
Environmental
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Research
Fund

207

Upstream Oil and Gas Waste
Stream Study

En amont du pétrole et du gaz
Étude flux des déchets

Canada

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Dear Mr. Paget:

Re: Upstream Oil and Gas Waste Stream Study

Amec Foster Wheeler Environment & Infrastructure is pleased to submit our report to provide information and a waste model to assist decision-makers address the assessment of land-based, drilling waste disposal options applicable to the oil and gas industry. The report describes the scope of work, waste streams and sources, best practices, as well as the development of the Regional Waste Management Model (RWMTTool) that combines waste streams and projects over regional temporal and spatial boundaries.

We have enjoyed working with you on this interesting project and look forward to assisting you with future assignments. Please feel free to contact the undersigned at 403-387-1666 (mike.panek@amec.com) if you have any questions related to this document.

Yours truly,

**Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited**

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EXECUTIVE SUMMARY

It has been determined that the development of a regional waste management strategy is essential in managing the current and future demands from upstream oil and gas activities in the Northwest Territories. This would allow for the determination of appropriate approaches to managing wastes, coordination of treatment and disposal options, and ensuring suitable waste management infrastructure is in place to meet potential future industrial needs.

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was contracted by Environmental Studies Research Funds (ESRF) to prepare a comprehensive report that provides information and a waste model to assist decision-makers address the assessment of land-based, waste disposal options applicable to the oil and gas industry. The features of this report include:

- ▶ the development of a Regional Waste Management Model (RWMTTool) that combines waste streams and projects over regional temporal and spatial boundaries;
- ▶ the development of a regional waste model that can be used to estimate types and quantities of waste streams for various oil and gas development scenarios; and
- ▶ providing regulators, industry and communities with the information necessary to better access and manage issues related to waste treatment and disposal.

As part of developing the Regional Waste Management Tool and underlying model, Amec Foster Wheeler researched and summarized regulatory and industry best practices in waste management, both locally (Northwest Territories) and from other jurisdictions across North American and Europe. The Best Management Practices (BMPs) reviewed were from the following jurisdictions:

- ▶ Alaska's North Slope;
- ▶ Norway;
- ▶ East Coast of Canada; and
- ▶ Alberta.

The Regional Waste Management Tool is reliant upon the waste types and generation factors that have been developed. The quality of this waste information directly influences the applicability and usefulness of the RWMTTool. The list of waste types developed are those that would be typically found in the waste-generating activities or "project types" that have been selected for inclusion in the RWMTTool and include:

- ▶ seismic;
- ▶ exploration/drilling;
- ▶ completions / workover;
- ▶ construction / demolition;
- ▶ field support;

- ▶ production;
- ▶ camp; and
- ▶ shipping (marine).

To further leverage the waste-generation activities and associated waste factors developed in this project, Amec Foster Wheeler was asked to develop an online, interactive tool where users can create hypothetical regional scenarios of oil and gas activity in order to understand the quantity and distribution of waste streams over time. The RWMTTool is a simple, map-based interface where users can create regional scenarios of projects (individual, point-based activities) and project areas (polygon-shaped areas containing one or more projects, analogous to exploration or production licenses).

Once a scenario has been developed, users can generate reports on the waste streams generated in the scenario. The report includes a breakdown and summary of the waste produced by waste type, graphs showing the waste produced by project over time, and the cumulative waste produced over time by all projects, as well as a summary of best practices from other jurisdictions for the selected waste types.

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On a déterminé que l'élaboration d'une stratégie régionale de gestion des déchets est essentielle pour gérer les demandes actuelles et futures découlant des activités pétrolières et gazières en amont dans les Territoires du Nord-Ouest. Cette stratégie permettrait de déterminer des méthodes appropriées pour gérer les déchets, coordonner les options de traitement et d'élimination et s'assurer qu'une infrastructure adéquate de gestion des déchets est en place pour répondre aux besoins industriels futurs éventuels.

Le Fonds pour l'étude de l'environnement (FEE) a passé un marché avec Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) pour la rédaction d'un rapport détaillé fournissant de l'information et un modèle de déchet pour aider les décideurs à aborder l'évaluation des options terrestres d'élimination des déchets applicables à l'industrie pétrolière et gazière. Ce rapport traite entre autres de ce qui suit :

- ▶ L'élaboration d'un modèle régional de gestion des déchets (outilRGD) qui combine les flux de déchets et les projets à l'intérieur de limites temporelles et spatiales régionales;
- ▶ L'élaboration d'un modèle régional de déchets qui peut être utilisé pour estimer les types et les quantités de flux de déchets pour divers scénarios de mise en valeur pétrolière et gazière;
- ▶ La prestation aux organismes de réglementation, à l'industrie et aux collectivités de l'information nécessaire pour mieux aborder et gérer les enjeux liés au traitement et à l'élimination des déchets.

Dans le cadre de l'élaboration de l'outil régional de gestion des déchets et du modèle sous-jacent, Amec Foster Wheeler a recherché et résumé les pratiques exemplaires des organismes de réglementation et de l'industrie en matière de gestion des déchets, à l'échelon local (Territoires du Nord-Ouest) ainsi que dans d'autres territoires de compétence dans l'ensemble de l'Amérique du Nord et de l'Europe. Les pratiques exemplaires de gestion examinées provenaient des territoires de compétence suivants :

- ▶ versant nord de l'Alaska;
- ▶ Norvège;
- ▶ côte Est du Canada;
- ▶ Alberta.

L'outil régional de gestion des déchets est tributaire des types de déchets et des facteurs de production qui ont été établis. La qualité de ces renseignements sur les déchets influence directement l'applicabilité et l'utilité de l'outilRGD. La liste des types de déchets élaborée comprend les déchets que l'on trouve habituellement dans les activités de production de déchets ou les « types de projets » qui ont été sélectionnés aux fins d'inclusion dans l'outilRGD, notamment :

- ▶ l'activité sismique;
- ▶ l'exploration / le forage;

- ▶ l'achèvement / le reconditionnement;
- ▶ la construction / la démolition;
- ▶ le soutien sur le terrain;
- ▶ la production;
- ▶ le campement;
- ▶ la navigation maritime.

