EUB Alberta Energy and Utilities Board

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Interim Directive
ID 99-4

22 April 1999

TO: All Oil and Gas Operators
All Oil Sands Operators
All Drilling and Servicing Operators
All Pipeline Operators
All Oilfield Waste Management Operators

DEPOSITION OF OILFIELD WASTE INTO LANDFILLS

Alberta Environmental Protection (AEP) and the Alberta Energy and Utilities Board (EUB) have developed a Memorandum of Understanding (MOU) on new hydrocarbon and chloride criteria for the disposal of a range of oilfield wastes into Class II landfills. A summary of these requirements (Appendix 1) is attached.

Oilfield wastes targeted by this MOU include drilling mud and cuttings, produced sand, tank and treater bottoms, oily sludges, and flare pit material. Large volumes of these oilfield wastes are produced by oilfield operations and the improper management of these waste streams can have significant environmental consequences. The disposal of these oilfield wastes into landfills is still considered an acceptable practice provided the wastes are compatible with the receiving landfill.

The attached MOU outlines oilfield waste quality criteria and landfill facility design requirements for the deposition of these and similar oilfield wastes into Alberta landfills. The MOU is intended to enhance protection of the environment and the public interest, and to reduce liability through appropriate waste management.

Questions regarding the MOU should be directed to either Ms. Susan Halla (EUB, (403) 297-3184) or Mr. Tony Fernandes (AEP, (780) 427-0636).

<Original signed by>

Brian Bietz
Board Member
Alberta Energy and Utilities Board

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Doug Tupper
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Alberta Environmental Protection

Appendix 1: Total Petroleum Hydrocarbon (TPH) and Chloride Criteria for Acceptance of Non-Dangerous Oilfield Waste* into Class II Landfills**

Landfill Design Requirements	**Oilfield Waste Quality**	
leachate collection/removal engineered clay*** or synthetic liner	TPH chloride	no limit no limit
no leachate collection/removal engineered clay*** or synthetic liner	TPH chloride	< 30 000 mg/kg < 5 000 mg/kg
natural clay liner****	TPH chloride	< 20 000 mg/kg < 3 000 mg/kg

* Oilfield wastes targeted by this MOU include produced sands, drilling mud and cuttings, oily sludges, tank and treater bottoms, and flare pit material.

** All class II landfills require surface water run-on / run-off control systems, suitable hydrogeology, and groundwater monitoring.

*** Engineered clay liner: a liner constructed of appropriate clayey material where the material is laid down in 150 mm to 250 mm lifts and each lift is compacted at 2 to 3% wet of optimum moisture using a sheep's foot roller such that a thickness of 0.5 metres or more and a hydraulic conductivity of 10^{-8} m/s or less is achieved.

**** Natural clay liner: a liner constructed by scarifying and recompacting the native material (soil) in which the cell is built.

Note: The EUB and AEP have acknowledged the appropriateness of relating hydrocarbon limits to molecular weight and mobility and have committed to a future review of the total petroleum hydrocarbon criteria.

A Memorandum of Understanding Between Alberta Environmental Protection and The Alberta Energy and Utilities Board on Deposition of Oilfield Waste into Landfills

22 April 1999

1. Background

The purpose of this Memorandum of Understanding (MOU) between the Alberta Energy and Utilities Board (EUB) and Alberta Environmental Protection (AEP) is to outline oilfield waste quality criteria and landfill design requirements regarding the deposition of **drilling mud and cuttings, produced sands, oily sludges, tank and treater bottoms, and flare pit material** into Alberta class II landfills.

For the oilfield wastes addressed by this MOU, treatment and disposal options alternative to landfilling are available. Generators wishing to dispose of these wastes at landfills must ensure that the landfill in question is appropriately designed and approved to accept wastes exhibiting the properties of the oilfield waste in question.

2. General Landfill Requirements

Table 1 summarizes the current requirements for EUB regulated (oilfield) and AEP regulated landfill classes.

