GOVERNMENT OF WESTERN AUSTRALIA

Department of **Mines and Petroleum**

Department of **Water**

Guideline for Groundwater Monitoring in the Onshore Petroleum and Geothermal Industry

Response to Comments

August 2016

Introduction

The Department of Mines and Petroleum (DMP) and the Department of Water (DoW) have worked in collaboration over the past two years to develop the Guideline for Groundwater Monitoring in the Onshore Petroleum and Geothermal Industry.

This Guideline aims to provide assistance to petroleum and geothermal operators for the development of effective groundwater monitoring programs for their activities and includes guidance on:

- activities requiring groundwater monitoring
- review of existing information
- designing a monitoring program
- interpreting monitoring data
- provision for information to DMP and DoW.

The Guideline supports the initiative of the Reforming Environmental Regulation (RER) program by improving transparency around the expectations of DMP on baseline groundwater monitoring for the petroleum and geothermal Industry.

In September 2015, the draft guideline was sent to the representatives of the Interagency Working Group on Shale and Tight Gas and the Science Needs Working Group for review and comment.

The revised draft guidelines were released for an eight week public feedback period in January 2016.

A summary of the responses received is provided below

General

While there were various comments provided through the responses, overall stakeholders were supportive of the guidelines. The key themes of the feedback were:

- Requirement for groundwater monitoring – a number of submissions questioned whether groundwater monitoring was a regulatory requirement (ie. mandatory) or if it was optional. This affected the language being used in the document. Like with many other industries, groundwater monitoring is not a specific regulatory requirement, so the new guideline's approach is more about encouraging best practice in an adaptive, risk based framework – rather than having prescriptive, fixed requirements. Notwithstanding, DMP currently has the ability to require groundwater monitoring as a condition of approval. DMP has observed that most operators are constructing monitoring bores as part of being a responsible corporate citizen. The State Government always has the opportunity to make groundwater monitoring a specific regulatory requirement where uptake of 'best practice' is not deemed adequate.

- Monitoring design – a number of submissions made recommendations to improve the recommended sampling program design, number of bores, parameters, timeframes, etc. DMP and DoW actively considered this input and made adjustments where appropriate – noting that there is often a balance between an 'ideal' monitoring program and a 'real world' monitoring program. Real world constraints often include land access agreements, obtaining other relevant approvals and the company fine tuning the exact location of an exploration well. Consideration should also be given that groundwater monitoring requirements can be enhanced at any time should risks change, an incident occurs or an investigation is warranted.

Stakeholder comments

The review process notified respondents that their submissions would be made publicly available on the DMP website. However, company names attributed to those comments could be made confidential at the respondent's request. For those stakeholders providing confidential feedback (two respondents), this appears as an "In confidence" entry in the feedback table.

During the consultation period submissions were received from the following stakeholders:

- Company 1 (in confidence)
- Company 2 (in confidence)
- Individual contributor
- Santos
- Water Corporation
- Department of Health (DoH).