Pour miser davantage sur les activités de production de déchets et les facteurs de déchets connexes établis dans le cadre ce projet, on a demandé à Amec Foster Wheeler d'élaborer un outil interactif en ligne permettant aux utilisateurs de créer des scénarios régionaux hypothétiques d'activité pétrolière et gazière afin de comprendre la quantité et la distribution des flux de déchet au fil du temps. L'outilRGD est une simple interface cartographique permettant aux utilisateurs de créer des scénarios régionaux de projets (activités individuelles, basées sur un système de pointage) et des zones de projet (zones en forme de polygone contenant au moins un projet, analogues aux permis d'exploration ou de production).

Une fois qu'un scénario est créé, les utilisateurs peuvent produire des rapports sur les flux de déchets produits dans le scénario. Le rapport comprend une ventilation et un résumé des déchets produits par type de déchets, des graphiques montrant les déchets produits par projet au fil du temps et les déchets cumulatifs produits à la longue par tous les projets, ainsi qu'un résumé des pratiques exemplaires d'autres territoires de compétence pour les types de déchets sélectionnés.

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Amec Foster Wheeler Environment & Infrastructure is committed to achieving sustainability through balancing economic growth, social responsibility and environmental protection. Learn more at: <http://amecfw.com/aboutus/sustainability.htm>.

LIST OF ACRONYMS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AER	Alberta Energy Regulator
AOGCC	Alaska Oil and Gas Conservation Commission
API	American Petroleum Institute
AWPPA	Arctic Water Pollution Prevention Act
BAT	Best Available Technology
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BSEE	Bureau of Safety and Environmental Enforcement
CAPP	Canadian Association of Petroleum Producers
CEPA	Canadian Environmental Protection Act
CFC	Chlorofluorocarbon
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
COGOA	Canada Oil and Gas Operations Act
CSA	Canadian Standards Association
DN	Directorate for Nature Management
ECCC	Environment and Climate Change Canada
EE	Electronic Equipment
EIA	Environmental Impact Assessment
ENR	Environment and Natural Resources
EOR	Enhanced Oil Recovery
ESRF	Environmental Studies Research Fund
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
E&P	Exploration and Production
ESRD	Environment and Sustainable Resource Development
EU	European Union
GSA	Gwich'in Settlement Area
H ₂ S	Hydrogen Sulphide
HDD	Horizontal Directional Drilling
HFC	Hydrochlorofluorocarbon
INAC	Indigenous and Northern Affairs Canada
ISR	Inuvialuit Settlement Region
MACA	Municipal and Community Affairs
MSWLF	Municipal Solid Waste Landfill
MVRMA	Mackenzie Valley Resources Management Act
MVLWB	Mackenzie Valley Land and Water Board
NCS	Norway Continental Shelf
NEB	National Energy Board
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Material

NORSOK	Norwegian Shelf's Competitive Position
NP	Norwegian Polar Research Institute
NPDES	National Pollutant Discharge Elimination System
NSB	North Slope Borough
NWA	Norwegian Mapping Authority
NWT	Northwest Territories
OCSG	Offshore Chemical Selection Guidelines
ODS	Ozone Depleting Substance
OGOA	Oil and Gas Operations Act
OROGO	Office of the Regulator of Oil and Gas Operations
OSPAR	Oslo and Paris Conventions (OSPAR) Commission
OWTG	Offshore Waste Treatment Guidelines
PCB	Polychlorinated biphenyl
PFC	Perfluorocarbon
PLONOR	Pose Little or No Risk to the Environment
RA	Directorate for Cultural Heritage
RCRA	Resource Conservation and Recovery Act
RWM	Regional Waste Management
SBM	Synthetic Based Mud
SFT	Norwegian Pollution Control Authority
SSA	Sahtu Settlement Area
TAG	Technical Advisory Group
TRI	Trichloroethylene
WF	Waste Factors
WS	Waste Streams

1.0 INTRODUCTION

1.1 Background

Waste generated from historic and current upstream oil and gas activities in the Northwest Territories has placed significant demand on existing municipal and regional infrastructure. The experience in three key regions, Inuvialuit Settlement Region (ISR), Gwich'in Settlement Area (GSA) and in the Sahtu Settlement Area (SSA), has been that they are unable to provide consistent regulatory oversight in response to these demands, because they have limited ability to:

1. coordinate treatment and disposal methods for these wastes as there is no integrated regional approach available across the region;
2. understand and determine the appropriate approaches to the management of waste streams; and
3. ensure that the existing waste management infrastructure and disposal opportunities are capable of meeting current and/or anticipated future industrial needs.

In response, to these regional and local issues, it has been determined that a regional waste management approach would seem to be an appropriate response mechanism to these demands. In advance of developing a regional waste management system, tools to help determine and quantify the wastes and associated challenges are needed. As such, a web-based model to help predict wastes has been requested, and is the primary deliverable from this project. This report documents the development of the model – called the Regional Waste Management Tool or (RWMTTool).

Objectives for the RWMTTool include:

- ▶ assist with coordinating and managing planning efforts;
- ▶ allow sharing and utilization of resources and infrastructure, as well as a means to organize the regions to meet the demand of impending development;
- ▶ provide decision makers in the three regions with a range of oil and gas waste management related information inherent in the model to assist in the screening and approval of industry practices;
- ▶ assist where appropriate in the selection of waste management options for their regions; and
- ▶ help ensure that these decisions are environmentally sound, cost effective, technically feasible and socially acceptable while minimizing the cumulative environmental impacts that may otherwise occur.

1.2 Objectives of Study

The objectives for this project are to prepare a comprehensive report that will provide information and a waste model to assist decision-makers address the assessment of land-based, waste disposal options applicable to the oil and gas industry. Specifically, the objectives are:

- ▶ to develop a Regional Waste Management Model (RWMTool) that combines waste streams and projects over regional temporal and spatial boundaries;
- ▶ to provide a regional waste model that can be used to estimate types and quantities of waste streams for various oil and gas development scenarios; and
- ▶ to provide regulators, industry and communities with the information necessary to better access and manage issues related to waste treatment and disposal.