Section 15 within EUB Guide 58, *Oilfield Waste Management Requirements for the Upstream Petroleum Industry*, outlines the minimum requirements for the design and operation of EUB regulated oilfield landfills. It also identifies the types of AEP regulated landfills which may accept oilfield waste. The EUB requirements are typically consistent with the AEP *Waste Control Regulation* and the AEP *Code of Practice for Landfills*. However, oilfield waste generators should note that Section 15.8 within EUB Guide 58 specifically states that dangerous oilfield waste shall only be deposited into an approved class I oilfield landfill or an AEP regulated landfill which is approved to accept hazardous waste.

Section 15.8 within EUB Guide 58 also states that the disposal of liquid oilfield waste into any landfill class is prohibited. Therefore, any oilfield waste received at any class I, II or III landfill must be solid. Generators should also note that the mixing of oilfield waste with any solid for the primary purpose of dilution to avoid any Alberta regulatory requirement is in direct contravention of Section 5.5 of EUB Guide 58. Therefore, oilfield wastes intended for direct landfilling must pass the paint filter test (i.e. be classified as a solid) prior to the addition of any amendments. Provided the material passes the above test, the subsequent addition of sorbent

material required to facilitate solids handling and to manage any interstitial liquids that could shake out during the transportation of these wastes to the landfill is acceptable.

All oilfield wastes that are directed into class III landfills must be solid and inert. Inert waste is defined as any solid waste, that upon disposal in a landfill, is not reasonably expected to undergo physical, chemical, or biological changes to such an extent as to produce substances that may cause an adverse effect. Examples include demolition debris, concrete, asphalt, glass, cement returns, scrap metal, and dry timber or wood that has not been chemically treated. The oilfield wastes targeted by this MOU would normally require extensive treatment prior to being rendered inert.

3. Criteria for Disposal of Oilfield Waste into Class II Landfills

Although flashpoint criteria control the deposition of wastes containing highly volatile hydrocarbons into class II landfills, no criteria have been established for semi-volatile and non-volatile hydrocarbons and/or salt content, which are typically the main contaminants in many oilfield wastes.

Table 2 identifies the total petroleum hydrocarbon and chloride criteria that non-dangerous oilfield waste must now meet to be acceptable for disposal into class II landfills. Although these criteria are deemed appropriate based on the siting and design features associated with class II landfills, more stringent criteria may also be applicable in certain site-specific situations. Oilfield waste generators should note that specific approval or registration requirements and circumstances may overrule these disposal criteria as they apply to a particular landfill. In all cases adherence to appropriate landfill operational procedures identified in EUB Guide 58 or the AEP *Code of Practice for Landfills* is required.

The proper disposal of oilfield waste at municipal landfills is a shared responsibility between the waste generator and the landfill owner/operator. Oilfield waste generators are responsible for the proper characterization and classification of the waste and for assessing whether the landfill is of the appropriate design to accept the waste in question and has the required approvals. The landfill owner/operator is responsible for ensuring that the waste characterization is reliable, should provide written permission regarding the acceptance of the waste, and should identify in the landfill operational plan any specific procedures that may be required to ensure adequate handling and disposal of the waste at the landfill.

Some class II landfills approved prior to 1996 may not meet the engineering requirements set out in Table 1 and may be designed with features alternative to an engineered liner and a leachate collection and removal system. Municipal landfills often have such alternative designs. Therefore, oilfield waste generators proposing to use landfills for waste disposal are expected to exercise due diligence and evaluate the design and operation of these landfills. This needs to be done in order to limit liability associated with inappropriate waste management and to ensure compliance with environmental requirements. Table 2 outlines the minimum design requirements the EUB deems appropriate for class II landfills that receive oilfield waste.

Oilfield waste generators should note that some landfill owners/operators are offering to treat oilfield waste on their sites prior to landfilling. EUB Guide 58 requires oilfield waste generators use only approved waste management facilities that are specifically authorized to receive the waste in question for treatment and/or disposal. Therefore, oilfield waste generators must ensure that these treatment activities are also approved by the regulatory agency responsible for the landfill. In such cases the landfill approval or registration shall include:

- the provisions that establish the design, operation, monitoring, and reporting requirements for treatment activities used to manage specific wastes at the site, or

- reference to appropriate regulations, guides, or codes of practice that authorize the undertaking of the treatment activity in question or establish specific procedures that should be adhered to in carrying out the activity.

