONMENT; CLIMATE CHANGE; PEEL

27 SEP 2007

Appendix B – Summary of submissions received

Perth Integrated Water Supply Scheme

Comment	Response
<p><i>Water Corporation</i></p> <p>“As the Gnangara Mound wellfields will have a crucial role in the delivery of water into the IWSS into the future, the Water Corporation has a strong interest in ensuring there is sustainable, transparent management that will deliver good environmental outcomes, supported by the community.”</p>	<p>Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p>
<p><i>Water Corporation</i></p> <p>“Changes to management of this groundwater resource have major implications for the IWSS, particularly if water allocations available to the Water Corporation are reduced as a result. The resource contributes approximately 60% of the IWSS supply and significant changes to the established allocation approach would increase the risk of severe restrictions and accelerate the need for alternative replacement sources. The implications for water resource management, therefore, extend to a much wider area than the resources of the Mound.”</p>	<p>While the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference. Refer also to Section 3.1.</p>
<p><i>Water Corporation</i></p> <p>“...Overall reductions create issues in terms of either restriction levels, or placing pressure on other sources, and these constrain the extent of the ability of the Water Corporation to respond.”</p>	<p>The department agrees with this submission point. However, the <i>Review</i> does not imply restrictions. Refer also to Section 3.1.</p>

Comment	Response
<p><i>Water Corporation</i></p> <p>“Prior to the implementation of the GSS, it will be essential for the Water Corporation to maintain access to up to 165Gl/yr if needed, to offset possible low inflows to the hills sources. If allocations from the Mound are reduced in order to minimise the extent of non-compliances with water level criteria that may be in place following consideration of the s46 review, there will be a significant increase in the risk of more severe watering restrictions. The Corporation believes that there have been very clear signals from the community and Government that an increase in the level and severity of restrictions should be avoided.”</p> <p>“...In terms of its level of utilisation of the superficial formations, being the aquifer providing direct support to the environmental systems of the region, the Water Corporation takes less than 30% of the total groundwater abstraction.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>The department is not implying changes to allocation in this report. Allocation is dealt with in the Gngangara groundwater areas water management plans.</p> <p>Refer also to Section 3.1.</p>
<p><i>Water Corporation</i></p> <p>“...the pivotal role of the Gngangara Mound wellfields in provision of water during the 2001-2006 low rainfall period, underpinning the less reliable sources”.</p> <p>“...The public benefit from avoiding total sprinkler bans, initiation of new sources and a comprehensive demand management campaign have justified the abstraction for public water supply in that period. While total groundwater abstraction will be reduced this year in accordance with the variable abstraction rule, abstraction in future years may need to increase if winter rains in 2008 and subsequent years again fall).</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>The department is not implying changes to allocation in this report. Allocation is dealt with in the Gngangara groundwater areas water management plans.</p> <p>Refer also to Section 3.1.</p>
<p><i>Water Corporation</i></p> <p>“There are practical constraints to further acceleration of the source development program to meet any shortfalls, and maintenance of access to 165 GL/yr of Gngangara groundwater (if needed) is vital to the security of the system over the next 4 years.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>The department is not implying changes to allocation in this report. Allocation is dealt with in the Gngangara groundwater areas water management plans.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p><i>Water Corporation</i></p> <p>“As a result of the historical and contemporary investigation programs, the Water Corporation wellfields have been deliberately located, configured and operated to minimise drawdown impacts in areas of sensitive GDEs. As a result, Water Corporation abstraction impacts on the environmental values of the Gnamptu Mound are small compared to those from other factors.”</p> <p>“This has been acknowledged in both this review and the Stage 1 review. The Water Corporation believes that the opportunities for further reductions in impacts through reducing allocations are limited. Recent modelling based on PRAMS and Froend (2004b) indicates that there is no change to environmental risk category for GDEs under Water Corporation abstraction scenarios of 105 GL/yr to 165 GL/yr. Any environmental benefit arising from major changes to the public water supply abstraction patterns and infrastructure network must be demonstrated against the resulting social and economic costs.”</p>	<p>PRAMS modelling was used in the <i>Review</i> to determine the <i>relative</i> impact of abstraction, land use and climate. A revision of allocation limits was outside the scope of the <i>Review</i>. The draft Gnamptu groundwater areas water management plan addresses allocation for public water supply.</p> <p>The department has run the same environmental risk assessment as the Water Corporation and found that the environmental risk method is not compatible with the outputs of PRAMS modelling. The department does not recommend drawing conclusions regarding allocation limits based on this methodology.</p> <p>Refer also to Section 3.1.</p>

PRAMS Modelling and CFDM

Comment	Response
<p data-bbox="188 336 1193 368"><i>Edith Cowan University – Pierre Horwitz and Kylie McKay</i></p> <p data-bbox="188 384 1193 456">“We believe this proposal to be problematic and questionable on the following grounds:</p> <p data-bbox="188 472 1193 544">Basing the removal of sites on the outcomes of modelling may be inappropriate due to the uncertainties in the modelling:</p> <ul data-bbox="188 560 1193 1190" style="list-style-type: none"><li data-bbox="188 560 1193 711">a. The modelling package (PRAMS) appears to use a scale of 500m x 500m at a regional level to assist in the management of sites at a local scale. The PRAMS model may not adequately cater for the smaller scale local effects of abstraction, land use or climate change at a site specific level.<li data-bbox="188 727 1193 1190">b. The ability of the package to detect and predict threshold effects caused by hydrological changes is unknown. Several critical sites on the Gnangara Mound have shown such threshold changes, where a hydrological non-linearity has arisen as a result of complex interactions. For sites where such non-linearities have occurred, we believe that it may not be possible to attribute priorities to the causal determinants and triggers. In other words, any or all factors responsible for groundwater changes, like fire in organic sediments, exposure of burnt sediments to high temperatures, altered non-wetting nature of the sediments, vegetation regenerating after fire, as well as regulated and unregulated groundwater abstraction, decline in rainfall, and the effects of pine plantations may be responsible for an important component of groundwater declines, and all can be the subject of management responses”. <p data-bbox="188 1206 1193 1279">“We also note that this modelling has not been the subject of a wide public dissemination.”</p>	<p data-bbox="1193 336 2150 448">The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>

Comment	Response
<p><i>Forest Products Commission</i></p> <p>“FPC notes that one of the modelling scenarios considered in the recent study by Vogwill et al. 2007 is the immediate removal of pines from the mound. While this scenario may provide an indication of the impact of such a strategy, FPC is concerned that such a scenario is impractical from both legal and practical perspectives. There is a State Agreement for the supply of wood to Wesbeam over a 25 year period and it would be virtually impossible to liquidate the plantation resource immediately. Additionally rapid removal of the plantation would likely create significant issues for the management of the land area. FPC suggests that modelled scenarios should have both a theoretical and practical focus.”</p>	<p>The department agrees with this submission point. The scenario referred to was run simply to determine the <u>relative</u> impact on pines on groundwater levels.</p>
<p><i>Department of Environment and Conservation</i></p> <p>“It is widely recognised that the accuracy of modelling using PRAMS for prediction at a local scale has significant limitations, as the local error factor may be in the order of metres. This level of accuracy may be critical in the ecologically important superficial groundwater system. Also the model lacks sufficient fidelity to represent many of the key processes at a scale which is concurrent with the management of biodiversity assets. The upgrade of PRAMS will provide a superior regional groundwater model, but it will not address the need for the development of quality Local Area Models by DoW for prediction and calibration at the groundwater-dependent ecosystem scale. The arguments related to PRAMS and the need for Local Area Models have been articulated elsewhere by experts in the field. However, few DoW documents outline these shortcomings of PRAMS in local planning.”</p>	<p>The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“...We have concerns for the applicability of broad regionally-based groundwater models being used to demonstrate high degrees of predictability at fine resolutions. Apportioning the degree of causality to drawdown effects to a combination of climate change, forestry plantations or groundwater extraction is crucial to the recommendations of the DoW review, and largely based upon the interpretations of data present in the Vogwill et al (2007) document.”</p>	<p>The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“...As part of the GSS (p151)... additional modelling is proposed following an upgrade of the PRAMS software... Given that PRAMS modelling has been used to revise allocation limits in the superficial aquifer and that current modelling has shown that it will become increasingly difficult to meet current criteria water levels, it is felt that removing criteria from the sites proposed would be better left until after further modelling has been conducted. Additionally, removing Ministerial criteria from sites at this time based on climate as the predominant effective factor may serve as a precedent for further criteria site removal following further modelling.”</p>	<p>The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“...recommendations must however, accommodate and express the limitations and inherent scepticism of the mathematical modelling.</p> <p>Crucially the limitations are not well expressed in the Section 46 Review (Vogwill et al):</p> <ul style="list-style-type: none"> • The model is based on water extraction data up to 2002 and does not account for significant changes in climate and groundwater extraction (p11) • Increased extraction by Water Corporation since 2001 is not modelled • PRAMS is a regional model and results for this particular site ‘must not be over analysed’ (p7) • Average annual rainfall has decreased significantly since 2001 • Hydrographic analysis is not recommended for wetland criteria bores, as ‘wetlands are not accurately modelled in PRAMS because it is a regional scale model with a coarse model grid. If criteria bore hydrographs were used in the analysis it could give some very misleading results’ (p37) • Also ‘the present calibration of the model is not sufficient to predict the watertable change near or within wetlands. Surface water bodies cannot be accurately modelled using a regional scale groundwater model with a cell size of 500 x 500m’ (p67) • Accuracy of data relating to extraction from the superficial aquifer needs further testing, evaluation and survey work (p66) • Crucially DoW data relating to licenced groundwater allocation is described as ‘uncertain’ (p68) 	<p>The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>
<p><i>Conservation Council of WA</i></p> <p>“...the sponsorship of a finer resolution mathematical model to update PRAMS is urgently requested.”</p>	<p>The department agrees with this submission point. PRAMS is being upgraded as part of the GSS process and will inform the next Gngangara groundwater areas water management plan.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“The probabilistic models CDFM and PRAMS, can only predict compliance up to a certain level of probability. The regional basis of the CDFM model ignores changes in the actual structure of the bottom and particular input/output characteristics of the lakes themselves. Consideration needs to be given to interdependencies between the lakes as well as with the groundwaters.”</p> <p>“Too much time has been spent between 1990 and this year with models that do not adequately describe real world features and so the unbelievable waste of time and resources that culminates in the current MAR project is likely to be repeated.”</p>	<p>The department agrees with this submission point. The limitations of the modelling and how they were dealt with by the department are discussed in Section 3.1.</p>
<p><i>Town of Cambridge</i></p> <p>“While the information and modelling used by the Department seemed sophisticated, the Town’s attending Officer was not convinced that the cumulative effects of the abstraction, climate and land use were investigated properly. There was no link or assurance at the information session or in the documentation that ecosystem groundwater dependent vegetation and ecosystems would continue to be supported by an appropriate level or similar groundwater level if the condition was lifted.”</p> <p>“It is noted that from this investigation it appears that these areas are compliant in terms of the Department’s responsibilities under the conditions and the precautionary principle has been applied to the best of the Department’s ability.”</p> <p>“It appears that if the specific water level conditions are lifted that the Department should be required to submit reports on whether the water level is maintained and if after five years or at the conclusion of the GSS process, the water level has dropped and this drop has an unacceptable decline in the ecosystem’s health (to be determined by the EPA) then the resurrection of the condition is required (for example the lifting of the condition has a sunset clause to ensure that the issue and modelling is correct).”</p>	<p>As stated in the <i>Review</i> the department will continue to monitor, manage and report on water levels and ecological condition at these sites. All data recorded will continue to add to a valuable data set and feed into the GSS and future planning processes.</p>

