



Government of **Western Australia**
Department of **Mines and Petroleum**

Department of Mines and Petroleum

Chemical Disclosure Guideline



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Chemical Disclosure Guideline

BACKGROUND

This Guideline supersedes the Department of Mines and Petroleum's (DMP) Chemical Disclosure Information Note 2012. It outlines the chemical disclosure requirements for products, chemicals and other substances used 'down-hole' in petroleum or geothermal related activities regulated under regulation 15(9) of the:

- Petroleum and Geothermal Energy Resources (Environment) Regulations 2012;
- Petroleum (Submerged Lands) (Environment) Regulations 2012;
- and may be required for activities regulated under the: Petroleum (Pipelines) (Environment) Regulations 2012.

It also supplements information provided in DMP's "Guidelines for the Preparation and Submission of an Environment Plan".

PURPOSE

DMP uses chemical disclosure information to assess environmental impacts and risks (both above-ground and below-ground) as part of assessing an Environment Plan. DMP considers it important to have an accurate and transparent public record of all products and chemicals used in regulated petroleum and geothermal activities.

This Guideline details what chemical disclosure information is required by DMP and how and when this should be disclosed and made publicly available. It also provides Chemical Disclosure Reporting Templates which is DMP's preferred approach for submitting chemical disclosure information. Examples of completed chemical disclosure reporting templates are provided in this guideline.

SCOPE

Chemical disclosure is required for all 'down-hole' petroleum or geothermal related activities, including (but not limited to):

- Seismic surveys;
- Drilling;
- Hydraulic fracturing;
- Well testing;
- Waste disposal or storage;
- Fluid or gas injection, and reinjection;
- Well production and maintenance;
- Well closure or decommissioning; and
- Emergency scenarios.

Most chemicals used in the petroleum industry are present as ingredients within products. 'Chemicals' also include water and 'substances' (such as soils, muds, cements, proppants, ceramics and plant matter). All chemicals and substances used down-hole must be disclosed whether they are:

- organic or inorganic;
- solids, liquids or gases;
- natural or synthetic; or
- present in pure form, a solution or a mixture (such as slurries, emulsions or suspensions).

WHEN TO DISCLOSE

PREPARING CHEMICAL DISCLOSURE FOR A NEW EP

The Operator is responsible for disclosing all down-hole chemicals and substances to DMP in their Environment Plan (EP). DMP will assess the chemical disclosure information as part of the EP assessment process. Pending approval, the chemical disclosure information must be provided in the EP Summary which will be made publicly available on DMP's website www.dmp.wa.gov.au.

In preparing chemical disclosure information for an EP the Operator should allow sufficient time to:

- determine which chemical supplier/s or service providers will be used;
- plan which products and additives will be used down-hole;
- determine product volumes, chemical ingredients and their concentrations;
- collate relevant chemical disclosure information and Material Safety Data Sheets (MSDS);
- determine if an environmental risk assessment for a product or chemical is appropriate (refer to the DMP "Environmental Risk Assessment for Chemicals in WA Petroleum Activities Guideline");
- determine if laboratory testing of products or chemicals is needed; and
- complete the Chemical Disclosure Reporting Template.

The Operator is responsible for contacting the manufacturer, supplier, importer or service provider (and other information sources) as necessary to obtain the relevant chemical disclosure information. While MSDS contain some chemical information, this source should not be solely relied upon. Some chemical manufacturers and suppliers may provide additional information upon request (notably toxicity and ecotoxicity information).

Non-disclosure, inaccurate or incomplete Chemical Disclosure Reporting Templates to DMP may result in delays to the EP assessment, require revision of an EP, or lead to refusal of an EP.

MODIFYING CHEMICAL DISCLOSURE FOR AN APPROVED EP

Chemical disclosure allows for the use of contingency products which are not used under standard operating conditions, but usually stored on site for potential use in the event that they are needed at short notice, such as for emergency situations or for lost circulation material. If contingency products have been disclosed in the original EP's Chemical Disclosure Reporting Template, then they may be used if needed. No bridging EP document is required.