1.3 Methodology

The study methodology was developed to fulfill the requirements outlined in the project scope of work as follows:

- i. Details on existing NWT oil and gas exploration and development waste management infrastructure, its locations, capacities and related waste management practices in the Inuvialuit Settlement Region (ISR), Gwich'in Settlement Area (GSA) and Sahtu Settlement Area (SSA).
- ii. Details on existing accepted standard infrastructure and related design standards and related best practices for oil and gas exploration and development waste management from other jurisdictions such as Canada, Alaska and Norway.
- iii. Develop and populate a database that includes the information gathered in i) and ii) to allow comparison of the reference information and be capable of being digitally mapped.

An internet based screening of information sources including regulatory requirements and industry best practices was undertaken for the NWT study regions and the reference jurisdictions identified in the project scope of work. The study methodology involved establishing key terminology and "working definitions" for waste infrastructure and "Best Management Practices" to focus the internet based search. For each of the reference jurisdictions, the information provided includes:

- ▶ an overview of the exploration and production (E&P) industry and general discussion of the waste management infrastructure;
- ▶ a listing of the key E&P waste management related legislative and regulatory framework; and
- ▶ a summary of the best management practices.

Of note, the best management practices information presented clearly demonstrates the E&P industry response to regulatory requirements in each of the reference jurisdictions.

The internet based study was intended to fulfill the requirements of the scope of work and to identify and select demonstrated “best management practices” for the waste types presented as the basis of the RWMTool. The following key words were used in combination with the reference jurisdiction to focus the study (Table 1):

Table 1: Study Scope Waste Categories and Key Words or Indicators

Waste Categories	Key Words or Indicator Parameters
▶ Oil and gas exploration and development waste management practices	▶ Produced water treatment and disposal
▶ Offshore exploration and development	▶ Drilling fluids treatment and disposal
▶ Onshore exploration and development	▶ Drill cuttings treatment and disposal
▶ Seismic wastes	▶ Well completions fluids treatment and disposal
▶ Shipping and Service Vessel waste types	▶ Tank bottoms and oil solids
▶ Exploration and development waste management	▶ Non-Drilling Related Waste
▶ Drilling and completions waste management	▶ Sanitary wastes (liquids and solids)
▶ Construction and Demolition Waste Management	▶ Best management practices for treatment and disposal of oil and gas exploration and development wastes
▶ Institutional and/or biomedical waste management, treatment or disposal	▶ Exploration and development waste management regulations, standards or guidelines
▶ Field/operational treatment and disposal	

In addition, to the above waste categories and key words, the following oil and gas related waste management practices or terminology were also used in the search: subsurface disposal, waste injection, annular disposal, waste separation and/or recovery and disposal options (landfill, solidification, bioremediation, landspreading).

2.0 STUDY AREA AND CONTEXT

2.1 Geographic Study Area

The geographic study area consists of the Inuvialuit Settlement Region (ISR), the Gwich'in Settlement Area (GSA) and the Sahtu Settlement Area (SSA). These areas represent the areas of the Northwest Territories that have past, current and potentially future E&P development.

2.2 NT Regulatory Context and Waste Management Best Practices

Table 2 provides an overview of the various federal, territorial and regional waste management regulations that provide some guidance to E&P companies as they plan and/or implement their oil and gas drilling activities.

Table 2: NWT Regulatory & Waste Management Best Practices Summary

Region	Governing Body	Applicable Regulatory and Industry Documents
NWT	Municipal and Community Affairs (MACA), GNWT	Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories, April 2003 <i>Note: this guideline is for the management of solid waste sites for the management of community solid waste only and not intended for the design and/or operation of a site for the disposal of industrial waste</i>
	Environment and Climate Change Canada (ECCC)	<i>Technical document for Batch Waste Incineration, January 2010.</i>
	GNWT-ENR	<i>Guideline for Ambient Air Quality Standards in the Northwest Territories</i>
	GNWT – Lands	Northern Land Use Guidelines Camp and Support Facilities, Government of the Northwest Territories, 2015
	Department of Environment and Natural Resources (ENR), GNWT	Guideline for the Management of Waste Antifreeze, September 1998 Guideline for the Management of Waste Asbestos, April 2004 Guideline for the Management of Waste Batteries, September 1998 Guideline for the General Management of Hazardous Waste in the NWT, February 1998 Guideline for Industrial Waste Discharge in the NWT, April 2004 Guideline for the Management of Waste Paint, September 1998 Environmental Guideline for Contaminated Site Remediation, November 2003 Guideline for the Management of Waste Solvents, September 1998 Used Oil and Waste Fuel Management Regulations, (GNWT 2003) Guidelines for the Management of Biomedical Waste in the Northwest Territories Environmental Guideline for Ozone Depleting Substances (ODSs) and Halocarbon Alternatives Municipal Solid Wastes Suitable for Open Burning (GNWT 1993)
NWT Federal Areas	National Energy Board (NEB)	The NEB has regulatory responsibilities for oil and gas exploration and activities on Canadian frontier lands that are federal areas under the <i>Canada Oil and Gas Operations Act</i> and the <i>Canada Oil and Gas Drilling and Production Regulations</i> and certain provisions under the <i>Canada Petroleum Resources Act</i> : ► Authorization ¹ of the disposal of drill wastes by downhole injection under the <i>Canada Oil and Gas Operations Act</i>

¹ The authority for the approval of the disposal of drilling waste by downhole injection lies with the NEB or OROGO depending on the region. It is anticipated that a single approval authority may encourage E&P companies to utilize this management option for the disposal of drilling wastes.