Comment	Response
<p data-bbox="197 260 1032 288"><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p data-bbox="197 304 1178 735">“A key concern for the NWI is the issue of groundwater connectivity and double accounting of groundwater resources. We therefore request that the DoW make comment on the modelling used for determining extraction levels from the unconfined aquifer and whether it adequately considers the connectivity of the confined and unconfined aquifers of the Gngangara Mound. Increasing the confined aquifer allocation (abstraction) and reducing (or maintaining) the current unconfined allocation does not necessarily imply that additional impacts on the hydrology which supports GDEs in areas of aquifer connectivity will not be realised... Increased abstraction from confined aquifers will impact on overlying superficial aquifers in areas of connectivity which in-turn implies impacts on watertables and associated ecology.”</p> <p data-bbox="197 751 1178 1018">“Vogwill et al (2007) state: <i>Reductions in superficial aquifer Water Corporation abstraction will create a larger magnitude of recovery over a smaller area near the bores. Reductions in confined aquifer Water Corporation abstraction will create greater recovery in the superficial area in areas of aquifer connectivity...</i> It is clear that the concept of no or reduced impacts on GDEs through increasing confined aquifer allocation is not a given and does not take into account regional impacts. A precautionary and transparent approach should be adopted.”</p>	<p data-bbox="1202 260 2101 408">The department is undertaking additional investigations to refine our understanding of possible impacts of confined abstraction on the superficial aquifer and associated groundwater dependent ecosystems in the Northern Yeal area.</p>

Replacement of sites recommended for removal with equivalent sites

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“If the stated reasons for removal of criteria sites are accurate and transparent then it is far more likely to gain public acceptance. The authors of this submission believe that criteria sites should be review, some removed, and new sites added to maintain representation of potential impacted sites. The review of Froend et al (2004a, b & c)... highlighted a vast array of potential GDEs that are not currently monitored and arguably of higher ecological value than some existing criteria sites. Keeping this in mind, we note that whilst The Department has requested that a number of sites now be excluded as criteria site, there have been no recommendations as to replacing those sites with sites of equal or higher ecological values in order to maintain representativeness of GDEs across the Mound. Currently it is felt that vulnerable GDEs are under represented and that an adequate array of criteria sites needs to be represented across the entire area of the resource.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“Perhaps the most disappointing element to the Section 46 Review document is the emphasis on removing Department of Water responsibility, in effect dumbing down of Ministerial and legal compliance. The Department of Water has not considered <u>adding</u> potential Ministerial Criteria sites. When an ecosystem is in stress, more compliance is required, not less. Certainly some criteria sites have suffered from a lack of coordinated management oversight, but removing the sites and not replacing those sites with appropriate nearby vegetation transects is very short-sighted. Additionally what consideration could be given to providing some form of statutory protection for Ministerial Criteria sites under the Environmental Protection Act?”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p data-bbox="197 260 539 288"><i>Conservation Council of WA</i></p> <p data-bbox="197 308 1171 416">“The recommendations to remove Ministerial criteria from nine identified sites, and eleven more in the next tranche must be rejected by the EPA. More Ministerial Criteria sites must be added by way of Section 46 review process.”</p>	<p data-bbox="1202 260 2112 327">This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p data-bbox="1202 346 2134 655">Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p data-bbox="1202 675 2112 863">Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p data-bbox="1202 882 1507 908">Refer also to Section 3.1.</p>

Comment	Response
<p data-bbox="197 260 450 288"><i>Member of the public</i></p> <p data-bbox="197 304 985 333">“Your public review does not call for alternatives and should have.”</p>	<p data-bbox="1202 260 2114 327">This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p data-bbox="1202 346 2130 655">Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p data-bbox="1202 675 2114 863">Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p data-bbox="1202 882 1509 911">Refer also to Section 3.1.</p>

Application of the precautionary principle

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“...Generally the main identified causes are declining rainfall due to climate change; landuse decisions which are allegedly outside the ambit of Department of Water jurisdiction, and groundwater extraction by public water supply bores and licenced private extraction for irrigated agriculture. The Department of Water has a responsibility to manage the quality and quantity of groundwater resources and groundwater dependent ecosystems. The Department of Water and previously Water and Rivers Commission have always acknowledged that management of water resources has had to take into account land use, landuse change, water extraction and climate change...”</p> <p>“Specifically the Department of Water states its ‘approach aims for sustainable management of the groundwater resources in the context of the current land use and climate’. Later it states ‘The Department of Water has requested changes to conditions to reflect the current climate and land use’. Basing future sustainable management on current climate and current landuse is a perpetuation of past management failures. The Precautionary Principle has been abandoned.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“It is unclear how removing sites with high ecological values, such as Loch McNess and Lake Yonderup, will better integrate their management with that of groundwater abstraction. A brief statement of how this is planned to be done would have been useful in the current review document rather than delaying such a clarification until the release of the ‘Water Management Plan for the Gngangara Groundwater Areas’ sometime in early 2008. It is felt that maintaining all criteria sites for the interim period while the longer term sustainability management approach for the whole system is developed would be a more prudent and cautious path. Such a path... would allow a more thorough investigation as to the sustainable use of the groundwater resource across the whole system.”</p>	<p>The department agrees with the submission point.</p> <p>The department has revised decisions with respect to Loch McNess, Lake Yonderup, Lexia 94 and NR11C, the sites recommended for removal due to the influence of abstraction.</p> <p>The department agrees that it would be precautionary to maintain Loch McNess and Lake Yonderup as Ministerial criteria sites until the SGS Investigations at these sites are complete.</p> <p>Refer also to Section 3.2</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“It is unclear why The Department has chosen to adopt a precautionary approach and retain criteria for 11 sites and request that they be removed from another 4 where it is believed that factors other than abstraction are the predominant cause affecting groundwater levels. It is felt that a precautionary approach should be taken for the management of the whole Gngangara Mound resource and as such the 4 sites recommended for removal for this reason should have criteria retained until at least a full review can be undertaken as part of the <i>Water management plan of the Gngangara groundwater area</i> and the GSS.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change.</p> <p>The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there is evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has recommended maintaining the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has recommended maintaining 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>

Climate Change

Comment	Response
<p><i>Water Corporation</i></p> <p>“The Gngangara Mound groundwater system and the groundwater dependent (and other) ecosystems are undergoing a process of natural change in response to the declining rainfalls of the last three decades. This process will continue under all future climate and abstraction scenarios except with a return of the very wet period...”</p>	<p>The department disagrees with this submission point. Evidence suggests that change to groundwater dependent ecosystems has been accelerated by abstraction in some locations. It is the department’s responsibility to manage groundwater dependent ecosystems affected by abstraction.</p>
<p><i>Water Corporation</i></p> <p>“The lag in biological response to climate change suggests there would be further change even if climate stabilised in its current state. The potential further drying of climate in the regions can be expected to extend the changes to environmental values. This needs to be clearly recognised in any review of environmental conditions, with a primary difficulty being the lack of certainty about the expected extent of climate change and the characteristics of future climate that affect groundwater systems and environmental values.”</p> <p>“The notion of maintaining environmental values at pre-existing levels is considered inappropriate within the dynamics of the current and expected change. The implications of maintaining pre-existing environmental values for Water Corporation allocation quotas and licensing decisions related to private water users is substantial. The Water Corporation believes that a modified approach that recognises the impact of climate change on environmental values should be developed and implemented as soon as practicable.”</p>	<p>The department disagrees with this submission point. Evidence suggests that change to groundwater dependent ecosystems has been accelerated by abstraction in some locations. It is the department’s responsibility to manage groundwater dependent ecosystems affected by abstraction.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“The importance of managing groundwater resources in the face of cumulative impacts in order to protect GDEs is perhaps more important now and into the future than it was in 1988. Maintaining GDEs as criteria sites can only help in the understanding and management of the Gnamptara Mound resource, especially in the face of a changing climate. To put forward that sites should be removed as criteria sites because factors other than abstraction are more likely to be affecting them, would seem to go against the philosophy of managing for cumulative impacts.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has requested to maintain the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has requested to maintain 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“Development of methodology to underpin new climate relative criteria and subsequently determination of relative climate criteria should be completed prior to the removal of Ministerial conditions from sites on the grounds of changing climate.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.1.</p>