However, sometimes modifications to a petroleum activity may occur following approval of an EP, including variations to products and chemicals being used down-hole that was not foreseen. DMP must be notified of, and may re-assess, any proposed changes including:

- substituting products, additives, chemicals and other substances in an approved EP;
- proposed use of additional products and new chemicals;
- changes to contingency products;
- altering product volumes or chemical concentrations by more than 5% (of their original value in the approved EP);
- emergency use of chemicals.

For proposed changes to chemicals, the Operator is required to send DMP a bridging EP document including a Chemical Disclosure Reporting Template. DMP will assess the bridging EP and notify the Operator of the acceptability of the proposed changes. The size of the bridging EP documents need not be lengthy, but should be proportionate to the scale and nature of the proposed change.

If proposed changes to chemicals may result in increased environmental impacts or risks, this will require an environmental risk assessment for chemicals to be included together with the bridging EP document and the Chemical Disclosure Reporting Template. DMP's Environmental Risk Assessment for Chemicals in WA Petroleum Activities Guideline should be consulted in this regard.

HOW TO DISCLOSE

DMP requires all chemical disclosure information to be submitted via its Chemical Disclosure Reporting Template. The Chemical Disclosure Reporting Template should be attached as an Appendix to the EP and Summary EP. This enables the Appendix to be easily updated and re-submitted to DMP should future modifications be made to product and chemical use.

The reporting template is based on 'systems-based' disclosure. A 'system' refers to each systematic stage of well drilling, well construction, well testing, hydraulic fracturing, production and well closure (as appropriate). Specific products and chemicals are used for each system. Examples of system names include: "drilling fluids", "cementing slurry", "hydraulic fracturing fluid", "well closure fluids", etc.

'Systems-based' disclosure means that product information is disclosed separately from its chemical ingredients. In this way, details about products and chemicals are still provided to DMP without compromising the level of disclosure and without compromising commercially sensitive information about product recipes.

This allows Operators to have greater flexibility with their choice of products, potentially allowing commercially sensitive products that are:

- i) more efficient – i.e. reducing the need to use larger quantities of common chemicals;
- ii) more environmentally friendly – i.e. less hazardous chemical alternatives; or
- iii) scientifically beneficial – i.e. a better understanding of underground petroleum activities, hydrogeology or tracking fluid movement.

It should be noted that 'systems-based' disclosure does not make any provision for exempting proprietary chemicals from being publicly disclosed.

The Operator must inform the supplier or manufacturer that all chemical information disclosed to DMP will be made publicly available. If chemical disclosure information is not forthcoming from a supplier or manufacturer, then the Operator should consider selecting alternative products and / or suppliers that will be able to meet chemical disclosure requirements.

WHAT TO DISCLOSE

The 'systems based' Chemical Disclosure Reporting Template comprises three separate tables which must be completed for each system in the petroleum activity:

- PART A. Well and system details;
- PART B. Product list; and
- PART C. Chemical ingredient list.

Details about the requirements in the Chemical Disclosure Reporting Template are as follows.

PART A). WELL AND SYSTEM DETAILS

OPERATOR & PROJECT / WELL NAME

Operator and well names need to be provided as they appear on the EP, so that the EP and the chemical disclosure reporting template can be directly linked. This is particularly relevant should the Operator need to submit a revised or updated Chemical Disclosure Reporting Template separate to the rest of the EP.

SYSTEM NAME

Chemical disclosure for each well may involve multiple stages or 'systems' depending on the petroleum activity being undertaken. Each system requires its own product list and chemical list to reflect what will be used down-hole for each stage. System names can be referred to simply as "drilling fluids", "cementing slurry", "hydraulic fracturing fluid", "well closure fluids", etc.

VOLUME

Total volume (in litres or kilolitres) of the system fluid represents the collective sum of the volumes for all products and base fluids. This figure reflects the total amount of fluid used in the system which is relevant for assessing potential environmental impacts and risks. It does not include the volume of contingency chemicals.

PART B). PRODUCT LIST

PRODUCT NAME

Each 'product' must be identified that is present in the system identified in Part A. Each product has its own commercial or trade name specific to its manufacturer or supplier. A product can be made up of one or many chemical ingredients. The product name listed on the reporting template should match the product name on the MSDS.