For the purposes of grouping and responding to points raised by stakeholders, the submissions have been split into each topic, however the content has been retained in its submitted form (ie. the text of the submissions is included verbatim). DMP and DoW thank all respondents for their considered input into the process.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
1. GENERAL COMMENTS			
	Water Corporation	The Guideline is extremely well written and provides useful information on monitoring groundwater related to the onshore petroleum and geothermal industry in Western Australia	Noted.
Section 3	In confidence	Remove words 'from aquifers' in third paragraph. Groundwater samples are groundwater samples, the definition of an aquifer can be open to interpretation.	Removed 'from aquifers' as unnecessary.
Section 3	In confidence	6th paragraph: include the following words: 'This guideline does not replace, remove or negate other monitoring or reporting requirements required under other laws, regulations or policies.'	Agreed. Updated.
Section 4.1	In confidence	Incorrect use of word 'mobile' in the dot point on page 4. Better word would be 'mobilise'.	Agreed. Updated.
Section 4.4	In confidence	There are no 2012 Contaminated Sites Guidelines from the Department of Environment and Conservation (DEC). The DEC guidelines referenced in Section 5 (Assessment Levels for Soil, Sediment and Water, February 2010) are the now out of date and have been replaced by updated guidance from the Department of Environment Regulation from December 2014. When referencing the ASC NEPM, it should be noted that this was amended in May 2013.	Agreed. Updated.
	Department of Health	The DOH accepts that the guidelines will encourage proponents to properly address groundwater monitoring and establish an environmental baseline. However, if the document is not going to be mandatory or binding, what mechanisms are in place to ensure that ground water monitoring is undertaken?	Noted. Groundwater monitoring requirements are discussed in the DMP's Environment Plan Guidelines. An operator's Environment Plan for their petroleum activity is an approval document and commitments to groundwater monitoring are enforced through that process. DMP will monitor implementation of the guideline in relation to new drilling proposals – regulation is an option if other policy mechanisms are not working.
Section 2	Department of Health	*"This Guideline… …aims to establish good practice requirements for groundwater monitoring for onshore petroleum and geothermal activities in Western Australia.* *The purpose of this Guideline is to provide guidance to operators about:* • *identifying situations where groundwater monitoring is considered appropriate for onshore petroleum activities* • *outlining the general requirements and considerations that can be applied to groundwater monitoring using a risk based approach."*	Noted. Guidelines are not intended to be prescriptive and as such needs to accommodate a variety of situations, environments and risks – and this is reflected in the language. However, in some cases the change to 'should' is appropriate and the document has been reviewed and updated with this in mind.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
		The subsequent frequent use of the term “may” or “may be” throughout the document undermines these stated objectives when referring to what clearly is good practice or general requirements. The term “may” or “may be” should be deleted, or replaced by “should” or “are” or “are likely to” depending on the grammatical context. The term “may” is softer than “should” and is not capable of providing clear guidance, as it implies that the text immediately is possibly necessary or a suggestion, but not likely to be necessary. Good practice guidance requires language significantly more concrete than “may” in order to be useful to the reader, to provide public reassurance and to meet the stated goals of the Guidelines from section 2.	
	Water Corporation	Suggested additions to the Guideline include: – Glossary of terms – References and additional reading material – Technical appendix – with case studies / examples of application – Contact person in DoW or DMP for additional information	Noted. Groundwater monitoring is not a new concept and most of the terms and definitions refer to the common meaning so a glossary is not necessary. Specific terms relevant to the Guideline are included in the Scope section. Other petroleum terms, such as ALARP, are common to the petroleum industry and can be found in other documents. Given groundwater monitoring is site specific, it is DMP’s and DoW’s preference that specific case studies are not provided.
2. SPECIFIC COMMENTS (CASE-BY-CASE BASIS)			
