

# Procedure for Authorizing Deepwell Disposal of Wastes

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## 1.0 Definitions

**Class 1b Wells** means deepwell disposal wells used for the disposal of produced water, specific common oilfield waste streams, and waste streams meeting specific criteria; and constructed and operated in accordance with the requirements for class 1b wells as specified by the Oil and Gas Commission.

**Deepwell Disposal** means the technology of placing fluids deep underground, in porous formations of rocks, through wells or other similar conveyance systems. The fluids may be water, wastewater or water mixed with chemicals.

**Waste Minimization** means the reduction of a waste stream to be disposed of by assessment of the following parameters: source reduction, potential for reuse, potential to recycle, or potential to recover useful components. This assessment should include a full-cycle analysis of environmental benefits, economic and technically feasible options.

## 2.0 General

The *Environmental Management Act* requires that waste must not be discharged to the environment without authorization in the form of permits, approvals, regulations or waste management orders. This procedure provides guidance to Ministry and Oil and Gas Commission staff responsible for issuing waste discharge permits and approvals on the nature of wastes which may be injected underground.

The practice of disposing wastes by deepwell disposal has been carried out since the 1930s. The terms *underground*, *deep well* and *sub-surface injection / disposal* are sometimes used synonymously. The term *deepwell disposal* will primarily be used in this document and is not intended to apply to shallow, nears surface disposal facilities.

Deepwell disposal is a waste disposal technique that is used in many other North American jurisdictions, including Alberta. Its use is predominantly, but not exclusively, in the oil and gas sector. Historically, deepwell disposal of wastes has only been carried out to a very limited extent in BC. The

exception to this statement is the disposal of produced formation fluids, where deepwell disposal is almost the exclusive method of disposal.

In the past few years, the ministry has received several requests for authorizations of facilities to inject wastes underground. These requests are for facilities located in the oil and gas producing area of northeast BC, but in some cases are not limited to wastes directly related to upstream oil and gas activity (e.g. municipal sewage from remote camps, reject water from water treatment plants). The purpose of this document is to articulate a policy for deepwell disposal which will apply to a broad range of wastes.

## **3.0 Procedure**

### **3.1 Applications**

This procedure applies only to the deepwell disposal of waste fluids generated almost exclusively from the oil and gas drilling and production sector and does not apply to the oil refining, chemical or other industries. The Director or his / her delegate may consider applying the procedure in cases where a small amount of waste from other sectors is co-mingled with wastes from the oil and gas sector.

### **3.2 Rationale**

The intent of this procedure is to harmonize the requirements for the deepwell disposal of wastes from the oil and gas sector in BC with the requirements for the same wastes in Alberta as articulated in the Alberta Energy and Utilities Board Guide G-51 "Injection & Disposal Wells" (1994).

### **3.3 Classification**

This procedure adopts for the deepwell disposal of oil and gas sector wastes in B.C. the requirements associated with a Class 1b well in Alberta.

### **3.4 Deepwell Disposal Philosophy**

Deepwell disposal of oilfield fluids is a safe and viable disposal option where wells are properly constructed, operated, and monitored. Deepwell disposal should be guided by the following principles:

- waste minimization shall be implemented prior to using the deepwell disposal option;
- resource conservation, including surface water and the waste streams themselves, shall be pursued whenever possible;
- waste fluids shall not be diluted solely for the purpose of avoiding waste fluid classification;
- operators of surface facilities that generate or process waste material that is disposed through Class 1b wells are expected to design and operate those facilities using sound waste management practices and principles of waste minimization; and
- the design, construction and operation of all subsurface facilities must comply with requirements set out by the Oil and Gas Commission.

Ministry regulatory activities will focus on issues related to suitability of the waste stream for deepwell disposal having regard for the nature of the fluid and alternative waste management options.

The waste generator has the primary responsibility to ensure the aforementioned waste minimization and resource conservation principles are followed. In all cases, it is the responsibility of the waste generator to ensure that each waste stream has been properly identified, characterized, and is handled, treated, and disposed of in an acceptable manner. In addition, the waste receiver must take reasonable steps to ensure that the identification and characterization of wastes supplied by the generator is appropriate.

### **3.5 Deepwell Disposal Criteria**

#### **3.5.1 Prohibited List**

The following is a list of waste streams that are prohibited from disposal by deepwell injection, except under exceptional circumstances as agreed to by a director or director's designate:

- municipal or industrial sewage (1);
- surface run-off water that meets surface discharge criteria, or can meet surface discharge criteria without cost-prohibitive treatment (1);
- lube oils and spent solvents (2);
- diesel invert drilling fluids (2); and
- wastes where appropriate treatment technology exists (economically and technically).

**Notes:**

11. Treatment and return to the surface or watershed is the preferred waste management option as treatment technologies are standard, well established, and water conservation principles strongly apply.
12. Generally considered to be recyclable.