Some chemicals and substances may be used that don't have a commercial product name. Natural products fall into this category (e.g. water, nut shells, plant material, common sand) and may instead be identified by a common name.

Water can be added down-hole either as a base fluid or as an ingredient within a product. Where used as a base fluid, such as for water based drilling muds, it should be included as a separate 'product' in the Product List – with the source of the water identified (e.g. bore water, scheme water, recycled flow-back water, etc.).

While DMP encourages the use of recycled flow-back water and re-use of treatment fluids, the disclosure should cross-reference any chemical disclosure from a previously approved EP where appropriate (i.e. the original source of flow-back water or treatment fluids).

Contingency products should be included on the product list where they will be kept on standby. While contingency products are not used under standard operating conditions, they are usually stored on site for potential use in the event that they are needed at short notice, such as for emergency situations or for lost circulation material. In these instances, time is a critical factor for avoiding or minimising potential impacts, and therefore having approved contingency products in the EP is central to good safety and environmental risk management.

While DMP acknowledges the uncertainty associated with contingency product use, it encourages Operators to submit indicative per cent content for contingency products. Contingency product names must be flagged in the reporting template with an asterisk (*) to denote uncertainty regarding its use – but it will otherwise be assessed by DMP as if the product will be used.

SUPPLIER NAME

For each product used, the business name of the manufacturer, supplier or importer to Australia needs to be provided. This business name provided in the disclosure template should ideally match the business name on the MSDS. This recognises that some products may have identical names, but different manufacturers. Suppliers and manufacturers may need to be contacted in the event of an emergency or if further details about the product are required.

PURPOSE OF USE

For each product used, a general purpose or reason for its use needs to be identified. Short general descriptions are sufficient. Some products may have multiple purposes or reasons for use. It is inappropriate to refer to the term 'product' or 'additive' as a general purpose of use. The following terms are suitable examples for purposes:

acid	corrosion inhibitor	oxygen scavenger
base fluid	cross linker	pH adjusting agent
biocide	demulsifier	proppant
breaker	friction reducer	scale inhibitor
brine	gel	stabiliser
buffer	iron control	surfactant
casing cement	lubricant	weighting agent

PRODUCT % CONTENT IN SYSTEM

The per cent of product within a fluid system indicates the relative proportion of each product as part of a fluid system. The per cent content calculation should be consistent for all products, so that the total per cent content for all products within each system should total close to 100%.

For fluid systems, figures may be represented as per cent content by volume. For cementing slurries or other mixtures, comprising of solids and liquids, figures may alternatively be presented as mass fraction (%).

Contingency products (denoted *) should be included together with the 'standard use' products in the per cent content calculations. This may result in the total sum of per cent content being greater than 100%.

TOXICITY AND ECOTOXICITY INFORMATION

Toxicity refers to the adverse effects of human exposure to a product or chemical over a period of time. Ecotoxicity refers specifically to the toxic effects of a product or chemical on biological organisms at either the population, community or ecosystem level – fish, crustaceans and algae are commonly used in this regard. DMP uses this information in its environmental risk assessment of chemicals.

DMP requires details relating to:

- Acute toxicity: data relating to toxicity for mammals (i.e. rat toxicity is most commonly used as a proxy for human toxicity), in addition to data relating to ecotoxicity (fish, crustacea and algae);
- Chronic toxicity: information relating to whether the chemical is a known carcinogen, mutagen, reproductive toxin, etc. or a chronic toxicant;
- Persistent, biodegradation and bioaccumulative chemicals: data relating to a chemicals ability to remain in the environment for long periods of time or to biograde, and / or its ability to build up in food chains over time.

Further guidance about DMP's preferred measures for toxicity and ecotoxicity data and information can be found in DMP's "Environmental Risk Assessment for Chemicals used in WA Petroleum Activities Guideline".