	Individual contributor	**Topic: Case-by-case basis.** Comment: As stated in the guideline a monitoring programme should be tailored to the site (groundwater flow, faults, aquifers, etc.), but this concept should not be used as a justification for implementing a second-rate or supplanting comprehensive monitoring. There is dialogue throughout that seems to imply that the risks are almost always low; which is concerning and not factual. Nonetheless, even a small risk of contaminating important future groundwater resources should be enough to make a rigorous monitoring programme mandatory in all cases.	Agreed. While the risk of groundwater contamination from petroleum activities is low, the statement may be subjectively interpreted. Removed the relevant sentence.
	In confidence	Overall the guidelines appear to be too generic and open to interpretation. Too much reference to requirements on a case by case basis which allows for individual interpretation of the guidelines by assessors.	Noted. Risk management allows for flexible interpretation based on site specifics. Prescription will not suit every instance, and will increase regulatory burden. Other national guidelines for water quality monitoring are also similarly non-prescriptive – eg. ANZEEC.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
Section 4.3 Page 12	Santos	The statement that quarterly sampling is adequate for surveillance monitoring contradicts the sections opening statement that the frequency of monitoring is determined on a case by case basis.	Agreed. Changed to read "Quarterly sampling is usually adequate…".
Section 4.1 Page 4/5	Santos	Much of the language in this section implies that it is up to the proponent to determine if groundwater monitoring is necessary and advice should be sought from relevant departments. Where, as per Section 3, groundwater monitoring is typically a requirement of ministerial conditions, Environmental Protection Act Licence and /or Environment Plans. Should this be stated that where there is a legislative requirement monitoring programs must be implemented as per the requirement?	Agreed. Note that the Scope section contains statements to this effect. Other statements have also been inserted in the guideline about specific ministerial condition or licensing requirements.
3. SPECIFIC COMMENTS (RISK BASED DESIGN)			
	Individual contributor	**Topic: Risk-based design.** Comment: Again, the concept is acceptable, but if the assumption is that the risks are low then what should be expected of the industry with regards to monitoring under the ALARP principle? Even more concerning is the designation of PSDWAs and GDEs as high-risk sites meaning that others could get away with no monitoring at all. Even a small risk of contaminating important future groundwater resources should be enough to make a rigorous monitoring programme mandatory in all cases.	Noted. See previous comments about guidelines being mandatory. It is DoWs and DMP's expectation that groundwater monitoring would be implemented for both high risk and highly valued sites.
4. SPECIFIC COMMENTS (BASELINE / EXISTING DATA)			
	Individual contributor	**Topic: Baseline/existing data:** Comment: There are no existing data in WA for the range of parameters they need to monitor. Two years pre is not "more than sufficient to establish a baseline". It is borderline at best. This boils down to what DMP were advised to say by the DoW.	Noted. While baselines of greater than two years are desirable, this is not always realistic, nor achievable. Land access arrangements and investment commitment timeframes means that these timeframes need to be flexible.
Section 4.2 Page 5	In confidence	DOW already has numerous monitoring bores and a database across the State – working together to use existing data and bores would appear to be the best method of reviewing existing information.	Agreed. These bores may provide a regional context but do not negate the requirement for localised monitoring.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
5. SPECIFIC COMMENTS (PARAMETERS)			
	Individual contributor	**Topic: Parameters:** Comment 1: No mention drilling fluid additives where this is usually the first indication of a contamination pathway into surrounding aquifers. Hydrocarbons are recommended to be monitored at 6-monthly intervals, which could also miss a complete contamination front during a production accident. Presumably some of these parameters and drilling fluids are missing because of the expense? There is some credence to monitoring the generalised/cheaper water quality parameters more frequently as they can give an indication of a change in groundwater conditions. However, this is not mentioned as a surveillance strategy. In any case, I am not sure if the fate of the potential contaminants (drilling additives) and mixing effects on other parameters are known well enough to use the "indicator approach" if this is the plan. Would it be wise to just follow up with a statement of "fate of other potential contaminants in the aquifer will be tracked using the following indicator parameters at a monthly frequency...: If the mixing characteristics of obscure chemicals/additives is poorly known then the parameters should include direct monitoring of a full suite of compounds." A letter from a Senior Chemist at Chemcentre states this quite clearly referring to a comprehensive list of parameters that are not included in the guideline. The cost issue notwithstanding, it should be at least a mandatory requirement for bimonthly monitoring of generalised water quality parameters, drilling additives and of course hydrocarbons. This could be included in the parameters list or at least have a statement to the effect. Comment 2: DoW appears to have suggested a few very expensive laboratory parameters (isotopes, water dating, etc) which may not particularly useful for surveillance. The document should state why these are included, e.g. to better understand aquifer connectivity.	