Await outcomes of the Gngangara Sustainability Strategy

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“...Such a multi-agency approach (GSS) will be welcomed as it is felt that the current lack of interagency cooperation has allowed degradation to occur – without any single agency taking responsibility for the degradation.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.1.</p>
<p><i>Conservation Council of WA</i></p> <p>“The approach suggested by this document condemns the Gngangara Mound to continuing degradation and environmental harm. Any effective management envisaged to correct past management failure is deferred to some ill-defined future process of the Gngangara Sustainability Strategy. For recurring years the Department of Water and its predecessors, have ineffectively stood by and monitored the decline of the Gngangara Mound. Breaches of Ministerial Conditions for the groundwater resources on the Gngangara Mound have increased in number and severity over successive years. The Department of Water’s collective response is not to seek to comply with Ministerial Conditions, not to reduce the impacts of landuse or groundwater extraction but to have the Ministerial Conditions removed from 9 (nine) sites with another 11 (eleven) identified for the next Review of Ministerial Conditions.”</p> <p>“If the recommendations are accepted, which the Conservation Council of WA is strongly against, monitoring will continue, but the condition of the Gngangara Mound will continue to deteriorate. The Department of Water will no longer be required to comply with legally binding Environmental Protection Act Ministerial Conditions for those identified sites.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has requested to maintain the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has requested to maintain 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“The current approach taken leaves far too much subject to the Gnangara Sustainability Strategy (GSS), a long overdue process. Until some meaningful projects and outcomes are forthcoming from the GSS DoW must be made accountable for its management of the groundwater resources of the Gnangara Mound.”</p>	<p>The department agrees with this submission point. Evidence suggests that change to groundwater dependent ecosystems has been accelerated by abstraction in some locations. It is the department’s responsibility to manage groundwater dependent ecosystems affected by abstraction.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“As the Department of Water states on p. xvii and 7, a full review of existing environmental conditions would be better undertaken when the Water management plan and the GSS is complete. Therefore it would appear that the best time to review the inclusion of sites as criteria site based on environmental conditions would be after a full review and not prior. While it is agree that removing criteria for sites where ecological values no longer exist due to clearing has merit, evidence of irrecoverable loss of ecological values at some of the suggested sites is not present and it is requested that evidence for loss of ecological values is provided by The Department.”</p>	<p>Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference. Refer also to Section 3.1.</p>
<p><i>Town of Cambridge</i></p> <p>“It appears that this process and review is pre-emptive in terms of the work being conducted on the GSS.”</p> <p>“This is the primary reason to limit the removal of conditions to administrative and operational ‘tidying up’.”</p>	<p>Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference. Refer also to Section 3.1.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“As long as we continue to draw water from the Gngangara Mound resource, GDEs remain at risk of losing environmental values. The authors of this submission however also recognise that the Gngangara Mound resource is an important water supply for public and private use. However, environmental impacts need to be monitored and impacts assessed against acceptability criteria. We do applaud the DoW in accepting that criteria sites do need to be reviewed, however the public perception at this time (prior to the completion of a very public GSS) is that the DoW is reducing commitments before a more considered decision is made on the strategic management of the Gngangara Mound resource and environment.”</p>	<p>Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.1</p>
<p><i>Department of Environment and Conservation</i></p> <p>“DEC would also recommend that complementary hydrological and biological monitoring at existing (and future) criteria sites be upgraded and optimised by a joint DEC and DoW panel which answers to the GSS.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.1.</p>
<p><i>Department of Environment and Conservation</i></p> <p>“It would be useful for DoW to provide direction on the key issues that the GSS needs to address to move to a new conceptual and monitoring framework to evaluate and respond to impacts from abstraction on the ecosystems dependent on groundwater.”</p>	<p>Whilst the department agrees with this submission point it considers that it is not relevant to the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.1.</p>

Comment	Response
<p data-bbox="197 260 745 288"><i>Department of Environment and Conservation</i></p> <p data-bbox="197 308 1178 576">“DEC generally supports the proposed changes to the current environmental conditions recognising the loss of ecological values which have occurred and the impacts that climate and land use changes are having on groundwater levels of the mound. However, it is important that the proposed Gngara Sustainability Strategy is completed within the scheduled time to provide a contemporary and comprehensive set of environmental monitoring sites and criteria to ensure appropriate long-term conservation of environmental values of the mound”.</p> <p data-bbox="197 595 1155 695">“DEC is committed to working in partnership with DoW to develop a detailed, well structured hydrological and biological monitoring program as part of development of the GSS.”</p>	<p data-bbox="1202 260 1805 288">The department agrees with this submission point.</p> <p data-bbox="1202 308 1509 336">Refer also to Section 3.1.</p>

Future management

Comment	Response
<p><i>Water Corporation</i></p> <p>“The deterministic nature of the water level criteria, the shortcomings in the underlying science and the influence of factors beyond the control of the DoW all suggest that any criteria should be in the form of aspirational targets (or situations to be avoided). Any accountability of the DoW should relate to the actions it is taking within its powers, to achieve those targets, and whether they are reasonable (best endeavours), rather than whether the targets are specifically reached.”</p>	<p>It is the department’s role to manage water resources sustainably using the best available scientific information.</p> <p>Refer also to Section 3.1.</p>
<p><i>Department of Industry and Resources</i></p> <p>“Strongly recommend that industry, interest groups and government agencies are consulted as part of your development / assessment process for the new review. Also, that any planned changes to access for significant users of the resource are negotiated and implemented in an equitable and transparent manner.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.1.</p>
<p><i>Water Corporation</i></p> <p>“The current environmental regulation of management of the Gngangara Mound groundwater systems needs modification to address the issues of:</p> <ul style="list-style-type: none"> • The importance of the Gngangara Mound as a water supply source for public and private purposes (social and economic values) • Climate change, variability and the stochastic nature of the primary influence • Limiting DoW accountability to the influences that lie within its powers to control • Defining accountabilities for areas in which the Department of Water has no jurisdiction but which have a major impact on the Gngangara Mound, such as land use and management.” 	<p>The department’s to each point is:</p> <ul style="list-style-type: none"> • Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference • The department agrees with this submission point. Climate change and variability are being incorporated into the next phase of planning. Refer also to Section 3.1. • While the <i>Review</i> does not address all of these points, it was initiated as a response to them. • The department agrees with this submission point. The GSS is a multi-agency approach that will solve a number of land management and use issues currently impacting on the water resource of the Gngangara Mound. <p>Refer also to Section 3.1.</p>

Comment	Response
<p><i>Water Corporation</i></p> <p>“The objectives of the proposed approach to management discussed in Section 3... are based on the goal of protecting existing values of GDEs from abstraction and land use impacts. This goal does not recognise the natural dynamic nature of the Gnamptara Mound hydrologic and ecological systems and the changes that may be imposed through future climate change that may be well beyond the impacts of groundwater abstraction.”</p> <p>“The management goals should also reflect the importance of the Mound as a major groundwater source for a range of uses, and the need to manage it to achieve a balanced outcome between the competing uses, including environment.”</p>	<p>The department disagrees with this submission point. The department has acknowledged that climate is a major factor influencing groundwater levels. Refer also to Section 3.1</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“It may also be true that the criteria assessment methods and process need to be revamped. Minimum water table levels alone are an (overly) simplistic method of representing change in the hydrologic parameters relevant to the surface and aquifer ecology. Criteria based on the state/condition of biotic attributes should be integrated to represent impacts more accurately.”</p>	<p>The department agrees with this submission point. The department’s next Gnamptara groundwater areas management plan will address these issues. Refer also to Section 3.1</p>

Comment	Response
<p><i>Water Corporation</i></p> <p>“The Water Corporation believes that the structure of the Ministerial conditions needs to be modified to recognise several important aspects related to regulation of management of the groundwater resource by the DoW. The aspects needing to be considered are:</p> <ol style="list-style-type: none"> 1. Recognition of the limitations of groundwater licensing as the primary management tool available to the DoW to enable the Ministerial conditions to be satisfied. 2. The extent to which the DoW can be held accountable for groundwater levels given the range of influences beyond its control that have varying levels of effect on the groundwater systems and water levels. Significant factors include the dynamic and changing nature of GDEs and the uncertain prognosis in terms of the expected rate and extent of climate change. 3. The need to consider the social and economic aspects of water management as well as the environmental aspects, and the importance of the Gngangara mound as a public and private water supply source in particular. <p>The Water Corporation believes that it is important that these issues be considered in developing management framework under the GSS.”</p>	<p>The department’s response to each point is:</p> <ul style="list-style-type: none"> • Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference • The department agrees with this submission point. The various factors and processes that influence GDEs were taken into account in the <i>Review</i> • Whilst the department agrees with this submission point it considers that it cannot be addressed in the <i>Review</i> as it is outside the terms of reference. The department’s next Gngangara groundwater areas management plan will address these issues. <p>Refer also to Section 3.1</p>

Licensing

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“There are groundwater management areas that have been over-allocated for many years and for volumes of water far above the sustainable allocation limit. This has been highlighted in recent EPA compliance documents. The Department of Water’s own examination of metering on bores on the mound has discovered many licenced irrigators are extracting at far above their allocation. Yet the Department of Water does not suggest any immediate action to correct this blatant unauthorised use and resulting environmental harm – rather action is further deferred to some unidentified point in the future.”</p>	<p>The department considers that the submission cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>The sustainable allocation limit has changed with climate. The first phase of allocation limit review has occurred through the Gngangara groundwater areas water management plan. The next phase will occur through the next Gngangara groundwater areas water management plan.</p> <p>While the metering program showed some over use, it also showed underuse resulting in net use within the allocation limit. Overuse is being addressed initially through education.</p>
<p><i>Conservation Council of WA</i></p> <p>“Private licenced and unlicenced extraction from the Gngangara Mound in need of severe remedial management. Allocations to all users must be reduced and in some areas dramatically. To continue to allow unsustainable extraction to occur, based on outdated groundwater availability, will only further reduce the resilience of groundwater dependent ecosystems.”</p>	<p>The department considers that the submission cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>The draft Gngangara groundwater areas water management plan addresses allocation limits for licenced users across the Gngangara system.</p> <p>Unlicenced use is being addressed through permanent water efficiency measures that were introduced in 2007 for scheme water users and garden bore owners.</p>
<p><i>Conservation Council of WA</i></p> <p>“...A closer attention to extraction from all consumptive users must be put in place immediately...”</p>	<p>The department agrees with this submission point. The department will continue to pay attention to all consumptive users.</p>

Flaws with current Ministerial criteria

Comment	Response
<p><i>Water Corporation</i></p> <p>“The water level criteria set as environmental conditions represent a simplified construct intended to provide protection for the environmental values of GDEs on the Mound. The criteria suffer from several shortcomings in their derivation:</p> <ol style="list-style-type: none"> 1. The underlying science relating ecological condition to groundwater regimes... is still developing 2. The assumptions and uncertainty regarding the extent of future climate change and variability and the ecological consequences of such change with and without abstraction, creates a major issue in terms of: <ul style="list-style-type: none"> • An undefined shifting benchmark in terms of future ecological and social values • Managing water abstractions to achieve desired outcomes in response to climate 3. The assumptions relating to future land uses and their influence on groundwater regime are critical, and their application is beyond the control of DoW. The extent and rate of urbanisation, the management of the pine plantations and fire management are key aspects with a major effect on groundwater level regimes that are only partly understood 4. The assumption that wetland water levels are direct reflections of the underlying groundwater has been demonstrated not to hold true in a number of specific situations, with differences of several metres in some instances. This tenuous relationship makes management of wetland water levels potentially inappropriate for inclusion as Ministerial conditions on groundwater management activities. 	<p>The department’s response to each point is:</p> <ul style="list-style-type: none"> • The department agrees with this submission point. The decisions were made using the best information available at the time of the <i>Review</i> • Whilst the department agrees with submission points 2 and 3, the department considers they cannot be addressed in the <i>Review</i> as they are outside the terms of reference. • The department agrees with this submission point. This has been taken into consideration, and is under further investigation as part of the SGS Investigation.