**3.5.2 Criteria for Class 1b Wells**

Waste fluids are suitable for deepwell disposal in class 1b wells if a representative sample of that waste either is included in the list of wastes or the waste meets the following criteria:

**3.5.2.1 Listed Wastes**

The following list of aqueous fluids was compiled based on historical data and experience with waste streams originating as the result of standard industry practices. The listed wastes are considered appropriate for disposal in Class 1b wells without further sampling and analysis. It is therefore essential that both waste generators and receivers determine if these wastes are the result of standard industry practices. Where unusual operations or circumstances occur that would result in wastes qualitatively different from the generalized waste streams listed here, the wastes shall be classified under the criteria listed in sections [3.5.1](#) and [3.5.2.2](#) (note the term "neutralized" for Class 1b fluids refers to a pH between 6.0 and 9.0).

- saline fluids as obtained from oil field waste processing facilities, oil field tank washing operations, oil spill containment and recovery, or similar operations
- boiler blowdown water
- liquid fraction of drilling muds, including KCl muds, but excluding diesel inverts (in accordance with Section 2.3)

- aqueous liquid > fractions of spent sweetening agents — neutralized (Cansweet 200, 300, 300SX, 500, SulphaCheck, Sulfa-Scrub)
- amine filter backwash (e.g. MEA, DEA, MDEA)
- sulphur block run-off water — neutralized
- inorganic salts used in heat exchange medium (e.g. sodium / potassium nitrates / nitrites), properly solubilized using an existing aqueous waste stream
- waste fluids from drilling operations (i.e. used in or originating from the wellbore)
- spent work over or stimulation fluids (after neutralization and / or processing to recover hydrocarbons)
- glycol solutions as obtained from dehydration operations
- methanol or hydro-test solutions
- acidic or alkaline solutions (neutralized) with heavy metal concentrations at or below the levels given in [Schedule 1](#)
- gas scrubber or absorption tower bottom liquids (neutralized) with heavy metal concentrations at or below the levels of [Schedule 1](#)
- washing waste water (i.e. detergent or soap wastes)
- corrosion inhibitor solutions with heavy metal concentrations at or below [Schedule 1](#) levels
- oxygen scavenger solutions with heavy metal concentrations at or below [Schedule 1](#) levels

### 3.5.2.2 Criteria

A waste fluid that is not specifically listed above is suitable for disposal in a Class 1b well if a representative sample of that waste meets the following criteria:

- has a pH between 6.0 and 9.0<sup>(1)</sup>;
- has a flash point greater than 61 deg C<sup>(2)</sup> or has a non-halogenated organic fraction of less than 10 per cent by mass (100 000 mg/kg)<sup>(3)</sup> unless:
  - is an untreatable sand or crude oil / water emulsion<sup>(4)</sup>, or
  - is an antifreeze or dehydration fluid that contains greater than 60% water by mass<sup>(5)</sup>;
- has heavy metal concentrations at or below the levels specified in [Schedule 1](#)<sup>(5)</sup>; and
- has a total combined concentration of halogenated organic compounds of less than 100 mg/kg<sup>(6)</sup>;
- does not meet surface water discharge criteria<sup>(7)</sup>; and
- has a polychlorinated biphenyl (PCB) concentration of less than 50 mg/kg<sup>(8)</sup>.

### Notes:

- (1) Limitation to avoid significant corrosion and possible wellbore integrity problems.
- (2) Flash point greater than 61 deg C identifies non-flammable liquids. Flammable liquids are restricted from Class 1b disposal due to less stringent monitoring and operational restrictions.
- (3) Considered to be of sufficient heat value to make incineration or recycling economically feasible.
- (4) Return to the subsurface (i.e. origin) considered a prudent waste management option.
- (5) These are common fluids within the oil and gas industry for which recycling is considered economically feasible up to a water content of 60 per cent by mass, but otherwise are not practical or feasible to segregate for alternative management.
- (6) Limitation based on Alberta AUEB Guide G-51. Restrictions recognize less stringent operational and monitoring requirements for Class 1b wells. Operators should be aware that high concentrations of halogenated organic compounds in produced crude oil can cause processing and refining problems.
- (7) Treatment and return to the surface or watershed is the preferred waste management option as treatment technologies are standard, well established, and water conservation principles strongly apply.
- (8) Limitation based on federal environmental regulations.

### **3.6 Hazardous Wastes**

Classification of wastes using the criteria listed in [Section 3.5](#) may result in wastes that are classified as hazardous and wastes that are classified as non-hazardous, under the BC Hazardous Waste Regulation (HWReg), being deemed acceptable for deepwell disposal. Given that Section 37 of the HWReg contained a prohibition on the underground injection of hazardous wastes, any authorization of deepwell disposal of these wastes will require an exemption from Section 37. This may be in the form of:

- a substitution of requirements under Section 2(10) of the HWReg,
- an application for change in requirements under Section 51 of the HWReg,

- compliance with Sections 7(1) of the Oil and Gas Waste Regulation, for disposal of produced fluids and well completion and work over fluids, or
- compliance with Sections 7(1) or 7(5) of the Oil and Gas Waste Regulation for disposal of acid gas.

### **Schedule 1: Heavy Metals Criteria**

The following concentrations of heavy metals are based on land disposal prohibitions from Alberta Environment. Waste fluids above these levels, when disposed by subsurface injection, must be through an approved Class 1a disposal well.

<b>Metal</b>	<b>Concentration (mg/kg)</b>
Arsenic	500
Beryllium	100
Cadmium	500
Chromium	500
Lead	500
Mercury	20
Nickel	500
Selenium	200
Silver	100
Thallium	200
Uranium	100