Comment 1: Noted. DMP and DoW are aware of the ChemCentre list, and believe it should be used as a secondary level of investigation should preliminary testing indicate elevated chemicals above the trigger values. The guideline makes reference to including other analytes as appropriate. Comment 2: Noted. While this is beneficial for the advanced technical person, these parameters are really only utilised for specific studies and not suited to a general audience.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
		Chem Centre EXPERT SOLUTIONS Stephen Keenihan Latent Petroleum PO Box 7209, Cloisters Square, WA 6850 Hi Stephen, ChemCentre have examined the water analysis work being undertaken by Latent Petroleum at Warro. For the chemicals being used in the fluids during drilling and fracking operations (see Attachment A), we believe that regularly carrying out the suite of analysis presented in Attachment B would be enough to detect a significant spill/discharge of these fluids, provided an appropriate baseline (including temporal variation) is established. Note that the list of fluids used has recently been updated to reflect the most recent products used at Warro. Should a spill occur or any anomalous readings be detected further analysis would be required to determine the nature of the chemicals detected to diagnose their source. This would likely be accompanied by an increase in the frequency of sampling. Regards, Leif Cooper Senior Chemist 23 April 2015 **Attachment B** **Latent Petroleum's regular suite of analysis** | Analyte	Method Code	Limit of Reporting	Units
Alkalinity, total	iALK1WATI	1	mg/L
Aluminium	iMET1WCICP	0.005	mg/L
Arsenic	iMET1WCMS	0.001	mg/L
Barium	iMET1WCICP	0.002	mg/L
Bicarbonate	iALK1WATI	1	mg/L
Boron	iMET1WCICP	0.02	mg/L
Cadmium	iMET1WCMS	0.0001	mg/L
Calcium	iMET1WCICP	0.1	mg/L
Carbonate	iALK1WATI	1	mg/L
Chloride	iCO1WCDA	1	mg/L
Chromium	iMET1WCICP	0.001	mg/L
Cobalt	iMET1WCICP	0.005	mg/L
Copper	iMET1WCICP	0.002	mg/L
Electrical Conductivity	iEC1WZSE	0.2	mS/m
Hardness, total	iHTOT2WACA	1	mg/L
Iron	iMET1WCICP	0.005	mg/L
Lead	iMET1WCMS	0.0001	mg/L
Magnesium	iMET1WCICP	0.1	mg/L
Manganese	iMET1WCICP	0.001	mg/L
Molybdenum	iMET1WCMS	0.001	mg/L
Nickel	iMET1WCMS	0.001	mg/L
Nitrate	iNTA1WFIA	0.05	mg/L
pH	iPH1WASE	0.1	
Potassium	iMET1WCICP	0.1	mg/L
Sodium	iMET1WCICP	0.1	mg/L
Sulphate (from S)	iMET1WCICP	0.1	mg/L
TDS (calculated)	iSOL1WDCA	5	mg/L
Vanadium	iMET1WCICP	0.005	mg/L
Zinc	iMET1WCICP	0.005	mg/L
Methane	ORG513O	0.01	mg/L
TRH >C10-C16	ORG007W	50	µg/L
TRH >C16-C34	ORG007W	100	µg/L
TRH >C34-C40	ORG007W	100	µg/L
TRH C6-C10	ORG007WLiq	25	µg/L
Total TRHs	ORG007WLiqC	275	µg/L
Acenaphthene	ORG100W	1	µg/L
Acenaphthylene	ORG100W	1	µg/L
Anthracene	ORG100W	1	µg/L
Benz(a)anthracene	ORG100W	1	µg/L
Benzo(a)pyrene	ORG100W	1	µg/L
Benzo(b)fluoranthene	ORG100W	1	µg/L
Benzo(g,h,i)perylene	ORG100W	1	µg/L
Benzo(k)fluoranthene	ORG100W	1	µg/L
Chrysene	ORG100W	1	µg/L
Dibenzo(a,h)anthracene	ORG100W	1	µg/L
Fluoranthene	ORG100W	1	µg/L
Fluorene	ORG100W	1	µg/L
Indeno(1,2,3-cd)pyrene	ORG100W	1	µg/L
Naphthalene	ORG100W	1	µg/L
Phenanthrene	ORG100W	1	µg/L
Pyrene	ORG100W	1	µg/L		
6. SPECIFIC COMMENTS (MONITORING DESIGN)			
	Water Corporation	There are a few editorial comments to ensure the Guideline (1) maintains wide technical and non-technical readership, (2) is applicable across large areas of WA, and (3) supports the collection and use of consistent and reliable information to minimise any possible risk of contamination of groundwater: **1.** Monitoring is one part of the overall process for the management of groundwater quality and alone cannot ensure water is safe. Sampling data are important as they are used to define the baseline or pre-development condition, assess changes in quality and trigger corrective action.	1. Agreed. 2. Agreed – that is what DMP and DoW are advocating. 3. Triggering of corrective actions would be covered in EP. 4. Section 4.4 page 17 – covers this point. 5. Document already refers to the ISO 31000 risk management process.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