Region	Governing Body	Applicable Regulatory and Industry Documents
Inuvialuit Settlement Region	Northwest Territories Water Board	<p>Under the <i>Waters Act</i>, the Inuvialuit Water Board has the responsibility for licensing water use and waste disposal in the Inuvialuit Settlement Region (ISR) of the Northwest Territories. Undertakings that require large amounts of water and produce discharges of waste have the potential to impact the environmental quality, and are thus, of concern to the Board.</p> <p>The Board has developed some of the following guidelines:</p> <ul style="list-style-type: none"> ▶ Discharge of Treated Municipal Wastewater (1992) ▶ Drilling-Waste Disposal Sumps (2005) ▶ Spill Contingency Planning (2007) ▶ Mine Site Reclamation (2007) ▶ Waste Management (to be approved by Board)
		Oil and Gas Approvals in the Northwest Territories – Inuvialuit Settlement Region: A Guide to Regulatory Approval Processes for Oil and Natural Gas Exploration and Production in the Inuvialuit Settlement Region (2001)
		Protocol for the Monitoring of Drilling-Waste Disposal Sumps. Inuvialuit Settlement Region Northwest Territories; Northwest Territories Water Board, October 2005
		Guidelines and Strategies for Oily Waste Management in Arctic Regions, Joint Secretariat Inuvialuit Renewable Resources Committees, March 2008
	National Energy Board (NEB)	The NEB has regulatory responsibilities for oil and gas exploration and activities in the Inuvialuit Settlement Region (ISR) as set out in the <i>Canada Oil and Gas Operations Act</i> and the <i>Canada Petroleum Resources Act</i> .
Natural Resources Canada – Environmental Studies Research Fund (ESRF)	Cuttings Treatment Technology Evaluation, Jacques Whitford Stantec Limited, July 2009 Environmental Studies Research Fund Report No. 166 Drilling Waste in the Mackenzie Delta (Inuvialuit Settlement Region) Region (Edition 1); Drilling Waste Recommended Best Management Practices (March 2004)	
ISR Offshore	National Energy Board (NEB)	<p>Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands, National Energy Board, Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), April 2009</p> <p>Offshore Waste Treatment Guidelines (NEB et al. 2002)</p>
	Environment and Climate Change Canada (ECCC)	Environment and Climate Change Canada (ECCC) administers a permit system controlling the deliberate disposal of approved substances at sea from ships, aircraft, platforms or other structures under the <i>Disposal at Sea Regulations</i> , Canadian Environmental Protection Act, 1999 (CEPA 1999)
	Transport Canada	Within Canadian Arctic waters, the Arctic Waters Pollution Prevention Act (AWPPA) and related regulations control the discharge of waste in the Arctic from vessels. The AWPPA prohibits the discharge of waste, with the exception of untreated sewage.
Mackenzie Valley (excluding ISR)	Mackenzie Valley Land and Water Board	<p><i>Mackenzie Valley Resource Management Act</i> (MVRMA)</p> <p>Mackenzie Valley Land Use Regulations</p> <p>Guide to Land Use Applications to the Mackenzie Valley Land and Water Board (2000)</p> <p>Guide to Water Use Applications to the Mackenzie Valley Land and Water Board (2000)</p> <p>Guidelines for Developing a Waste Management Plan, March 2011</p>
	Office of the Regulator of Oil and Gas Operations (OROGO)	The Office of the Regulator of Oil and Gas Operations (OROGO) has regulatory responsibilities for oil and gas exploration and activities on Northwest Territories onshore areas outside of the ISR under the <i>Oil and Gas Operations Act</i> (OGO).

2.3 Upstream Oil and Gas Activities

Oil and gas activity has occurred over the past 50 years within the ISR, GSA and SSA, and while occurring at various levels of intensity, it has been predominantly restricted to exploration with limited production activity development. However, Imperial Oil's Norman Wells production field has been operating since the 1920s. Two producing oil and gas areas in the above referenced study area are the Norman Wells oil field and pipeline to Alberta in the central Mackenzie Valley, and the Ikhil gas field and pipeline to Inuvik on the Mackenzie Delta. Drilling and exploration activities have been regularly focused on the land areas adjacent to the following study area communities in the ISR, GSA and SSA:

- ▶ the Beaufort Sea & Mackenzie Delta Region – Tuktoyaktuk and Inuvik; and
- ▶ the Central Mackenzie Valley Region – Fort Good Hope, Colville Lake, Deline, Tulita and Norman Wells.

In the NWT study area, industrial activities (predominately oil and gas industry related) generate various waste streams in substantial quantities, which are different from, but additional to existing domestic or community sources of waste. However, overall coordination of treatment and disposal of waste is lacking and there is currently no integrated regional approach to waste management for either the industrial or domestic waste sectors.

2.4 Current Waste Management Practices and Infrastructure

Research undertaken for this project has confirmed that there are currently no operating oil and gas exploration and development waste management infrastructure treatment and disposal facilities within the three regions of the study area. In addition, although a regulatory framework exists for the screening and approval of E&P proposals, it is limited in providing standards and/or specific requirements for the treatment and disposal of waste generated as a result of the actual undertaking of the E&P activities. In addition, where regulations and associated guidelines do exist (e.g., offshore exploration and drilling activities), they may not meet the researched Best Practices from other jurisdictions. For example, local waste management infrastructure or agreement on the acceptability of disposal to the sea from an offshore drilling location are currently lacking in the NWT study area.

The historic context information presented in this section is provided as the basis for comparison and to assist in better understanding the waste management best practices information provided for the reference jurisdictions.

Recently, exploration and development companies proposing to drill in any of the aforementioned jurisdictions have had to make arrangements to transport hazardous and other industrial waste (may also include drill cuttings) requiring final treatment and disposal to locations in southern Canada. Any historic or current reliance on community infrastructure for the disposal of materials from industrial sources is not a reasonable solution to waste management issues from the oil and gas sector, as these domestic facilities are not designed, managed or licensed to accommodate industrial waste streams.

2.4.1 Disposal in NWT Communities

The waste facilities in the communities located in the NWT study areas (ISR, GSA, and SSA) have not been constructed to specifications of modern facilities, as most communities have historical unlined waste dumps or sewage wastewater lagoons/ditches and are not suitable for receiving industry sourced wastes (solids or liquids). These wastes, if transported to the communities, might readily result in exceedance of capacities thus limiting the opportunity for local utilization. For example, the Town of Norman Wells (in the SSA) has experienced waste streams from legacy oil and gas exploration and development in the region, and now closely controls non-community waste disposal at its facilities.

2.4.2 Onshore Oil & Gas Domestic Camp Wastes

Oil and gas land-based operations in the NWT require Land Use Permits and Water Licenses that determine conditions of camp waste management. Currently, the methods and practices are generally operator specific and determined on a project-to-project basis. Specifically, “deposits of waste” are regulated under the *Waters Act* and the *Mackenzie Valley Resources Management Act (MVRMA)*. Current practices for managing these wastes are detailed by the proponent in a Waste Management Plan (for example as per the *Guidelines for Developing a Waste Management Plan*, March 2011, MVLWB), and subject to approval by the land or water authority.