DMP prefers that toxicity and ecotoxicity information is product specific – rather than for its individual chemical ingredients. If product toxicity and ecotoxicity data is not available for a product, then DMP will accept toxicity and ecotoxicity data for a comparable product (no less than 95% similar) or for its chemical ingredients. Where toxicity and ecotoxicity information is not readily available then independent laboratory testing of a product should be undertaken.

Toxicity and ecotoxicity information is not required for natural products, including water, nut shells, common sand or clay, and plant material. DMP should be contacted if there is any doubt as to what may be considered a 'natural' product.

A short statement should be included by the Operator where scientific data or research is unavailable in relation to chronic toxicity, persistence and bioaccumulation. This uncertainty will be factored into the environmental risk assessment undertaken by DMP.

MATERIAL SAFETY DATA SHEETS (MSDS)

DMP requires copies of the MSDS for each product identified in Part B. This information should be included in the Appendix of an EP. A MSDS is a document supplied by the manufacturer, supplier or importer that contains important information about a product, additive or chemical and generally contains information about the product including the:

- product trade name;
- the manufacturer's, supplier's or importer's details;
- chemical composition and ingredients;
- the chemical and physical properties of the product / additive;
- toxicity and ecotoxicity information; and
- response information for managing spills, accidents or emergencies.

PART C). CHEMICAL LIST

CHEMICAL NAME

This list represents a compilation of all chemical ingredients from every product identified in Part B. Each chemical should be identified only once in the chemical list – even if it is an ingredient in multiple products. Chemical ingredients within contingency products should be incorporated into the chemical list – as if they are going to be used. Chemical by-products or chemicals within flow-back water do not need to be identified.

The scientific chemical name should be used – consistent with the International Union of Pure and Applied Chemistry (IUPAC) naming convention. DMP does not consider the use of generic chemical family names as an acceptable scientific chemical name (e.g. aldehydes, alkenes, ketones, carboxylic acids, esters, ethers, alcohols, amines, thiols, nitriles, inorganic salt). Family names do not identify the actual chemical used which creates uncertainty in assessing an EP.

Notwithstanding the above, a generic chemical family name will be accepted where no commercial product name is available, or the product is natural (e.g. water, walnut shells, common brown sand), or it is appropriate to use an abbreviated version of a complex or lengthy scientific chemical name.

Water should be listed as a chemical in Part C and should include water from various sources – whether it is used as a base fluid or within products. Where water is used as a base fluid this may include a combination of water from various water supplies (whether fresh, brackish or saline), recycled flow-back water, reused produced water, and water as solvents within products.

CHEMICAL ABSTRACTS SERVICE (CAS) REGISTRY NUMBER

A CAS number needs to be identified for each chemical in Part C. The CAS number represents a unique numerical identifier that can verify the chemical internationally together with its known hazards and properties - irrespective of its trade, scientific or common names.

There may be some substances for which CAS numbers are not available. For example, brown sand may be used as a proppant and does not have a specific CAS number; however, its bulk composition is crystalline silica / quartz / silicon dioxide which has a CAS number. Similarly, walnut shells do not have a specific CAS number; however, its bulk chemical composition is plant cellulose which does have a CAS number.

DMP may use the CAS number to query the Australian Inventory of Chemical Substances (AICS) to determine whether the chemical has been approved for use in Australia, to assess toxicity, ecotoxicity and other properties, or to determine whether there are any constraints on its use. Other international databases may also be consulted.

MASS FRACTION (%) IN FLUID SYSTEM

Mass fraction (%) of a chemical in a fluid system represents the relative concentration of each chemical within a fluid system. This information is used by DMP directly for assessing environmental risks in relation to relevant environmental guidelines, standards and criteria.

The per cent content of each listed chemical is additive – that is, if the same chemical is present in two or more products in the system, then the per cent content must be added together. This scenario will be most common for water, which is often present as a base fluid and as a solvent in various products.

The per cent calculation must be consistent for all chemicals present in the system, with the combined per cent content of all chemicals used in a system totalling close to 100%.

Inclusion of chemicals from contingency products may result in the total per cent mass fraction of the system being greater than 100%. DMP will accept this discrepancy where contingency chemicals have been identified in the Product List – Part B.