		In WA, most groundwater sources used for public supply are vulnerable to contamination and in limited supply so this process is of paramount importance. **2.** Ground water monitoring must be seen as a long term management commitment that extends from pre-development, operational phase and then into closure, decommissioning and rehabilitation of the project site. Therefore, the groundwater monitoring plan should be documented to cover this complete period. **3.** Components of the monitoring plan include: initial sampling and risk assessment of the groundwater, definition and development of the plan, sample collection, data storage and analysis, determination of trigger values, implementation of operational monitoring, data review and possible triggering of corrective action, and reporting. **4.** Process control tables are a practical means of documenting: sample point, constituent, sampling frequency, trigger value and corrective action should the data go outside the pre-determined limit. This approach is endorsed by the ADWG and WHO in their Water Safety plans. **5.** Monitoring is part of a "plan-do-check-review" process. The plan guides how data are collected (sample, field instrument and on-line), how trigger values are determined and also what action is taken if the trigger is exceeded. The review-step allows assessment of the performance of the program, identification of missed samples, and identification of possible enhancement to the plan.	
	Individual contributor	• **Topic: Design:** Comment: The guideline recommends one bore if groundwater flow is known and three bores if not known – NOT SUFFICIENT. It is reasonable to expect the guideline would prescribe industry standards by targeting monitoring bores to connected aquifers (using shallow and deep bore holes at each location) – not just the shallow drinking water aquifer – and including radial monitoring of 5x locations per well (1-5 km radius depending on aquifer zoning). If near surface aquifer expressions occur (springs, soaks, baseflow rivers) then monitoring should be extended to a 10-20km radius (depending on aquifer connectivity) and these sites should be monitored in addition to the well bores.	DMP and DoW do not consider a landscape monitoring bore network to be practical or appropriate. The focus of the Guideline is for operators to monitor groundwater in vicinity of their specific petroleum activity. Additional monitoring bores may be necessary where a specific groundwater investigation is required.
Section 4.3	In confidence	"Monthly sampling is a typical initial baseline frequency" – Monthly sampling is not typical and impractical for remote sites. Quarterly or biannual sampling to capture seasonal variations would be sufficient for most sites.	Changed monthly sampling from 'typical' to 'recommended'.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
Section 3 Page 3	Santos	Are there situations where groundwater monitoring commences after a petroleum activity has already started? If so, should there be guidance on how to establish baseline data i.e. measurements up-gradient of the petroleum activity or in a similar area where there is no petroleum activity?	Noted. This is not something that DMP and DoW want to advocate. There shouldn't be any instances where there is not adequate baseline information for before the activity commences. Inserted a statement that baseline is for new activities – baseline does not refer to activities that are already occurring.
Section 3 Page 3	Santos	This section refers to Ministerial conditions that may require groundwater monitoring. Should it also mention that an Environmental Protection Act Licence may also require groundwater monitoring?	Agreed. Statement inserted.
Section 4.1 Page 4	Santos	Should the list of areas where intensive groundwater monitoring is likely to be considered appropriate include "areas of where known or potential contamination may reach the groundwater"?	Agreed. Inserted new dot point.
Section 4.1 Page 5	Santos	Petroleum activities where groundwater monitoring is not considered appropriate includes pipelines. Does this cover all pipelines, as historically below-ground pipelines have been a known source of groundwater contamination?	Pipelines have been noted as out of scope of the Guideline.
Section 4.1 Page 5	Santos	Petroleum activities where groundwater monitoring is not considered appropriate includes where existing data is sufficient to determine the baseline. Could this be interpreted as meaning not only is no further baseline monitoring required but no further surveillance monitoring?	Relevant dot point has been removed.
Section 4.2 Page 5	Santos	Should this section be applicable for new monitoring programs at existing sites as for new sites? If so, should this be stated?	Clarified 'new' petroleum activities in scope of the Guideline.
	Water Corporation	To ensure consistency in the process, it is important that numeric methods are described for the determination of Trigger Values in the Guideline.	The Guideline does not intend to describe the methods for determining trigger values. Considered out of scope.
	Water Corporation	To assist operators, I suggest a technical appendix is added to the report with clear "good practice information" on the overall steps in the sampling process. Ideally this could include a test case that includes: a. Initial surveys samples, risk assessment and development of Sampling Plan (where, when and what to sample). Selection of sampling frequency for water samples – monthly is good practice. How to select key variables and surrogates. b. Implementation of baseline sampling – ideally 24 months c. Data review and analysis to define triggers	Noted. Most elements have been included in the Guideline. DMP may consider this idea in a future revision of the Guideline.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