Comment	Response
<p><i>Water Corporation</i></p> <p>“The Stage 1 review report proposed a stochastically based approach to reflect the intent of the ‘two in six’ year preferred levels, as a interim arrangement until information gathered following the Stage 1 review could be applied. The specific proposal was to replace the ‘two in six’ year commitment with ‘<i>water levels should not fall below the preferred minima except when the average rainfall of the preceding three years is less than the 1st tercile (33rd percentile) of the three-year moving average</i>’.”</p> <p>“This approach incorporated recognition of the variability (stochastic nature) of climate and the potential for long runs of low rainfall, and ongoing climate change, none of which are accounted for in the current conditions.”</p> <p>“The WC believes that the proposed modified criteria is more relevant than the current criteria and that low water levels in wetlands are likely to occur in any event, as the consequence of the overriding influence of climate.”</p>	<p>The department disagrees with this submission point. The proposal to replace the ‘two in six’ year commitment with ‘<i>water levels should not fall below the preferred minima except when the average rainfall of the preceding three years is less than the 1st tercile (33rd percentile) of the three-year moving average</i>’ was made in a draft version of the Section 46 Stage 1 review report. It was not submitted to the EPA in the final version.</p> <p>The department will take this recommendation into account as part of next Gngangara groundwater areas water management plan.</p>
<p><i>Conservation Council of WA</i></p> <p>“The approach taken by DoW for the Section 46 Review does make some pertinent points regarding the Ministerial Conditions that have been set in the past and appear to act as a snapshot of an ecosystem... If the wetlands that were under stress in the late 1980’s are STILL under (greater) stress in the 21st century then all processes stressing wetlands needs to be re-examined, not merely the Ministerial Conditions put in place to measure the performance of the decision making authority.”</p>	<p>The department agrees with this submission point. The various factors and processes that influence GDEs and can be addressed by the department were taken into account in this <i>Review</i>. Other influences are being addressed through the GSS.</p> <p>Refer also to Section 3.1.</p>

Froend et al (2004b) recommend EWRs

Comment	Response
<p><i>Water Corporation</i></p> <p>“In discussing hydrographs at each of the criteria sites (in assessing compliance with the Ministerial Statement criteria), the DoW comments on water level performance against EWRs recommended by Froend (2004b). However, the status of these recommended EWRs is not discussed other than to acknowledge them as being ‘a valuable source to inform this review’. Examination of the recommended EWRs in comparison with the Ministerial Statement criteria indicates that they vary from these criteria to different extents at different locations. In some cases, the recommended EWRs are similar to the current criteria, but are substantially different in others, being both above and in some cases, below the current criteria levels”.</p> <p>“It is not clear from the report how these recommended EWRs will be considered in development of the future management framework. A key aspect will be whether the environmental objectives remain as being protection of the values identified over 20 years ago or whether they recognise the actual changes that have occurred, and the changes likely to occur as a consequence of climate change.”</p>	<p>The department did not adopt 2004 EWRs as they are similar to current EWRs. Further, the department agrees with the last point made here and recognises that if a change were to be made, it would need to be more contemporary. In the absence of GSS outcomes and other initiatives as part of the SGS Investigation and future planning processes, it was considered appropriate to maintain current EWRs.</p>
<p><i>Member of the public</i></p> <p>“Objection to the decline in any groundwater minimum levels for the following reasons:</p> <ol style="list-style-type: none"> 1. The decline in minimum water levels will result in further loss of seasonal wetlands which are vital for many plants and fauna. 2. The decline planned is greater in ‘less sensitive’ areas and this is also not acceptable. The environmental values in these areas are compromised by abstraction and development and to hit these areas hard is not acceptable as there will be no opportunity for re-establishment of values.” 	<p>The department disagrees with this submission point. The department is not suggesting a decline in minimum groundwater levels. It is only suggesting removing criteria where the cause of decline is outside its control, or where ecological values have been lost.</p>

Location/Hydrogeology

Comment	Response
<p><i>Town of Cottesloe</i></p> <p>“...the peninsula on which Cottesloe exists receives no groundwater from the Gnangara Mound... ...there appears to be no geological evidence that the groundwater supply available to the majority of the metropolitan area north of the river contributes any underground water to this area from the north...”</p> <p>“If your Department has any detailed information that this understanding is incorrect, then the Town of Cottesloe would be extremely interested in obtaining this information”.</p> <p>“If our understanding is correct... ... no comments are offered...”</p>	<p>For the purposes of administration and management, everything that falls to the north of the Swan River is deemed as being a part of the Gnangara Mound.</p>
<p><i>Shire of Peppermint Grove</i></p> <p>“Previous data always supplied to this Shire has always clearly indicated that Cottesloe, Mosman Park and Peppermint Grove are not part of the Gnangara Mound and do not receive groundwater from that source.”</p> <p>“Please advice if you have evidence to suggest that Peppermint Grove receives a water flow from the Gnangara Mound.”</p>	<p>For the purposes of administration and management, everything that falls to the north of the Swan River is deemed as being a part of the Gnangara Mound.</p>

General - Agree with the Review

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>“DEC supports the replacement of ecologically damaged Ministerial criteria sites impacted by abstraction with new equivalent sites if possible.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>The department will consider the addition of new sites following the outcomes of the GSS.</p>
<p><i>Department of Industry and Resources</i></p> <p>“DoIR agree that the Gngangara Mound should be managed sustainably in the context of reduced rainfall patterns and potential impacts of climate change on recharge rates.”</p>	<p>The department agrees with this submission point.</p>
<p><i>Department of Planning and Infrastructure</i></p> <p>“DPI has no objections to the review of the Ministerial Conditions on the Groundwater Resources of the Gngangara Mound. It should be noted through that it has not been possible to undertake any detailed technical investigation into the above, in particular against the individual sites and against existing policy/strategies.”</p>	<p>The department agrees with this submission point.</p>
<p><i>Forest Products Commission</i></p> <p>“The Forest Products Commission endorses the approach taken by the EPA to review the Ministerial Conditions in two stages and to wait on the outcomes of the Gngangara Sustainability Strategy before finalising the second Stage of the review of conditions. The FPC endorses the basis for the review of conditions outlined in the report.”</p>	<p>The department agrees with this submission point.</p>

Comment	Response
<p><i>Forest Products Commission</i></p> <p>“The Forest Products Commission is pleased to note that the report identifies that climate change has been the most influential factor in the declining groundwater levels in the Gngangara Mound and that abstraction of groundwater for private and public use is the next most influential issues and that land use impacts such as pine plantations and changed conditions in the native vegetation due to alternations in fire frequency have been identified as less influential than both climate change and abstraction.”</p>	<p>The department agrees with this submission point.</p>

Timing of the release of the *Review*

Comment	Response
<p><i>City of Wanneroo</i></p> <p>“...It would have been helpful if the above mentioned Water Management Plan had been available for consideration at the same time as the Review report so that the latter could be considered within its context. This especially relates to the Review proposals for removal of Ministerial criteria sites such as Loch McNess and Lake Yonderup”.</p> <p>“It is suggested that when the Water Management Plan is released soon for public comment, that opportunity be given for further submissions to be made on the Review report, in light of the Water Management Plan.”</p>	<p>The department agrees with this submission point.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“During the four week public comment process the Conservation Council of WA has experienced some difficulties in access this absolutely vital supporting documentation... Conservation Council of WA had identified apparent issues in critical sections of the Section 46 Review document. As a result of the Conservation Council of WA approach, an internal review was conducted and identified errors were confirmed and further errors were discovered...”</p>	<p>The department recognises that supplementary material was not made available promptly.</p> <p>The Vogwill <i>et al.</i> report was unable to be released sooner as it was still in draft format. A copy of this draft was provided to the Conservation Council of WA on 1 February 2008.</p> <p>Draft versions of Froend <i>et al.</i>, 2004 (a and b) had been on the department’s web since September. Final versions of these documents, along with Froend <i>et al.</i>, 2004c were uploaded onto the department’s website at the end January 2008.</p> <p>All supplementary material was provided to the Conservation Council of WA and a submission was received by the department and addressed in this response.</p>
<p><i>Conservation Council of WA</i></p> <p>“In addition, certain key documents were not available on the Department of Water website.... There is an identified lack of time to make a fully reasoned response to the Section 46 Review, directly attributable to supporting documentation not being available for the public to peruse... The lack of available, referenced documentation and the refusal to release information gives the impression of government being conducted behind closed doors.”</p> <p>“Conservation Council of WA has made it quite clear to the EPA... that due to the intransigence of the Department of Water to release identified documents that we consider this submission on the Review to be provisional while we await the availability of the Vogwill et al (2007) document.”</p>	<p>The department recognises that supplementary material was not made available promptly.</p> <p>The Vogwill <i>et al.</i> report was unable to be released sooner as it was still in draft format. A copy of this draft was provided to the Conservation Council of WA on 1 February 2008.</p> <p>Draft versions of Froend <i>et al.</i>, 2004 (a and b) had been on the department’s web since September. Final versions of these documents, along with Froend <i>et al.</i>, 2004c were uploaded onto the department’s website at the end January 2008.</p> <p>All supplementary material was provided to the Conservation Council of WA and a submission was received by the department and addressed in this response.</p>