Historic information demonstrates that the E&P industry has been able to utilize local municipal facilities for the disposal of domestic waste generated from their activities. As stated previously, reliance on community infrastructure has faded from the oil and gas sector, as these facilities are not designed, managed or licensed to accommodate industrial waste streams. In addition, many existing community facilities that are influenced by industrial activities are at or are exceeding capacity.

2.4.2.1 Solid Domestic Waste

Domestic solid and food camp waste is currently segregated, stored and either transported off-site for disposal or incinerated on-site following the *Technical document for Batch Waste Incineration* (Environment Canada January 2010). Residual ash produced by the incineration of waste is subject to transport south of 60 for disposal at an approved facility, or face laboratory analytical testing to demonstrate it is safe for disposal in the NWT (for example, as defined under process residuals in the *Guideline for Industrial Waste Discharges in the NWT* (GNWT 2004).

There is an acceptance for the controlled open burning of selected wastes (untreated wood and woody debris, paper and paper related products where no economical recycling exists), adopted from the GNWT-ENR document *Municipal Solid Wastes Suitable for Open Burning* (GNWT 1993) but not domestic solid waste. Residual ash produced by the combustion of paper, paper products (no plastic films, etc.) and non-treated wood may be considered safe for disposal as non-hazardous waste in the NWT, after approval from the receiving community landfill or per an issued Water Licence for the camp.

2.4.2.2 Liquid Domestic Waste (Grey/Blackwater)

Current practice for management of grey and blackwater waste sourced from E&P camps is either on-site treatment with a portable treatment plant and then discharged pending approval or meeting effluent criteria set in the Water Licence for the camp, or stored and shipped south of 60 for disposal.

Historically, temporary camps from E&P operational practices included either discharge into a sump and backfilled on-site, or transported to a local community wastewater lagoon/ditch. There have been permanent camps (e.g., Shell's Camp Farewell, near Tuktoyaktuk) with self-contained sewage treatment and disposal systems on-site.

2.4.3 Drilling Wastes

2.4.3.1 Onshore

Onshore oil and gas exploration and development programs in the ISR, SSA and GSA have historically used sumps as the primary containment for waste drilling fluids and solids. Under current Regulations under the *Waters Act*, drilling fluids and solids may be disposed of to a drilling sump approved by regional authorities. Upon completion of drilling, and with the approval of the regulatory Inspector, the sump is capped with excavated materials and left to revegetate. Drilling fluid recovery systems and drilling fluid can minimize waste volumes in sumps.

Drilling Waste Recommended Best Management Practice (ESRF 2004) provides criteria for the screening, approval and design of sumps for the disposal of drill cuttings in the ISR.

Authorization for the use of a sump in the ISR is granted via a water license issued under the Inuvialuit Water Board. The license requires a proponent to provide information on the construction, contents and abandonment conditions of drilling-mud sumps. Monitoring of active-layer and ground temperature site conditions is required for a minimum period of five years post abandonment as outlined in *Protocol for the Monitoring of Drilling-Waste Disposal Sumps: Inuvialuit Settlement Region Northwest Territories* (NTWB 2005). Although this document has been prepared for the ISR, there are important technical details included that might also be relevant for sump management and closure that could be used in the GSA and SSA.

However, current concerns of long-term liability from drilling sumps and increased restriction has reduced or eliminated recent use of sumps in the NWT. Most if not all drilling wastes, regardless of region of study in the NWT, are now transported for disposal to specific facilities south of 60. Historic oil/gas production fields in the NWT have seen limited use of injection wells for some drilling wastes and produced fluids (for example, in the Cameron Hills, Ft. Liard, and Norman Wells areas).

2.4.3.2 Offshore

In the offshore Beaufort Sea, operators have to meet NEB regulatory requirements. Offshore drilling programs are generally completed and/or proposed using water based or synthetic oil based drilling systems that are selected in accordance with the *Guidelines Respecting the Selection of Chemicals Intended to be Used in Conjunction with Offshore Drilling and Production Activities on Frontier Lands* (NEB et al. 1999). Discussions continue to determine if these guidelines will be considered acceptable for the determination of drilling wastes that may be suitable for Beaufort Sea disposal.

3.0 BEST MANAGEMENT PRACTICES FROM OTHER JURISDICTIONS

Best management practices for E&P wastes in other jurisdictions were researched. These jurisdictions included:

- ▶ Alaska's North Slope;
- ▶ Norway;
- ▶ Canada's East Coast; and
- ▶ Canada – Alberta.

Summaries of the BMP research are provided in the following sections.

3.1 Alaska North Slope

Alaska's North Slope E&P activities commenced in 1968 and have occurred predominantly on land with the initiation of remote offshore drilling and production planning occurring only in the past several years. The promulgation of regulations and amendments to the US *Drinking Water Act* led to decisions on deep well injection and the establishment of the basic practices currently being applied to oversee and approve North Slope E&P waste management.

3.1.1 E&P Waste Infrastructure Overview

Drill cuttings and waste fluids generated during drilling activities are collected and stored on-site. These materials are then transferred to a central waste disposal injection well for final disposal. Non-drilling related wastes are treated similar to production wastes and are treated at source to minimize volume (e.g., camp incinerator) and transferred off-site for final treatment and/or disposal to North Borough incinerator or landfill. All wastes transferred to the North Borough waste treatment and disposal facilities must meet acceptance criteria as defined by the facility's operating license as determined by Alaska Department of Environmental Conservation (ADEC). The production waste management program benefits from the existing road network and a logistic infrastructure that collects waste at source, transfers it to satellite location to concentrate volumes or provide treatment. In addition to recycling or reuse, wastes are treated by incineration, ground up into a slurry for disposal to one of three types of available injection well categories or sent to the North Slope Borough landfill for final disposal. Recyclable materials and hazardous waste that cannot be treated locally are sent south for treatment and disposal. The Alaskan BMP documents provided in Appendix A demonstrate the emphasis on waste reduction and segregation so as to optimize the recycle, reuse, treatment and disposal options.