		d. Implementation of operational monitoring – over the duration of the project and closure e. Review of data for exceedance of triggers f. If triggers exceeded, implement corrective action g. Routine reporting to regulators h. Program review	
	Water Corporation	The trigger values are a key component of the monitoring plan and a variety of methods are available: a. ADWG guideline detection/reporting limits for pesticides b. 10% of the ADWG health guideline value for carcinogens c. An increase of 25% above the ADWG guideline for other constituents d. 20% above the pre-development baseline concentration, or e. One or two standard deviations above the mean of the pre-development concentration.	See response in row above.
7. SPECIFIC COMMENTS (WELL CONSTRUCTION)			
Section 4.3 Page 10	In confidence	Monitoring sites and bore design – It is felt that the confirmation of well integrity of a suitably constructed petroleum well is more likely to ensure no impact on surrounding environment than the construction of monitoring bores around the wells. The monitoring wells themselves potentially provide a route for vertical contamination in the substrata.	Noted.
Section 4.3	In confidence	"Water bores must be drilled in accordance with the Minimum Construction Requirements for Water Bores in Australia guidance document." – This document is aimed at drilling water supply wells rather than groundwater monitoring wells. The ASTM and EPA guidance documents for GW monitoring well installation are more relevant.	DoW and DMP are happy with the current reference document.
Section 4.3 Page 9	Santos	Is the activity of installing groundwater monitoring bores required to be covered by an accepted Environment Plan? If so this should be detailed.	This is outlined in section 4.3.
Section 4.3 Page 10	Santos	Monitoring sites and bore design – The introduction uses the term "baseline groundwater monitoring bores". Typically baseline monitoring bores then turn into surveillance bores, should this section reflect that?	Agreed. Statement inserted.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
8. SPECIFIC COMMENTS (CONTAMINATED SITES)			
Section 4.4 Page 17	Santos	Are the notifications to the DMP, the Department of Water, the Department of Health, the Department of Environment Regulation and relevant water service providers of any exceedances of drinking water guidelines (i.e. in relation to a potable water supply) or contaminated site guidelines, guidance or an actual requirement? If this is a requirement, then it may need some more detail around where the requirements are from (i.e. what legislation) and what is required. Also, are these notifications in addition to those that maybe detailed in ministerial conditions, Environmental Protection Act Licences and Environment Plans?	Agreed. Text has been clarified in Section 4.4. Wording has been reviewed to indicate a transition from baseline to surveillance monitoring.
Section 4.4	In confidence	The mechanism/process for notification of the DER with regard to potential or known contamination as per the Contaminated Sites Act, Regulations and DER guidelines is not the same as the contact requirements outlined on page 17. Specific regulatory notifications (including those that are urgent), including contact details (branch, department), with regard to impacts to drinking water and/or site contamination should be more clearly stated for each regulatory department.	Noted. It should be noted that contact details for branches within departments often change.
Section 4.5	In confidence	Request clarification from the DMP in terms of the definition of 'groundwater contamination' in regard to reporting of incidents to the DMP. It is assumed that the DMP should only be notified of 'contamination' defined as where it exceeds baseline condition, as its not within regulatory jurisdiction to report under the Contaminated Sites Act.	Noted. Inserted wording that DMP and DoW should be contacted if there are general trends from the baseline groundwater condition.
9. SPECIFIC COMMENTS (ALARP)			
Section 1 Page 2	Department of Health	*"While the petroleum industry acknowledges these risks do exist, the combination of robust regulations and industry best practice mitigation ensure that these risks are minimised to 'As Low As Reasonably Practicable' (ALARP). As such, the risk of groundwater contamination is extremely low."* The document should explain for the benefit of the reader what the ALARP protocol actually is, why it is the most appropriate means for protecting ground water values and how *'the risk of groundwater contamination is extremely low'*. This latter statement is an opinion expressed as fact that needs to be justified, in particular the meaning of *'extremely low'*.	See previous comments regarding glossary and removal of the statements around 'low risk'.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
10. SPECIFIC COMMENTS (PDWSA)			