Owners/operators of class II landfills designed primarily for municipal waste must plan for the effective use of that landfill's capacity. Even if the characteristics of the oilfield waste are appropriate for entrance into a municipal landfill, it is the landfill owner/operator's decision as to whether or not they will accept non-municipal waste.

4. Rationale for Class II Landfills, Hydrocarbon, and Chloride Criteria

a) Class II landfill with an engineered liner and a leachate collection and removal system:

Hydrocarbon and chloride limits are not required for oilfield wastes disposed in this class of landfill, as the landfill design should ensure that any migrating hydrocarbons or salts are contained. Leachate accumulation at these sites must be monitored and removed as required to reduce the concentration of the sodium ion, which can affect the physical integrity of clay based liners.

Note: Even though there are no limits for hydrocarbon or chloride it is expected that oilfield waste generators will undertake appropriate treatment of their wastes consistent with the philosophy of waste minimization and resource recovery.

b) Class II landfill with an engineered liner:

A limit of 30 000 mg/kg total petroleum hydrocarbon has been established for oilfield wastes received at these landfills, as testing has shown that hydrocarbons with medium and high molecular weight are not readily mobile in the surrounding soil or groundwater. In the absence of a driving force, any significant migration from the oilfield waste matrix is unlikely to occur.

The 5000 mg/kg chloride criteria assumes a worst case scenario in which:

- chlorides and associated cations are readily available,
- the clay liner does not provide for physical containment or any chemical attenuation of the salt present in the waste, and
- all chloride is readily solubilized and mobilized in the surrounding groundwater.

Under this conservative scenario, a dilution factor lower than 20 would be required for the chloride ion to impact the surrounding groundwater at a concentration that would exceed 250 mg/L. This chloride concentration represents the performance standard for class II landfills and the Canadian maximum acceptable concentration for drinking water (*Guidelines for Canadian Drinking Water Quality*).

c) Class II landfill with a natural clay liner:

The limits of 20 000 mg/kg total petroleum hydrocarbon and 3000 mg/kg chloride for these landfills are based on the absence of an engineered liner and the greater variability of natural liner systems. However, the rationale used to set these limits is similar to the previous case. A dilution factor of 12 or less would be required before concentrations of chloride in excess of the landfill performance standards would be observed.

Note: A dilution factor of 100 was used by the United States Environmental Protection Agency in modelling the impact of hazardous waste constituents into groundwater when this waste is disposed into landfills. This work was used to develop the hazardous waste classification criteria adopted in the United States and by some Canadian provinces, including Alberta and therefore, the use of the dilution factors of 20 and 12 are considered to provide a factor of safety.

5. Alternatives to the Disposal of Oilfield Waste at Municipal (Class II) Landfills

Acceptable alternatives to the disposal of oilfield waste at municipal class II landfills include the following:

a) treatment of the oilfield waste, if appropriate, to a quality that allows it to be reused,

b) disposition of the oilfield waste in approved industrial class I or class II landfills,

c) establishment of EUB approved oilfield landfills by individual oil and gas companies for their own oilfield waste (first party receivers) or by oilfield waste management companies (third party receivers), or

d) the construction, at AEP approved municipal landfill sites, of dedicated trenches or cells for oilfield waste and other industrial wastes.

Alternative (a) promotes the philosophy of waste minimization and will continue to be encouraged by the regulatory agencies.

6. Approved Landfills in Alberta

Oilfield waste management facilities, including landfills, that solely accept oilfield waste require approval from the EUB. Oilfield operators should refer to EUB General Bulletin GB 99-5, *List of EUB Approved Oilfield Waste Management Facilities*, for the location and approval number of facilities that are approved to accept third party oilfield wastes. This list will be updated as needed.