Mass fraction as a per cent should be reported to 5 significant figures where possible and to a maximum of 5 decimal places for trace chemicals. This recognises that chemical concentrations may need to be compared to relevant environmental standards, criteria and limits – frequently referenced as ppm or mg/L. Mass fractions less than 0.00001% should be reported as <0.00001%.

Per cent (%)	ppm
0.00001	0.1
0.0001	1
0.001	10
0.01	100
0.1	1,000
1	10,000
10	100,000
100	1,000,000

CONTACT

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DMP CHEMICAL DISCLOSURE REPORTING TEMPLATE: EXAMPLE ONLY

Note: The below table provides examples of actual products to practically illustrate how the template should be used. DMP does not endorse any specific products or suppliers.

A. SYSTEM DETAILS:

OPERATOR:	JAGUAR ENERGY PTY LTD
PROJECT / WELL:	XAVIER BRAVO-2 DRILLING
SYSTEM:	DRILLING FLUID S1A
TOTAL VOLUME OF SYSTEM:	5,560L

B. PRODUCT LIST

Product name	Supplier	Purpose	Product in system fluid (%)	Toxicity & ecotoxicity	MSDS attached
Water	Bore water	Base fluid	87.64%	Bore water sourced on site.	N/A
Sud-Chemie Bentonil THR	Sud-Chemie Australia Pty Ltd	Drilling mud	5.28%	<p><u>Acute toxicity (Bentonil THR):</u> Bentonites are natural unmodified clays.</p> <p><u>Acute toxicity (Silica crystalline quartz as ingredient):</u> Fish LC50(96hr): >10,000mg/l (Brachydanio rerio, zebra fish) Crustacean EC50(24hr): >1000 mg/L (Mysidopsis bahia)</p> <p><u>Chronic toxicity (Silica crystalline quartz as ingredient):</u> Silica is a IARC Group 1 Carcinogen, respiratory (IARC)</p> <p><u>Biodegradation / bioaccumulation (Bentonil THR):</u> Low bioaccumulation expected**</p>	Y
GEM CP	Halliburton	Shale stabiliser	2.05%	<p><u>Acute toxicity (GEM CP):</u> LD50 (oral): >2000 mg/kg (rat) Fish EC50: 86ppm (Abra alba) Crustacean TLM(48hr): 356 mg/L (Acartia tonsa) Algae EC50: 465 mg/L (Skeletonema costatum)</p> <p><u>Chronic toxicity (GEM CP):</u> No known carcinogenic properties or chronic impacts.</p> <p><u>Biodegradation / bioaccumulation (GEM CP):</u> BOD (28day): 76% of COD</p>	Y
Magnacide	Baker Hughes Australia Pty Ltd	Biocide	1.02%	<p><u>Acute toxicity (Magnacide):</u> Oral LD50: 29 mg/kg (rat) Fish LC50(96hr): 24ppb (Oncorhynchus mykiss) Crustacean LC50(96hr): 500 ppb (Mysidopsis bahia) Algae EC50(120hr): 27 ppb (Skeletonema costatum)</p> <p><u>Chronic toxicity (Magnacide):</u> Studies do not indicate carcinogenic (rat, dog) or mutagenic (rat, Salmonella strains) properties (WHO, 2005).</p> <p><u>Biodegradation / bioaccumulation (Magnacide):</u> Studies indicate not bioaccumulative (fish, shell fish, mammals, birds, lettuce) (WHO, 2005). Degradation half-life (freshwater): 6-10 hrs. Degradation half-life (aerobic soil-water): 4.2 hrs.</p>	Y
Etc.....					
Total			~100%		

C. CHEMICAL LIST

Chemicals within Drilling Mix Water S1A	CAS number	Mass fraction (%)
Water	7732-18-5	84.65%
Crystalline silica	14808-60-7	14.53%
Petroleum distillate, hydrotreated light	64742-47-8	0.19319%
Guar gum	9000-30-0	0.17459%
Polyactide resin	9051-89-2	0.14763%
Tetramethyl ammonium chloride	75-57-0	0.09164%
1,2,3-Propanetriol	56-81-5	0.04667%
Methanol	67-56-1	0.04594%
Carbonic acid, sodium salt	533-96-0	0.00910%
Sodium hydroxide	1310-73-2	0.00007%
Magnesium silicate hydrate	14807-96-6	<0.00001%
Etc.....		
Total		~100%

DMP CHEMICAL DISCLOSURE REPORTING TEMPLATE: EXAMPLE ONLY

Note: The below table provides examples of actual products to practically illustrate how the template should be used. DMP does not endorse any specific products or suppliers.