Page 6	Department of Health	*'Consultation with public water service providers, such as the Water Corporation, is required where activities are situated in proximity (5km) to public water bores in PDWSAs.'* This sentence needs to be redrafted on a number of aspects: • To make clear who should be consulting with Water Corporation and when. It is essential that exploration companies contact water service providers as they will be directly impacted and are immediately answerable to their customers. • To make clear that consultation is required within 5 km of a public water bore, either a bore in a PDWSA or a bore supplying an Aboriginal community drinking water supply, regardless of whether the bore itself is or is not in a PDWSA and also noting that the 5km distance from the bore may extend outside PDWSA boundary. • To make clear that consultation is required if the activities are within a PDWSA, regardless of proximity to a bore or not. • In the case of a bore supplying an Aboriginal community drinking water supply, consultation would be required with the Housing Authority instead of the Water Corporation.	Agree. Sentence reviewed: "Exploration companies must consult with public water service providers prior to commencement where activities are situated: • in a PDWSA, • within 5 km of a PDWSA, or • within 5km of a public water bore. Where the activity is within 5km of a bore supplying an Aboriginal community, the relevant public water service provider is the Housing Authority."
11. SPECIFIC COMMENTS (REPORTING)			
Section 4.5 Page 17-18	Department of Health	*"An incident report should be submitted to DMP where groundwater contamination has been identified."* It is important that a copy of the incident report must be provided to Department of Water (DoW) and DOH at the same time. Note also that this is the only reference to an "incident report". It is essential that the document provides clear explanation of what an "incident report" is and what it might contain, so this detail should be added.	Noted. DMP encourages concurrent reporting to relevant regulatory agencies. DMP has provided contact details for other agencies on its website, including DoH. DMP will also notify other relevant agencies of incident reports as appropriate and according to administrative arrangements.
Section 4.5 Page 17-18	Department of Health	*"Operators are encouraged to submit raw groundwater monitoring data to the Department of Water (datain@water.wa.gov.au) as the Government's custodians of groundwater data and information."* It is important that operators submit the raw ground water monitoring data to DoW, so the above sentence should be redrafted to replace 'are encouraged to' with 'must' in the above sentence.	Noted. "Encouraged" is the appropriate term given it is company data. "Must" implies a regulatory requirement to provide DoW with the data – which it is not.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
		The best practice Guidelines stipulated that DoW may do anything with that data that is consistent with its role and purpose and that no confidentiality constraint can be placed on DoW in relation to the data unless the confidentiality constraint is in the public interest.	
Page 19	Department of Health	*"The terms of the operator releasing the report to the landholder can be negotiated in the land access agreement."* This statement requires classification that the landholders support this aspect of the Guidelines (refer APPEA 2015). The following general caveats are suggested in relation to the land access agreement: • The baseline groundwater monitoring report should be provided to the landholder on request by the landholder • The data should be provided in a format understandable to the reasonable layperson • No confidentiality clause can be imposed on the landholder. In particular, the landholder has the right to show the report to a third party at any time in order to understand it • The report is provided to the landholder in a timely manner relevant to the data in question and relevant to the time of the request of the landholder This section should also clarify if the "groundwater monitoring report" referred to here is the same document as the one submitted to DMP or if it is restricted to just monitoring on the landholder's property.	This is a privately negotiated agreement and the terms cannot be dictated by a third party. This is also outside the scope of the guidelines. Inserted the following sentence: "DMP supports openness and transparency regarding monitoring results".
Section 4.5 Page 17	Santos	It is unclear under what legislation or mechanism groundwater monitoring reports are required to be submitted to the DMP. The use of the word "should" makes the submission of a groundwater monitoring report to DMP sound like an option, is this correct? Should the reporting section include a statement that monitoring plans may be required to be submitted under legislation or ministerial conditions, Environmental Protection Act Licences and Environment Plans?	Noted. Operators are aware of their reporting requirements under the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012.