AEP regulated landfills that receive more than 10 000 tonnes of waste per year or accept hazardous waste require approval under the *Environmental Protection and Enhancement Act* (EPEA). Landfills that receive less than 10 000 tonnes of waste per year generally require registration with AEP. In some situations these smaller landfills may meet the current design requirements for a class II landfill and may be appropriate to receive oilfield wastes. When a person responsible for any landfill subject to EPEA desires to engage in any activity other than those authorized by the current approval or registration, the person responsible shall submit an application for amendment of the existing approval or registration to the respective regional AEP Director to cover the additional activity.

Oilfield waste generators contemplating using class II municipal landfills are encouraged to contact AEP to determine the location and design features of these landfills and to ensure that they have the appropriate approvals. Ideally, the waste generator should contact the appropriate AEP Regional Office in which the landfill is situated.

List of Alberta Environmental Protection Regional Offices:

Northwest Boreal Region
Regional Director
3rd Floor, Provincial Bldg
9621 - 96 Ave, Bag 900-31
Peace River AB T8S 1T4
Phone: (780) 624-6330
Fax: (780) 624-6542

Parkland Region
Regional Director
3rd Floor, Provincial Bldg
4920 - 51 Street
Red Deer AB T4N 6K8
Phone: (403) 340-7744
Fax: (403) 340-5173

Northern East Slopes Region
Regional Director
107, 1111 - 54 Street
Edson AB T7E 1T2
Phone: (780) 723-8357
Fax: (780) 723-8386

Northeast Boreal Region
Regional Director
6th Floor, Oxbridge Place Bldg
9820 - 106 Street
Edmonton AB T5K 2J6
Phone: (780) 422-4407
Fax: (780) 427-7824

Bow Region
Regional Director
Rm 303, Deerfoot Square
2938 - 11 Street N.E.
Calgary AB T2E 7L7
Phone: (403) 297-7948
Fax: (403) 297-6069

Prairie Region
Regional Director
2nd Floor, Provincial Bldg
200 - 5 Ave South
Lethbridge
Phone: (403) 381-5512
Fax: (403) 382-4428

Table 1: Oilfield and AEP Regulated Landfill Classes

Class Ia	**Class Ib**	**Class II**	**Class III**
AEP: liquid and solid hazardous and non-hazardous astes	AEP: solid hazardous and non-hazardous wastes	AEP: solid non-hazardous wastes only	AEP: solid inert waste only
EUB: solid dangerous and non-dangerous oilfield wastes	EUB: solid dangerous and non-dangerous oilfield wastes	EUB: solid non-dangerous oilfield waste only	EUB: solid inert waste only
2 liners (of which at least one is synthetic)	1 liner (engineered clay or synthetic)	1 liner (engineered clay or synthetic)*	No liners required, but waste containment
Leak detection between the liners			
Leachate collection and removal	Leachate collection and removal	Leachate collection and removal*	
Groundwater monitoring	Groundwater monitoring	Groundwater monitoring	Groundwater monitoring, only if deemed necessary by EUB or AEP
Surface water run-on / run-off control	Surface water run-on / run-off control	Surface water run-on / run-off control	Surface water run-on / run-off control
Suitable hydrogeology **	Suitable hydrogeology**	Suitable hydrogeology**	Suitable hydrogeology**

* If no engineered liner or leachate collection and removal system is used in a class II landfill, there must be 5 metres of a clayey deposit having a hydraulic conductivity of 1×10^{-8} m/s immediately beneath the waste, followed by at least another 5 metres of natural geologic materials that have a hydraulic conductivity of 1×10^{-8} m/s or a system that can provide equivalent protection. Alternatively, technical evidence has to be provided that ensures groundwater performance standards will be respected.

** The natural geologic materials and local hydrogeologic flow regime shall be sufficient to retard movement of any potential contaminants.

Note: Class Ia and Ib landfills are to be consolidated into a single class (class I landfill); this table reflects classes as identified currently in AEP Waste Control Regulation and EUB Guide 58.

Table 2: Total Petroleum Hydrocarbon (TPH) and Chloride Criteria for Acceptance of Non-Dangerous Oilfield Waste* into Class II Landfills**

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