A. SYSTEM DETAILS:

OPERATOR:	JAGUAR ENERGY PTY LTD
PROJECT / WELL:	XAVIER-2 BRAVO WELL
SYSTEM:	CEMENTING SLURRY CS23-1
TOTAL VOLUME OF SYSTEM:	5,500L

B. PRODUCT LIST

Product name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS attached
Class G – silica blend D956	Schlumberger	Cement	64.35%	<p><u>Acute toxicity (Silica crystalline quartz as ingredient):</u> Fish LC50(96hr): >10,000mg/l (Brachydanio rerio, zebra fish) Crustacean EC50(24hr): >1,000 mg/L (Mysidopsis bahia) Algae: NOEL(72hr): 10,000 mg/L (Scenedesmus subspicatus)</p> <p><u>Chronic toxicity:</u> Crystalline silica is a Group 1 carcinogen, respiratory (IARC).</p> <p><u>Biodegradation / bioaccumulation (silica):</u> Not applicable given inorganic and naturally occurring in soil.</p>	Y
Water	Bore water	Base fluid	20.52%	Bore water sourced on site.	N/A
Latex 3000	Halliburton	Mechanical properties enhancer	5.20%	<p><u>Acute toxicity (amorphous silica):</u> Fish LC50(96hr): 97,811mg/L (fish - estimated) Crustacean EC50(48hr): 16,552 mg/L (Daphnia magna - estimated)</p> <p><u>Chronic toxicity:</u> No known carcinogenic properties or chronic impacts.</p> <p><u>Biodegradation / bioaccumulation:</u> No specific studies undertaken to date.</p>	Y
Halad-413L	Halliburton	Fluid loss control	3.85%	<p><u>Acute toxicity:</u> Fish LC50(96hr): >1000mg/L (Scophthalmus maximus) Crustacean LC50(48hr): >2000mg/L (Acartia tonsa) Algae EC50(72hr): 1102 mg/L (Skeletonema costatum)</p> <p><u>Chronic toxicity:</u> No known carcinogenic properties or chronic impacts.</p> <p><u>Biodegradation / bioaccumulation:</u> Log Pow: <0 ~ 3.5 (OECD, 117) Biodegradation half-life: 6.1% (OECD, 306).</p>	Y
CFR-3L* [contingency]	Halliburton	Dispersant	2.10% [max]	<p><u>Acute toxicity:</u> Crustacean LC50(48hr): >1,687 mg/L (Acartia tonsa) Algae EC50(72hr): >3,300 mg/L (Skeletonema costatum)</p> <p><u>Chronic toxicity:</u> No known carcinogenic properties or chronic impacts.</p> <p><u>Biodegradation / bioaccumulation:</u> Log Pow: <0 (OECD, 117) Biodegradation half-life (28d): 5% marine (BODIS).</p>	Y
Etc					
Total			~102%*		

C. CHEMICAL LIST

Chemicals within Cementing Slurry CS23-1	CAS number	Mass fraction (%)
Portland cement	65997-15-1	58.023%
Water	7732-18-5	25.364%
Crystalline silica	14808-60-7	15.645%
Styrene	100-42-5	1.2536%
Functionalised styrene butadiene latex	403824-26-0	0.06853%
4-vinylcyclohexane	100-40-3	0.04555%
Sulfonic acid salt	40104-76-5	0.01003%
Butadiene	106-99-0	0.00680%
Humic acids, sodium salt, polymers	473268-27-8	0.00095%
Magnesium oxide	1309-48-4	0.00015%
Etc		
Total		~102%*

* denotes contingency chemical, or figure affected by contingency chemical/s



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