REFERENCE	STAKEHOLDER	COMMENT	RESPONSE/ACTION
12. SPECIFIC COMMENTS (HYDRAULIC FRACTURING)			
Section 4.1	Water Corporation	In November 2015, the Parliamentary Inquiry report was released on the Implications for Western Australia of hydraulic fracturing for unconventional gas. The Guideline should consider referencing relevant recommendations and findings from this Inquiry, namely: Recommendation 10 states "The Committee recommends that baseline monitoring of aquifers and the subsequent publication of this data be a mandatory condition of all approvals for hydraulic fracturing operations in Western Australia." As such, this Guideline will serve as an important reference with readership by technical and non-technical audiences in WA. This Recommendation will also affect the content of Section 4.1 of the report it is stated monitoring may be on a case by case basis.	Out of scope. The Guideline isn't specific to hydraulic fracture stimulation – but petroleum activities more generally. Government has outlined its response to the Parliamentary Inquiry which can be found at www.parliament.wa.gov.au.
	Water Corporation	In November 2015, the Parliamentary Inquiry report was released on the Implications for Western Australia of hydraulic fracturing for unconventional gas. I feel there are some areas in the Guideline where more detail is required to clarify how to set up a monitoring plan and prevent possible inconsistency to ensure the monitoring data are reliable and consistent across all projects. This is reflected in the Inquiry Findings and Recommendation, and discussed further below: Finding 50: The Committee finds that baseline monitoring of water sources and local geology is fundamentally important, not only for scientific purposes, but also to establish a successful social licence for unconventional gas development. Finding 51: The Committee finds that transparency in data and effective communication to the public of information related to hydraulic fracturing is vital to establish a successful social licence for unconventional gas development. Recommendation 12 of the PSC report states: "The Committee recommends that any future consideration of hydraulic fracturing for unconventional gas in Western Australia be based on established facts, ascertained through baseline data and monitoring, with a view to strengthening the industry's social licence to operate".	As above.

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