Comment	Response
<p data-bbox="197 260 450 288"><i>Member of the public</i></p> <p data-bbox="197 308 1151 416">“Your timing for submissions over the holiday season is poor and aimed at reducing submission numbers. This needs to be exposed as manipulation of the system...”</p> <p data-bbox="197 435 1151 541">“I have no faith in this manipulated public review process and the changes will no doubt be accepted for good political reasons only. My only hope is that you will spare some areas and undertake wetland development work in public areas.”</p>	<p data-bbox="1202 260 2119 368">The department disagrees with this submission point. The public comment period was delayed until 7 January 2008, after the Christmas period and was agreed to by the EPA.</p>

Other

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>“Although the DoW do not manage clearing and land use at the 37 Ministerial criteria sites, the Government has invested significantly at these sites and there needs to be a process to protect them or have disturbance referred to the EPA for comment.”</p>	<p>The department agrees with this submission point. The department is currently developing a process for triggering cross-agency management of these sites.</p>
<p><i>Conservation Council of WA</i></p> <p>“The Department of Water and the EPA have approved significant over extraction from the mound for public water supply augmentation. The rates of extraction for private licenced bores, licenced public water supply production bore, and most significantly private unlicenced groundwater bores have not reduced, rather due to a combination of subsidy and declining rainfall, extraction rates have increased.”</p>	<p>The department agrees with this submission point. The draft Gngangara groundwater areas water management plan recognises that the system as a whole is close to full allocation with some aquifers now considered over-allocated in some groundwater areas. This is the result of high demand as well as reduced availability of water because the rainfall recharging the aquifers has declined over the past 30 year period. The plan has put in place measures to address these issues.</p>
<p><i>Conservation Council of WA</i></p> <p>“The presence of intensive plantation forestry across the Mound is of great concern. Yet for the Department of Water to state that this is beyond their responsibility is not entirely correct. The Department of Water manage groundwater and surface water for quantity and quality. The National water Initiative signed recently by WA acknowledges the impact plantation forestry has on groundwater quantity and quality. Clearly the Department of Water must anticipate the evapotranspiration of groundwater and interception of rainfall when building their hydrogeographic models. Surely the Department of Water has some influence in determining which blocks of forestry should be removed in order to deliver an environmental benefit to down-gradient environmental assets?”</p>	<p>The department agrees with this submission point in part. The influence of plantation forestry is accounted for in the CDFM and PRAMS modelling and subsequent management recommendations made by the department. Changes to harvest rates are being explored through the GSS.</p>

Comment	Response
<p><i>Town of Cambridge</i></p> <p>“The statement that the Department of Water has no control over the loss of ecological values at these sites is questioned. Ministerial environmental conditions are set on these resources to ensure that environmental responsibility and protection of these resources is achieved and that each Department responsible for the ecosystem health of these areas are motivated to work collaboratory.”</p> <p>“While the Department may not have control directly over vegetation and disturbance levels it is implied by the condition that they have a duty to enquire of other Departments that do have direct control as to why a threatening activity is occurring, what measures are in place to reduce the impact of this activity, and express the effect that it has on the Department of Water’s ability to meet its ministerial conditions.”</p> <p>“There is no evidence in the review document that this has or has not occurred and thus we cannot judge whether the Department of Water has fulfilled its responsibilities in this area and now will be rewarded. It is an appropriate check and balance that these conditions should remain in place and should be monitored by the Environmental Protection Agency despite the new Departmental framework, by reducing its management requirements and associated expenditures.”</p> <p>“It is recognised that the removal of these conditions at the operational level is a reduction in expense and administration complexity and that has its own benefits to the Department of Water and also society as it ‘frees’ resources to move to more important tasks. On the alternative view it will remove these areas of significant resources from the attention of upper management in the Department of Water and the Minister as there will no longer be an EPA penalty that attaches to the resource.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Edgecombe Seepage, WM6 and PM25 are located on private land. The department is currently developing a process for triggering cross-agency management of sites on Crown land.</p>

Comment	Response
<p><i>Department of Indigenous Affairs</i></p> <p>“...advised that the review is deficient with respect to the lack of consideration of Indigenous heritage values.”</p> <p>“It is recommended that the Ministerial conditions be amended to include:</p> <ol style="list-style-type: none"> 1. The requirements for Aboriginal heritage surveys at all locations where physical changes to the environment (e.g. bores) are to occur. 2. Compliance with the Aboriginal Heritage Act 1972 at any locations where Aboriginal sites are identified. 3. The inclusion of a statement of the Indigenous beliefs in relation to groundwater, its flow and surface expressions (e.g. wetlands, springs and streams) 4. A commitment to ongoing consultation with relevant Aboriginal people in the management of Groundwater Resources of the Gnangara Mound.” 	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>The Department of Water is legally required to comply with all statutory requirements related to the Native Title Act 1993 and the Aboriginal Heritage Act 1972. It has developed guidelines to ensure that all reasonable measures are undertaken under the Acts. As part of the SGS Investigation anthropological consultation and archaeological surveys are being undertaken before any works are commenced.</p> <p>At locations where Aboriginal sites have been identified as a result of anthropological and archaeological consultation s18 notices are submitted to the ACMC according to their guidelines.</p> <p>The department takes cultural water requirements into account as part of its water allocation planning process and in 2005 completed a <i>Study of groundwater related Aboriginal cultural values on the Gnangara Mound</i>, by Estill and Associates</p>

Comment	Response
<p><i>Department of Indigenous Affairs</i></p> <p>“There is no reference to any Aboriginal heritage studies in the References although there is brief mention of a study into the Aboriginal heritage values of the Gngangara Mound (Estill) at page 205. A statement that further Indigenous consultation is being undertaken for the Shallow Groundwater System project is also made at page 205 but this in context of requesting that the condition for Aboriginal consultation is deleted. As recommended above the Department of Indigenous Affairs would like to see this condition strengthened.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>This Condition refers specifically to the now commissioned East Gngangara bore field. This was a condition set prior to the construction of this bore field. The department is asking for the Condition to be removed as it was met in 1995. As stated in the Review “The Swan Valley Nyungah Community were consulted with respect to the East Gngangara Proposal.”</p> <p>The department is legally required to comply with all statutory requirements related to the Native Title Act 1993 and the Aboriginal Heritage Act 1972. It has developed guidelines to ensure that all reasonable measures are undertaken under the Acts.</p> <p>The department continues to consult with members of the indigenous community on matters relating to groundwater investigation and management.</p>
<p><i>Department of Indigenous Affairs</i></p> <p>“The specific evaluations in Section 4, the review of environmental conditions, only list Ecological values”. Goes on to use Loch McNess as a example. It is a registered Aboriginal site.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p>
<p><i>Member of the public</i></p> <p>“If the Departments are so concerned about the environment they should take a drive through the forest from Sydney Road through to Warbrook Road. There is more asbestos dumped along the road than was ever exposed in Wittenoom township which the Government closed.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p>
<p><i>Member of the public</i></p> <p>“A complete topographical survey needs to be carried out over the Gngangara Mound. Any areas where subsidence has occurred abstraction should be reduced or stopped altogether.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“To assist in the recharge of the Gnangara Mound drainage bores need to be drilled in storm water basins or in wetlands to drain water down the boreholes into the superficial aquifer. The bore holes can be filled with crushed rock, yellow sand or Attapulgate to filter the water going into the aquifer. All drains now draining into the river should be dammed and drainage bores installed to capture the stormwater, which is now lost. Large buildings, sporting fields or any catchment area should have drainage bores installed.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p>
<p><i>Member of the public</i></p> <p>“The area between the southern monitoring bores and the area west of Gingin, which is being drilled now with four bores per site but not yet rigged for recording, is on average 30km north and south in which no information on the Pizzometric horizon is known, yet the Departments are engaged in clear felling or thinning of the pine trees, taking the logs and burning the remaining debris – whether deliberately or accidentally. ‘Slash and Burn’ of the forests is condemned all over the world as contributing to Global Warming and Climate Change, but it appears to be OK here in the Pine Forest.”</p>	<p>The department considers that the submission is cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p>

Sites recommended for removal as Ministerial criteria sites due to loss of ecological values

Comment	Response
<p><i>Town of Cambridge</i></p> <p>“While it is granted that there has been a loss of vegetation in an area and damage to the ecosystem due to a number of factors, the monitoring of the conditions should not be removed. It is the opinion of the Town that the Department’s and other stakeholders that are responsible for this degradation should be asked to explain why this is the case. If, as it was stated in the information session, that it was due to the WAPCs not taking the recommendation of the Department of Water into account adequately then any clearance of the condition should be tied with an increase on the WAPCs reporting requirements and the Minister for Planning.”</p> <p>“Ensuring a certain level of water at these sites should still be a requirement for the Department to support any further rehabilitation works that are required in this area. If the water levels are allowed to fall in these areas this is not reported at the Minister level then there is a stronger likelihood that degradation will continue to occur at an unreasonable rate in these areas. This degradation will be directly linked to the ability to abstract more groundwater in these areas and ultimately may lead to over allocation of the resource.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>The department is continuing, to monitor groundwater levels at these sites and will notify relevant agencies for rehabilitation purposes.</p> <p>The department is requesting that legally binding criteria are removed where environmental values no longer exist. The department intends to continue to monitor water levels at these sites whether they are criteria sites or not.</p>

PM25

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Site PM25 is cleared, does not have an associated vegetation transect and is relatively close to Ministerial criteria site PM24. DEC supports its removal as a Ministerial criteria site without replacement."</p>	<p>The department agrees with this submission point.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>"...we agree with the recommendation that this site be removed as a criteria site."</p>	<p>The department agrees with this submission point.</p>