3.1.2 Regulatory Summary

Oil and gas development and operational screening and approvals in Alaska involve federal, state and local authorities and stakeholders. For the North Slope, the relevant agencies and authorities which oversee oil and gas exploration and development activities are as follows, while the key regulatory documents for each authority are listed in Table 3.

- ▶ **Federal** US EPA, National Oceanic and Atmospheric Administration (NOAA);
 US Dept. of Interior;
 Bureau of Safety and Environmental Enforcement²;
 Bureau of Land Management;
 US Fish and Wildlife Services;
- ▶ **State** Alaska Department of Environmental Conservation (ADEC);
 Alaska Oil and Gas Conservation Commission (AOGCC);
 Alaska Department of Natural Resources (ADNR);
- ▶ **Local** North Slope Borough (NSB)

An oil and gas lease grants to the lessee the exclusive right to drill for, extract, remove, clean, process, and dispose of oil, gas, and associated substances.

Table 3: Alaska Regulatory Authorities Summary

Governing Body	Applicable Regulatory and Industry Documents
Alaska Department of Environmental Conservation (ADEC)	<ul style="list-style-type: none"> ▶ 18 Alaska Administrative Code 50 Air Quality Control (2002) ▶ 18 Alaska Administrative Code 60 Solid Waste Management (2002) ▶ 18 Alaska Administrative Code 72 Wastewater Disposal (2002) <ul style="list-style-type: none"> ○ Fact Sheet: Alkaline Batteries (1996) ○ Fact Sheet: Generators of Used Oil (1996) ○ Fact Sheet: Hazardous Waste (1996) ○ Fact Sheet: Used Antifreeze (1996) ▶ ADEC regulates solid waste storage, treatment, transportation, and disposal under 18 AAC 60.
Alaska Oil and Gas Conservation Commission (AOGCC)	<ul style="list-style-type: none"> ▶ 20 Alaska Administrative Code Chapter 25 (2001) - Drilling Approvals ▶ The AOGCC, regulates UIC Class II oil and gas waste management wells
Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> ▶ 40 Code of Federal Regulations, Parts 240-282 ▶ <i>Resource Conservation and Recovery Act</i> (Subtitle C Hazardous Waste and Subtitle D Solid Waste) (1996)* ▶ EPA administers the <i>Resource Conservation and Recovery Act</i> (RCRA) relating to hazardous wastes and UIC Class I injection wells.

Key Alaska regulatory requirements as the basis for the implementation of best management practices are summarized as follows:

- ▶ Non-drilling related solid waste must be disposed of in an approved municipal solid waste landfill (MSWLF). MSWLFs are regulated under 18 Alaska Administrative Code (AAC) 60.300-398. All other solid waste (except for hazardous materials) must be disposed of in an approved monofill (18 AAC 60.400-.495).
- ▶ The incinerator operating at the North Slope Borough is approved under 18 AAC Chapter 50 Air Quality Control (as amended January 2013) for the treatment of combustible organic wastes.

² The Bureau of Safety and Environmental Enforcement was established following the Deepwater Horizon incident to promote safety, protect the environment, and conserve resources through vigorous regulatory oversight and enforcement. The functions of BSEE include oil and gas permitting, facility inspections, regulations and standards development, safety research, field operations, environmental compliance and enforcement, review of operator oil spill response plans, production and development, conservation, and operating a national training centre for inspectors.

- ▶ Presently, the preferred practice is to dispose of drilling fluids by reinjection deep into the ground; however, EPA and ADEC may authorize limited discharge of waste streams under the National Pollutant Discharge Elimination System (NPDES permit system).
 - All produced waters must be reinjected or treated to meet Alaska Water Quality Standards before discharge. Drilling activities are approved under Title 20 Chapter 25 and before a well may be permitted under 20 AAC 25.005, a proper and appropriate reserve pit, also known as a solid waste disposal cell, must be constructed or appropriate tankage installed for the reception and confinement of drilling fluids and cuttings, to facilitate the safety of the drilling operation, and to prevent contamination of freshwater and damage to the surface environment (20 AAC 25.047).
- ▶ The plans for the proposed design and construction of the drilling waste disposal facility and the fluid management plan must be approved, signed, and sealed by a registered engineer per 18 AAC 60.430(c)(5).
- ▶ Domestic gray water must be disposed of properly at the surface and requires a Wastewater Disposal Permit per 18 AAC 72 as amended through April 2012. Typically, domestic wastewater is processed through an on-site plant and disinfected before discharge. ADEC sets fluid volume limitations and threshold concentrations for biochemical oxygen demand (BOD), suspended solids, pH, oil and grease, fecal coliform, and chlorine residual. Monitoring records must be available for inspection, and a written report may be required upon completion of operations

3.1.3 NPDES Discharge Permits and Certification

ADEC participates in the federal National Pollution Discharge Elimination System (NPDES) program that is administered by EPA. This program regulates discharges of pollutants into all US waters and has been adopted for onshore and offshore “point sources,” releases such as industrial and municipal facilities. Permits are designed to maximize treatment and minimize harmful effects of discharges into any waters (inland surface waters or offshore). Presently, the preferred practice is to dispose of drilling fluids by reinjection deep into the ground; however, EPA and ADEC may authorize limited discharge of waste streams under the NPDES permit system. On 31 October 2008, the EPA approved the transfer of authority to the state to issue and enforce permits for wastewater discharges issued under the *Clean Water Act*.

NPDES covers a broad range of pollutants, which are defined as “any type of industrial, municipal, and agricultural waste discharged into water” (EPA 2008c). Examples of oil and gas industry effluents regulated by NPDES include:

- | | | |
|------------------------------|----------------------------------|--------------------------|
| ▶ drilling muds and cuttings | ▶ blow-out preventer fluids | ▶ excess cement slurry |
| ▶ wash water | ▶ boiler blowdown | ▶ water flood discharges |
| ▶ deck drainage | ▶ fire control system test water | ▶ produced waters |
| ▶ sanitary and domestic | ▶ non-contact cooling water | ▶ well treatment fluids |

wastes

- ▶ desalination unit waste
- ▶ uncontaminated ballast and bilge waters

An example of best management practices is “Alaska Waste Disposal and Reuse Guide” prepared for use by industry and workers that provides a comprehensive outline of required waste management practices. The guide is presented in Appendix A and outlines the accepted management practices for all liquid, solids and semi-solid wastes produced as a result of North Slope exploration and development activities.