Lake Gnangara

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"...DEC supports its removal as a Ministerial criteria site without replacement."</p>	<p>The department agrees with this submission point.</p>
<p><i>City of Wanneroo</i></p> <p>"Given the extensive pine area to the east of this lake, and the public water supply bores also just to the east of it, it is hard to believe that the effect of these things over the decades that they have been there is not the main cause of the loss of this site's ecological values, rather than climatic change".</p> <p>"If this wetland has indeed lost its groundwater related ecological values and its management objective have been irreversibly compromised, it raises the issue of what this area should be used for in the future. This is something which the GSS study could address."</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“... it was also recognised in Froend et al (2004a) that new ecological values exist in the area with the surrounding bushland supporting priority flora. We would contest then the citation in The Department’s review that Froend et al (2004b) reported groundwater related ecological values have been lost. Further, while no EWRs were proposed for Lake Gngangara in Froend et al (2004b) due to the lack of a vegetation monitoring transect; nor was the site listed as being one at which there had been a severe decline or complete loss of ecological values related to groundwater dependence (Table 1, Froend et al 2004b, p9).”</p> <p>“End of summer 2007 monitoring showed that healthy, mature <i>Melaleuca preissiana</i> persist along the Lake with mixed sedges and <i>Astartea fascicularis</i> occurring in the understorey. This would indicate that groundwater dependent systems do persist in the area. As only two end of summer assessments have been undertaken at Lake Gngangara, and due to the occurrence of declared rare and priority flora in the area – which should be recognised as a new value (Froend et al 2004a), we feel that it would be prudent to maintain Lake Gngangara as a Ministerial criteria site at this time.</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

WM6

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Site WM6 is on private property, is cleared and does not have an associated vegetation transect. DEC supports the removal of bore WM6 as a Ministerial criteria site, however, there is the very long term 'Neaves' vegetation transect established by Dr Libby Mattiske up gradient of this bore that could be considered as a replacement for WM6 if a new bore was established and calibrated during Stage Two of the GSS (SGS) Investigation."</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>
<p><i>City of Wanneroo</i></p> <p>"...It is therefore questioned whether this criteria site should be removed, or rather a new monitoring bore be established in a better site in relation to the vegetation monitoring transect."</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>"...With the bore being situated between Neaves Road and a semi-rural homesite, and approximately 2m downslope and opposite intact <i>Banksia</i> woodland (where groundwater levels are unlikely to be representative of those underlying the vegetation), it is felt that WM6 should be relocated or replaced as recommended in Froend et al (2004b) rather than removed completely as a Ministerial criteria site."</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

Edgecombe Seepage (B10)

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"The Edgecombe Seepage is a unique wetland habitat that is highly disturbed and cleared. There appears to be no appropriate alternative site and no ecological reason to continue to include it as a Ministerial criteria site. DEC supports its removal as a Ministerial criteria site."</p>	<p>The department agrees with this submission point.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>"Edgecombe Seepage is described by The Department as highly disturbed and as having experienced declining fauna abundance and diversity, however ecological values may recover with improved conditions (Froend et al, 2004a). Therefore Froend et al (2004a) determined that ecological values were retained at the site due to the mosaic of habitats likely to support diverse fauna populations. There appears to be no mention in Froend et al (2004b) of lost values due to clearing and earthmoving activities."</p> <p>"While revised EWRs were not determined... ... the reason for this is that there is no vegetation monitoring transect at the site and revised EWRs were not given for any site without a monitoring transect.</p> <p>"Mound springs are entirely dependent on the groundwater resource for habitat, biophysical process and consumptive use. We therefore do not support the recommendation that Edgecombe Seepage be removed as a Ministerial criteria site. Further, as abstraction does impact on this site we feel it is imperative that Ministerial criterion be retained and The Department continue to report against these criteria."</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

MM49B

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Site MM49B is cleared, does not have an associated vegetation transect and monitoring of the vegetation complex is Whiteman Park is replicated on four other Ministerial criteria sites. DEC supports its removal as a Ministerial criteria site without replacement."</p>	<p>The department agrees with this submission point.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>"While we agree that MM49B should be removed as a criteria site, as suggested in Froend et al (2004b) its replacement with site GD10 should be considered after an investigation as to the representativeness of this site."</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

Sites proposed for removal as Ministerial criteria sites as water levels are predominantly affected by climate or land use and not abstraction

Comment	Response
<p><i>Edith Cowan University – Pierre Horwitz and Kylie McKay</i></p> <p>“We believe that an element in the behaviour of sites at the regional level might be explained at a much larger than that modelled, by the behaviour of the entire Gngangara Mound. If the entire Mound is affected by extractions of both confined and unconfined groundwater, <u>then the argument does not hold</u> that sites where the influence of groundwater extraction is modelled to be lower, are worthy of removal on these grounds alone.”</p>	<p>Recommendations were made on the basis of the best hydrogeological information and advice at the time. Outcomes of modelling were cross checked with other methodologies as well as licensing data and information to identify the predominant cause of groundwater level decline at each site.</p>
<p><i>Edith Cowan University – Pierre Horwitz and Kylie McKay</i></p> <p>“We note and applaud the Department of Water’s verbal assurance that some form(s) of monitoring at some important ‘removed’ sites will continue. Lake Gngangara, Loch McNess and Lake Yonderup may act as important indicators for local climatic or ecological threshold effects such as those previously exhibited in the Yanchep cave system. However, the removal of these sites from Ministerial conditions prior to intensive site-specific investigations of groundwater-wetland interactions may be unwise.”</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>
<p><i>Edith Cowan University – Pierre Horwitz and Kylie McKay</i></p> <p>“The losses of ecological values or water level criteria breach at sites listed (Section 4.1.2) have been widely publicised. We believe there is a danger that members of the public will perceive the removal of sites as a cynical response to the failure to comply with those ministerial conditions. Such perceptions may be even more damaging to public understandings of better management of the Gngangara Mound, than the failures themselves. We note that the Department of Water has not sought to comprehend the nature or extent of such perceptions or their effects.”</p>	<p>The department recognises this point and as such has proposed retaining the bulk of its sites until future management objectives have been better defined through the GSS. Only Lake Gngangara, Edgecombe Seepage, WM6, MM49B and PM25, are proposed for removal due to a loss of ecological values. About half of the remaining sites will not meet compliance criteria.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>City of Wanneroo</i></p> <p>“...Regarding whether abstraction is or is not a factor at these sites (Loch McNess and Lake Yonderup), it is queried whether this is focusing on direct abstraction from the superficial aquifer. The Yeal and Pinjar subareas generally to the east of these sites are the primary impact areas for abstraction from the Leederville and Yarragadee aquifers, and it is recommended that clarification be sought regarding the possible impact of abstraction from the confined aquifers on these sites.”</p>	<p>The department agrees in part with this submission point.</p> <p>Refer also to Section 3.2.</p>
<p><i>City of Wanneroo</i></p> <p>“Aside from the issue of whether past and current abstraction may be a factor at these sites there are proposals for future public water supply wellfields to be west of these sites. While these possible future wellfields will be ‘downstream’ of these sites, it is understood that they might still have some effect on these sites, given experience with the operation of the existing wellfield in the general Clarkson-Butler area.”</p> <p>“In the past, there have also been proposals for possible new wellfields to the east of these sites and it is unclear whether these are likely to proceed or not.”</p>	<p>The department agrees in part with this submission point.</p> <p>Refer also to Section 3.2.</p>
<p><i>City of Wanneroo</i></p> <p>“The GSS study is looking at the matter of future public water supply/wellfield proposals for the Gnangara Mound area and it is recommended that the Loch McNess and Lake Yonderup sites be retained as Ministerial criteria sites until these future public supply wellfield proposals have been clarified through the GSS study.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“While it is agreed that the Department of Water cannot control groundwater declines due to decreasing rainfall, the Gnangara Mound Resource and all of its associated GDEs continue to require management. Retaining criteria for sites which it appears are predominantly affected by changing climate and/or land use will allow comparisons to be drawn against sites which are affected predominantly by abstraction but where impacts are cumulative. Criteria site retention, despite some sites being affected by variables which are outside the management of the Department, may help integrate sustainable land and water planning by adding to the understanding of how many factors influence the state of the Gnangara Mound resource. As stated in EPA (2007) Bulletin 1252 in order to adequately protect environmental values or optimise social and economic outcomes on the Mound it is not possible to only manage one aspect, namely abstraction, affecting the groundwater resource. Management of all factors affecting the Mound must be undertaken.”</p> <p>“In retaining criteria for sites the Department can continue to ensure that groundwater abstraction is strictly control within the area of those sites – especially for those sites considered to have high ecological values.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has requested to maintain the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has requested to maintain 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“The EPA (2007) Bulletin also states that modelling suggests the main factor contributing to declining water levels at a large number of criteria sites was the continued drying of the climate since 1977. For the Department to recommend then that sites be removed because of non-compliance with criteria is due to climate change may set a precedent whereby many of the criteria sites may be removed in the future... ..It is felt that allowing the recommended 4 sites to be removed from the criteria list may result in a great many of the criteria sites being recommended for removal in the future due to changes in their condition and value, removing the need to manage for many factors, all of which impact on the resource of the Gnanagara mound.”</p>	<p>This submission point cannot be addressed in the <i>Review</i> as it is outside the terms of reference.</p> <p>Ministerial criteria sites were originally established to monitor the impacts of abstraction on ecological values, rather than the impact of climate change. The recommendation to remove Ministerial criteria sites has been done on the basis that the sites are no longer able to fulfil this function due to either a loss of ecological values due to land use and land management changes or on the basis that groundwater abstraction is not a factor in water level decline. The department is focusing efforts on managing and investigating those sites where it is clear that abstraction impacts ecological values.</p> <p>Wherever there evidence that abstraction may be influencing water levels and/or affecting the ecological values of a particular site, the department has requested to maintain the site as a Ministerial criteria site, at least until necessary investigations and the GSS are complete. The department has requested to maintain 30 sites as Ministerial criteria sites.</p> <p>Refer also to Section 3.1.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“Further, it is felt that any removal of criteria sites on the grounds of climate or land use impact should be delayed until the review of shallow groundwater systems (SGS) is undertaken, which will report on the sustainability of shallow groundwater systems in the Perth Metropolitan Region. Additionally... ‘a complete review of environmental criteria, with particular focus on the development of new climate-relative criteria’ is not scheduled for completion until 2008-09. Until such climate-relative criteria are determined, it is recommended that no sites be removed on the grounds of changing climate.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Member of the public</i> <i>page xvii</i></p> <p>“This submission objects to the proposal to remove the Ministerial criteria from Lake Yonderup and Loch McNess. In essence these are water features of great ecological importance and central to aboriginal and European cultures which require the highest standards of monitoring and most thoughtful reasons to explain any discrepancy. The Review seems to abandon these lakes because the most probable cause(s) is(are) out of the direct control of the Water Authority.”</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>
<p><i>Member of the public</i> <i>Section 1.1</i></p> <p>“Adequate groundwater data for the Gngangara Mound in the vicinity of, and east of the 2 lakes (McNess and Yonderup) go back little more than 40+ years. Only firm data, preferably based on direct and measured observations, can be able to determine if the ‘baby has been thrown out with the bathwater’. As said above, regardless of the adequacy of the management controls the Water Department face in the face of diminished rainfall and land use, no other government department can apply sufficient resources and experience in groundwater monitoring.</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>
<p><i>Member of the public</i></p> <p>“Without specific lake target levels the ecological responses and presently adequate flows into Lake Yonderup and Loch McNess will be lost in measures based on regional models that do not actually describe these lakes very well at the small scale.”</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“Without the clear focus of Ministerial criteria it is likely that scarce resources will be taken from monitoring and applied elsewhere as political needs dictate. I believe that the Precautionary Principle should apply to both Lake Yonderup and Loch McNess before they both join Lake Wilgarup as an increasingly terrestrialised wetland system, with a loss of amenity and cultural values.”</p>	<p>Refer to Section 3.2 where this is addressed in more detail.</p>