3.1.4 Reserve Pits

Typically, a reserve pit is a temporary containment cell lined with an impermeable barrier compatible with both hydrocarbons and freshwater based drilling and production wastes. Average dimensions are approximately 130 feet wide by 150 feet long by 12 feet deep, although specific configurations vary by site. The cell may receive only drilling and production wastes associated with the exploration, development, or production of crude oil, natural gas or hydrocarbon contaminated solids. The disposal of hazardous or other waste in a containment cell is prohibited. As the well is developed and the annulus is installed, the residue in the reserve pit is often dewatered and the fluids are injected into the well annulus. An inventory of injection operations including volume, date, type, and source of material injected is maintained by requirement. Following completion of well activities, the material remaining in the pit is permanently encapsulated in the impermeable liner. Fill and organic soil is placed over it and proper drainage is re-established. Surface impoundments within 1,500 feet of a water body are sampled on a periodic basis pre and post reserve pit operations and analyzed for indicator compounds such as hydrocarbon and salinity. In addition, groundwater monitoring wells are drilled and sampled on a regular basis. If there are uncontained releases during operations, or if water samples indicate an increase in the compounds being monitored, additional observation may be required

3.1.5 Underground Injection Wells

On the North Slope, stable geological conditions make it possible to safely and permanently inject fluids thousands of feet below the surface. This has tremendous environmental benefits, because it eliminates the need for large surface disposal facilities on or off the North Slope. Each of the North Slope injection facilities has its own operating restrictions, training requirements, and manifesting procedures.

- ▶ **Class I disposal wells** may inject non-hazardous and exempt wastes. Some facilities can process solids for injection as slurry; others are limited to fluids.
- ▶ **Class II disposal wells** are restricted to waste that has physically come out of an oil and gas well. This includes all produced fluids; muds and additives that have circulated in the well; and solids that originate downhole, such as formation cuttings.
- ▶ **Class II enhanced oil recovery (EOR) wells** are used to inject produced water and other approved fluids directly into the oil-producing formation, to increase oil production. EOR, also known as “waterflood,” is considered a beneficial use of fluid rather than disposal.

3.1.6 Hazardous and Exempt Waste Management

Some E&P wastes typically are generated in large volumes and historically were believed to possess less risk to human health and the environment than the wastes being identified for regulation as hazardous waste. They include: drilling fluids, produced wastewater, and other wastes associated with the exploration, development, or production of crude oil, or natural gas.

In general, the exempt status of an E&P waste depends on how the material was used or generated as waste, not necessarily whether the material is hazardous or toxic. For example, some exempt E&P wastes might be harmful to human health and the environment, and many non-exempt wastes might not be as harmful. The following simple rule of thumb can be used to determine if an E&P waste is exempt or non-exempt from RCRA Subtitle C regulations:

- ▶ Has the waste come from downhole, i.e., was it brought to the surface during oil and gas E&P operations?
- ▶ Has the waste otherwise been generated by contact with the oil and gas production stream during the removal of produced water or other contaminants from the product?

If the answer to either question is yes, then the waste is likely considered exempt from RCRA Subtitle C regulations. It is important to remember that all E&P wastes require proper management to ensure protection of human health and the environment. Substances proposed for disposal that are classified as “hazardous” undergo a more rigorous and thorough permitting and review process by both ADEC, per 18 AAC Chapters 62 and 63, and the EPA.

3.1.7 Alaska E&P Best Management Practices Summary

Of note, the Fairbanks to Prudhoe Bay haul road that parallels the Trans Alaska Pipeline provides key benefits to the planning and implementation of industry related waste management practices. Best management practices on the Alaska North Slope have been influenced by decisions of state regulators and US federal agencies in the late 1980s to address environmental contamination issues associated with E&P activities. Specifically, these are initiatives adopted in response to regulatory requirements in response to historic contamination from drilling sumps and poor drilling waste disposal practices. This has led to improvements in waste management practices for drilling waste (liquids and solids), produced water, oil contaminated solids (e.g., soils, tank bottoms), other wastes (e.g., chemicals) and domestic wastes associated with camps and support facilities. Exploration and production best management practices include practices for onshore and offshore activities summarized as follows:

- ▶ reserve pits are not used;
- ▶ drilling fluids are recovered and reused, and when not suitable for reuse are disposed by reinjection;
- ▶ drilling solids/cuttings are disposed of to injection wells;
- ▶ produced waters are treated for reuse and/or release to surface water or used for enhanced oil recovery (Class III injection wells);

- ▶ domestic organic wastes are treated with an approved incinerator at the point of generation;
- ▶ oily waste and contaminated soils are incinerated at company facilities or the Northshore Borrow incinerator;
- ▶ oily fluids are recovered and injected into the product pipeline with other fluids injected in downhole systems;
- ▶ hazardous wastes are collected and shipped south for approved disposal to lower 48 approved facilities; and
- ▶ recyclables are transported to depots in southern Alaska for processing.

3.2 Norway

Oil and gas exploration and development is the largest industry in Norway with all extraction of resources occurring in the approximate 50 offshore fields. There are no onshore oil and gas drilling activities, only gathering, storage and refining related activities and infrastructure. The majority of oil and gas extraction takes place in shallow waters (up to 300 metres depth) within the Norway Continental Shelf (NCS) and only a few are done in deep water (300 – 1,500 metres depth) although there is significant effort underway to develop the deep water resources of the Barents Sea.

According to Norway statistics in 2010, 1.2 million tonnes of hazardous waste were handled in compliance with approved treatment. Norway has the capacity to treat almost all of its own hazardous waste, with the exception of items requiring specially adapted technology for recycling or disposal, which are exported. Taxation systems and level of other costs vary between countries, therefore, making exporting waste more appealing to some manufacturers and municipalities (CPA 2012).

- ▶ Norway petroleum regulations are found at: <http://www.ptil.no/regulations/category87.html>.