Comment	Response
<p data-bbox="197 260 1032 288"><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p data-bbox="197 304 1167 695">“...there may be also be a shift of abstraction from the superficial to the confined aquifers for a limited period. It is further discussed that because GDEs across the mound are reliant upon the superficial aquifer, abstraction from the deeper, confined aquifers assists in protecting GDEs from changes in water level... ...overall abstraction from all groundwater resources should be assessed for potential GDE impacts and simply shifting abstraction from the superficial to the confined aquifers will not necessarily prevent loss of existing environmental values of GDEs. It is clear that the comments in the review do not take into account aquifer communication and the interconnectivity between the superficial and underlying aquifers.”</p> <p data-bbox="197 711 1178 1174">“...the relationship between surface water levels and groundwater levels is complex, and no general relationship can be applied to all wetlands in the Perth region. Each wetland has a specific water balance controlled by the relative size of components making up the balance, and the size ad depth of the wetland. Without a detailed investigation it is very difficult to located groundwater monitoring bores which accurately reflect surface water levels in wetlands. The effects of groundwater inflow and outflow from the Superficial formations to the Leederville aquifer is inferred to be contributing to the decline in some water levels on the western side of the Gnangara Mound. This would include Loch McNess and Yonderup... Until the relationship between the confined and unconfined aquifers can be related to groundwater levels it is difficult to trust completely modelling which suggests that abstraction is not affecting groundwater levels at some sites.”</p>	<p data-bbox="1202 260 2141 408">The department agrees in part with this submission point. The decisions made in the review were based on best hydrogeological information and comments available at the time. The SGS Investigation and improvements to PRAMS will improve understanding.</p>

Loch McNess

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Loch McNess is well north of the commercial bore fields and north of the horticultural zone around Carabooda (see Figure 16). Given this, DEC does not oppose its removal as a Ministerial criteria site without replacement."</p>	<p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p>"Lock McNess is at the stage now that Lake Gnangara was at 30 years ago. The pines are too far away to affect the lake and private abstraction on Old Yanchep Road would affect Lake Wilgarup which has had no surface water for nine years than have any affect on Loch McNess".</p> <p>"Monitoring should be carried out to the north of the Lake as the whole of the coastal plains from Bunbury to Geraldton is laminated by old coast lines which in most cases lead in a true north direction. Unless abstraction is reduced, Lock McNess will end up like Lake Gnangara or Lake Wilgarup".</p> <p>"Local records of rainfall would help decide which effect climate change is having. Investigation of the ground water levels to the north of Loch McNess and east of Two Rocks will give an indication of why the water levels at Loch McNess are dropping."</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“Loch McNess is Yanchep National Park to 90% of the public who go there to recreate... ..the inflow of groundwater from Boomerang Gorge enters the Loch as a surface stream under the road to the local golf course. This section of the Loch is much like a throughflow lake where the flow across the Loch and the sub-surface flow below the Loch are not greatly separated.”</p> <p>“Should the Loch ever dry out completely the seal of the mud/peat base will be forever compromised. There are two kinds of spaces within the muds, pore spaces and connecting spaces. While permanently submerged the mud holds water. Once the peat is allowed to dry completely the structure collapses and water may fill the pore spaces once more, but the longitudinal connecting spaces never do and the mud cracks never to hold a perched water body again... This is a <u>threshold condition</u> that seems to have been omitted in the Report, in an attempt to give assurances.”</p> <p>“...The surface water and groundwater flows separate almost totally here in times of very low Summer lake levels. The Loch waters are effectively ‘perched’ with downward infiltration restricted by the muds/peats. The subsurface water levels are below the lake levels in the vicinity which makes these a separate ‘underflow’...”</p> <p>“...The character of the groundwater flows alters dramatically in a few hundred metres, something that the models used cannot really show”.</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“Froend et al did not make any recommendations as to summer absolute minimum water levels for vegetation as there was no established vegetation transect at Loch McNess at the time of investigation. ...did however comment on the water depth ranges and period of inundation experienced by wetland species... ...did state that given the excellent condition of the vegetation at Loch McNess, the current (pre-2004) water regime may be adequate to maintain vegetation values and that WAWA (1995) EWRs were likely to be appropriate.”</p> <p>“While public abstraction does not appear to be an influence on water levels at Loch McNess according to CDFM and PRAMS modelling, it is felt that until the SGS investigation is completed; a suitable monitoring bore established at the new vegetation transect; and it is known whether there is a correlation between bore and staff gauge levels against which to measure criterion levels, Loch McNess should remain as a criteria site.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>

Lake Yonderup

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Lake Yonderup is well north of the commercial bore fields; however, it is only just north of the large commercial horticultural area off Old Yanchep Road (see Figure 16). DEC and the Yanchep Caves Recovery Team have some concerns about the horticultural use adversely impacting on the southern Yanchep Cave TEC. If this site was to be retained as a Ministerial criteria site, there would be a need to bring together the gauge and the vegetation monitoring site at this site. DEC is not comfortable to support its removal as a Ministerial criteria site.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“The three lakes Lock McNess, Lake Yonderup and Lake Wilgarup I feel are all interconnected along with Pipidinny Swamp. Pipidinny Swamp and Lake Wilgarup have been dry for some time. Monitoring bores are required at Lake Yonderup as quickly as possible, also accurate recording of rainfall at these sites.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p>“The main body of Lake Yonderup has a throughflow character that moves an astounding amount of water, across the centreof the lake... The greatest groundwater flows pass at various depths through the gap between Wilgarup and Yonderup Lakes moving under the Wanneroo Road near Gilgie Cave. Other components of the groundwater originating east of Carpark Cave and Onychophra Cave move south in annular flows before entering the part of Lake Yonderup cut off by the Yanchep beach Road and joining other subsurface flows from the swamps and higher areas east of the Wanneroo road which enter Lake Yonderup from the east. These considerable flows exit the lake via two systems of inflow caves – one around the mid point of the western shore and the other to the south west.”</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p data-bbox="197 256 1032 288"><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p data-bbox="197 304 1171 536">“No recommended level is provided in Froend et al (2004b) as the vegetation monitoring transect is located some 750m south of the staff gauge (not north as mentioned in review) and is not influenced by surface water. ...given the excellent condition of wetland vegetation surrounding the Lake Yonderup basin the then (2003) current water regime was likely to be adequate to maintain vegetation values, and therefore EWRs were likely to be appropriate.”</p> <p data-bbox="197 552 1144 735">“While public abstraction does not appear to be an influence on water levels at Lake Yonderup according to CDFM and PRAMS modelling, it is felt that until the SGS investigation is completed; a suitable monitoring bore established at the vegetation transect; and pending calibration of the new bore and review of the EWP, Lake Yonderup should remain as a criteria site.”</p>	<p data-bbox="1202 256 1805 288">The department agrees with this submission point.</p> <p data-bbox="1202 304 1509 336">Refer also to Section 3.2.</p>

NR11C

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Site NR11C has no vegetation monitoring transect, is relatively close to three other Ministerial criteria sites in Melaleuca Park and is well east of the East Gnangara bore field. It is close to the eastern end of the Bassendean Dune complex where deep grey sands are replaced by heavier soils of the biologically rich eastern side of the Swan Coastal Plain. DEC does not oppose its removal as a Ministerial criteria site without replacement."</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p>"The reduction of 50% in the abstraction from the Wanneroo Wellfield which had no effect on this monitoring bore NR11C, just proves that the monitoring bores <i>must run in a line north-south</i> and not east-west, as is the case now. Perhaps SGS Investigation can correct this problem."</p>	<p>The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p data-bbox="197 260 1032 288"><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p data-bbox="197 304 1182 456">“...NR11C site was chosen to ensure comprehensive representation of native vegetation which is susceptible to drawdown. Froend et al (2004a) further point out that site NR11C also supports declared rare fauna and retains value as representative of undisturbed phreatophytic vegetation...”</p> <p data-bbox="197 472 1167 663">“...we fell that removing criterion at this stage may lead to over abstraction in the future which in turn may lead to significant impacts for vegetation when coupled with climate variability and land use changes. The significant risk of impact posed by the modelled climate trend over and 8 and 28 year period would signify that a precautionary approach is warranted in an area with high ecological values.”</p> <p data-bbox="197 679 1167 978">“Increasing urbanisation... ..will increase pressure on the total groundwater resource. The proximity of private licenses in the area would also suggest a precautionary approach is required. Given that the hydrology of a terrestrial site is based only on water levels as measured at the groundwater level bores; and that this does not represent the variation in topography and its impact on groundwater levels across a site, we recommend that site NR11C is retained... until future hydrogeological assessments of groundwater levels across the Mound are undertaken.”</p>	<p data-bbox="1202 260 2092 328">The department considers that the submission cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p data-bbox="1202 344 1509 373">Refer also to Section 3.2.</p>

Lexia 94 (GNM17a)

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>"Site Lexia 94 is well east of the Lexia bore field with two replicated Ministerial criteria sites in the Maralla Road Bushland. DEC does not oppose its removal as a Ministerial criteria site without replacement."</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p>"Hydrograph from Lexia 94 says it all – this site was borderline from the start. Stage 2 of the SGS Investigation should have been carried out in 1994, not 2009."</p>	<p>The department manages environmental resources using the best scientific information and techniques available at the time. The SGS Investigation uses hydrogeological techniques that were unavailable in 1994.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>"...while drying is negatively impacting on this Dampland, fringing vegetation is providing a range of habitat types. Of concern to these ecological values are water levels and the risk of fire. However, more recent health assessment monitoring shows that there has been increasing health in the fringing vegetation of Lexia 94, with little evidence of terrestrialisation (Boyd, Loomes & Froend 2008)."</p> <p>"While CDFM and PRAMS modelling suggests that public and private abstraction is having minimal influence on water levels at Lexia 94, we would advise against removing Ministerial criteria from this Dampland at least until after the SGS Investigation is complete. Retaining GDEs which are primarily affected by climate change as criteria sites provides an excellent reference against which abstraction impacts can be measured at sites which are influenced cumulatively by abstraction, climate change and land use."</p> <p>"Further, encroachment of urbanisation within the vicinity of Lexia 94 would also appear to warrant the retention of criteria from a precautionary point of view. With the possibility of an increase in the number of private bores in the area, Lexia 94 may be adversely affected. An increase in the number of bores within the vicinity may impact the Dampland greater than anticipated."</p>	<p>This submission point cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>Refer also to Section 3.2.</p>

Sites to be retained as Ministerial criteria sites

Comment	Response
<p><i>Water Corporation</i></p> <p>“Many of the sites to be retained as Ministerial criteria sites have proposals for new monitoring wells to replace the existing criterion well. Several of these sites have proposals for hydrogeological review to improve understanding of the relationship between groundwater and wetland water levels. Several others have proposals for a review of the existing environmental water provision (EWP). However, there is no indication of the timing of approach proposed.”</p>	<p>New monitoring bores are being installed as part of the Perth Shallow Groundwater System Investigation. Stage 2 is due for completion mid 2008. Stage 3 is scheduled for 2009.</p>
<p><i>Member of the public</i></p> <p>“Whiteman Park:</p> <ol style="list-style-type: none"> 1. Whiteman Park is a major site of huge environmental value and any further loss of water level will be damaging to its environmental values 2. The lower water levels proposed at bores that are mid way between the production bores and therefore show the minimum level of decline due to abstraction. This is a slight of hand trick to understate the true affect and needs to be exposed. 3. Permanent wetlands of Whiteman Park will be further degraded by lower water levels further up the Mound. Most seasonal wetlands of the Park have now been destroyed by the present allowed levels and further decline will destroy the few that remain.” 	<p>No Ministerial criteria sites located in Whiteman Park, other than MM49B, have been recommended for removal as Ministerial criteria sites. At MM49B clearing has led to the loss of the <i>Banksia</i> woodland and the remaining vegetation is not representative of high priority conservation areas within Whiteman Park.</p>

Lake Goollelal

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“In the second paragraph of this section there are two references to Froend et al (2004c) which do not appear to be attributable to this source. While we would agree that the current staff gauge is unsuitable and a relocated gauge is required; and that a new bore at the vegetation transect be established as part of the SGS is desirable, no reference to these recommendations has been made in Froend et al (2004c). It would only be fair that the correct source for these recommendations is attributed.”</p>	<p>The department agrees with this submission point.</p>

Administrative Conditions

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>DEC does not oppose these proposed amendments to Ministerial conditions and procedures or proponent commitments.</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p><i>page xviii</i></p> <p>“The same sort of poor logic attends the further proposal that, as the department commitments (10) have been met, these be removed as binding legal conditions. Just because conditions have been met in the past is no guarantee that the conditions will continue to be met in the future.”</p>	<p>Once commitments have been met, and if they are not ongoing, there is no need to continually report against them.</p> <p>Refer also to Section 3.2.</p>

Comment	Response
<p><i>Member of the public</i></p> <p>“...rationalising procedures should not be a major argument for changing conditions and commitments that have already be met, else the future simplified reporting and audit procedures may degenerate into simpler descriptions that leave much out, and without detail leave more to interpretation.”</p>	<p>Once commitments have been met, and if they are not ongoing, there is no need to continually report against them.</p> <p>Refer also to Section 3.2.</p>
<p><i>Member of the public</i></p> <p>“The conditions in the past did not save Lake Wilgarup from being a onetime ‘defined stretch of clear water in the lake, which runs like a meandering stream directly to the corner of the lake’ to becoming the present half Tuart and half swamp paperbark. I believe there was simply insufficient focus on maintaining the wetland ecosystem there since this description, and not being an agricultural priority, was allowed to disappear. There was never much likelihood of enough water being pumped from the Leederville aquifer into Coogee Springs and working via Little Lake Mindarie into Lake Wilgarup.</p>	<p>Lake Wilgarup suffered from the impacts of regional groundwater level decline, largely as a result of climate.</p>
<p><i>Town of Cambridge</i></p> <p>“This is an administrative clearance that will free operational complexity of the documents and is fully supported. It is pleasing that the Department is taking a proactive approach to ensuring that its records are easy to navigate and accurate.”</p>	<p>The department agrees with this submission point.</p> <p>Refer also to Section 3.2.</p>
<p><i>Town of Cambridge</i></p> <p><i>Table 10 Vegetation Monitoring No. 19:</i></p> <p>“This actually requires an acceptable rate of change to be established. While the species and indices have been submitted this is obviously a continual and adaptive management monitoring program. Considering the Department’s reliance on the climate change argument in clearing some of the other conditions, the Department should realise that the acceptable rate of change may have to be redefined as the effects of climate change knowledge increases over time. This condition should remain and be reassessed under the GSS review of conditions at a later point...”</p>	<p>The department agrees with this comment.</p>

Proponent commitments

Comment	Response
<i>Section 5.2 Table 10, No. 21 Pine plantation</i>	
<p><i>Forest Products Commission</i></p> <p>“FPC endorses the identification of this commitment as being met and the proposal that it is removed.”</p>	<p>The department agrees with this submission point.</p>
<i>Section 5.2 Table 10, No. 14 Lake Nowergup Supplementation</i>	
<p><i>Member of the public</i></p> <p>“...I do not agree with this practice at any site, as one is drawing water from the bottom of the glass to fill the top of the glass is a simplistic view of this practise. Obviously it has to be done or all of the wetlands will be lost.”</p> <p>“All water drawn from other Aquifers must be conditioned to match the water in the wetland or it will destroy the wildlife in the wetlands. Off-the-shelf dosing plants are available to do this.”</p> <p>Any wetland already dry and subjected to acidification should be aerielly top dressed with lime during the winter months to halt the process of degradation.”</p>	<p>The department considers that this submission point cannot be addressed by the <i>Review</i> as it is outside the terms of reference.</p> <p>An assessment of options pertaining to the ongoing supplementation of Lake Nowergup is currently being undertaken by the Department. This is within the constraints of the current ministerial commitment to artificially supplement in an effort to meet the Environment Water Provision.</p>

Miscellaneous

Comment	Response
<p><i>Department of Environment and Conservation</i></p> <p>“It would help in assessing each Ministerial criteria site if the accompanying maps of their location included a symbol for the location of vegetation monitoring transects (similar to the location to the bores and staff gauges) .”</p>	<p>The department agrees with this submission point.</p>

Comment	Response
<p><i>Conservation Council of WA</i></p> <p>“For each criteria site, the scale of aerial photography varies – from 200m to 2000m. The scale chosen appears to be completely arbitrary. No indication is given for the reason for this approach. Obviously at the finer resolutions, that is below 1000m, the number of adjacent bores is not easy to determine, and nor is it easy to examine the context of the particular site. This must be corrected for the public to make any meaningful interpretation of the influence of groundwater extraction on environmental values. It is clear that for the public to comment on the number of groundwater bores on the vicinity of Ministerial Criteria sites, the cumulative impact of water extraction must be taken into account. A map showing all groundwater bores across the mound is needed.”</p>	<p>The department agrees with this submission point.</p>
<p><i>Conservation Council of WA</i></p> <p>“...has concerns regarding the accuracy of the mapping used to identify groundwater bores in the vicinity of the various Ministerial Criteria sites. ...licenced bores with an allocation over 150 megalitres are identified. Given that the new metering guidelines state that licenced allocations over 50 megalitres should be metered, why were these bores not identified in the Section 46 document? Also the Department of Water’s own website has online hydrographs that identify private licenced bores with allocations greater than 10 megalitres. Why could this level of surety not be included in the Section 46 document? It is the Conservation Council of WA’s contention that all groundwater bores on the mound should be identified, starting particularly in areas near to significant environmental assets—that is, the wetlands and groundwater dependent ecosystems of the Gngangara Mound.”</p>	<p>Bores with a licensed abstraction of 150 megalitres or more were those considered significant enough to possibly impact nearby groundwater dependent ecosystems.</p>

Appendices

Comment	Response
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“The table at Appendix C is entitled ‘Froend et al., (2004b) recent water level trends (2004-2007) for Ministerial criteria sites’ Froend et al (2004b) could not have provided recent water level trends for the period 2004-2007. The table heading should be amended to read ‘Recent water level trends (2004-2007) for Ministerial criteria sites base on Froend et al (2004b)</p>	<p>The department agrees with this submission point.</p>
<p><i>Edith Cowan University – Ray Froend, Tonja Boyx and Robyn Loomes</i></p> <p>“The table at Appendix D ‘Risk of impact and possible response to drawdown for wetlands and terrestrial phreatophytic sites’, should be cited as adapted from Froend et al (2004b).”</p>	<p>The department agrees with this submission point.</p>