3.2.1 Regulatory Summary

Authorities that oversee offshore oil and gas activities include:

- ▶ Norway Pollution Control Authority (SFT);
- ▶ Directorate for Nature Management (DN);
- ▶ Directorate for Cultural Heritage (RA);
- ▶ Norwegian Polar Research Institute (NP); and
- ▶ Norwegian Mapping Authority.

Each of these works with a local Environment Unit office in 434 municipalities in Norway to oversee industrial environmental enforcement initiatives including onshore associated oil and gas activities.

The Ministry of Environment through the *Pollution Control Act* (1981) and Pollution Control Regulation of 2004 provides primary regulation and enforcement of industrial activities including

oil and gas exploration and development. This is accomplished via five regulations under the *Pollution Control Act* that define Health, Safety and Environmental requirements and standards for the offshore oil and gas industry. Prime responsibility for these activities lies with the Norway Pollution Control Authority (SFT) that oversees and approves operations through the evaluation of environmental impact assessments (EIAs), screening and approval of discharge to sea, emissions to air, the use and discharge of chemicals and establishing waste management requirements.

The Pollution Control Regulation of 2004 was instrumental in:

- ▶ banning incineration at sea;
- ▶ banning and/or regulating waste discharge or dumping of materials and waste into Norwegian waters; and
- ▶ establishing permitting requirements for industry and waste treatment technologies.

All the different regulations concerning waste and waste handling are gathered in one consolidated regulation called “Avfallsforskriften”/Waste regulation.

Waste Regulation (Avfallsforskriften, 2004)	Contains 14 chapters, and regulates explicitly different waste categories such as: Waste electrical and electronic equipment (EE equipment). Handling of discarded refrigeration equipment containing CFCs Batteries End-of-life vehicles Collection and recycling of discarded tyres Take-back systems for beverage packaging Refund of taxes paid on trichloroethylene TRI and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Landfilling of waste Incineration of waste Hazardous waste Permits for transfrontier shipment of waste Discarded insulating glass units containing PCBs
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Additionally, the European Union adopted certain legislation as they pertain to oil and gas industry oil and gas waste management practices that include:

Landfill Directive 99/31	Norwegian Waste Regulations	2002
Incineration Directive 76/00	Norwegian Waste Regulations	2006

3.2.2 Regulation of Offshore Discharges

A Norwegian Ministry of Petroleum and Energy summary report of 2010 to 2011 shows that the most significant offshore discharges were chemical discharges from wells and well operations. Sea discharges are regulated by discharge permits from SFT, based on the provisions of the *Pollution Act*. Regular discharges to sea are permissible and regulated through permits. The

discharges can include allowable levels of drill cuttings and produced water containing residues of added chemicals, oil, heavy metals and other naturally occurring substances from the bedrock, including radioactive substances.

Discharge of drill cuttings originating from drilling operations with water-based drilling fluid (green category) will normally be permitted, while drill cuttings originating from drilling operations with other drilling fluids (oil-based or synthetic) will normally be injected subject to a permit from the Climate and Pollution Agency, or transported to land for treatment and disposal. Oslo and Paris Conventions (OSPAR) adopted Decision 2000/2 on the Harmonized Mandatory Control System for the Use and Reduction of the Discharges of Offshore Chemicals. The Decision requires pre-screening, ranking and risk assessment of chemicals and the substitution of certain chemicals by less hazardous alternatives.

Norway is also signatory within the scope of its *Pollution Control Act* (March 1981 No. 6) to Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues. This directive enhances the availability and use of port reception facilities for ship-generated waste and cargo residues. The purpose is to protect the external environment by ensuring the establishment and operation of adequate reception facilities for ship-generated waste and cargo residues, and by ensuring delivery of ship-generated waste and cargo residues to port reception facilities. Under this regulation, port facilities provide receiving facilities for ship related operational wastes and waste that have been transported by ship from offshore operations to land for further treatment and ultimate disposal.

3.2.3 Norway Best Management Practices

Best management practices in Norway have been developed in response to regulatory requirements and standards, and are further influenced by the significant role played by the Government as a major shareholder and benefactor of the success of the industry. In addition, Norway is a signatory to the European Union initiatives for environmental protection and management including North Sea exploration and development operations. Under this framework, waste management and the advocacy of waste recovery and reuse as primary components of a successful waste hierarchy are the primary drivers of any waste management program with the ultimate goal of focusing on reducing waste production and the need for waste disposal. Key initiatives by all EU members include initiatives to reduce greenhouse gases, minimize and where possible limit landfills as a disposal option (associated with greenhouse gases) and the optimization of waste to energy recovery.

The Norwegian government is an active participant in the oil and gas exploration and development industry and adopted a key position in 1997 for sustainable development and introduced the “zero discharge” concept for the offshore developments. This report set a goal of zero environmentally harmful discharges to sea by the end of 2005. A collaborative effort by government authorities and the oil and gas industry has resulted in the successful reduction of discharges of environmentally harmful substances to sea, as well as reducing the environmental risk related to these discharges.

3.2.3.1 **NORSOK Standard**

The NORSOK standards are similar to documents prepared by the Canadian Standards Association (CSA). They consolidate industry best practices and provide guidance materials intended to achieve the implementation of procedures and the adoption of technology to minimize adverse impacts of industrial operations including oil and gas on the environment. They advocate cost effective technical and/or operational solutions, based on the principle of best available technology (BAT) and life cycle cost analyses. Two such documents prepared as Norsok standards contain materials relevant to this study:

- ▶ **NORSOK standard S-003 Environmental Care Rev. 3, December 2005:** This NORSOK standard is a guideline that applies to field development, design, construction, installation, modification and decommissioning of installations for offshore drilling, production and transportation of petroleum. This standard includes criteria and methods for establishing limitations for emissions to air, discharges to sea, for selection and handling of chemicals and for waste management.
- ▶ **NORSOK standard S-010 Well Integrity in Drilling and Well Operations Rev 3, August 2004:** This standard is a guideline that applies to the drilling operations of an exploration, production or injection well.

3.2.3.2 **Discharge to Sea**

Discharge to sea mainly includes produced water, cooling water, displacement water, sewage water, drainage water, and drill cuttings. All discharges to the sea must meet OSPAR release criteria of 30 mg/l of oil and contain only chemicals which appear on the approved OSPAR chemicals list which "Pose Little or No Risk to the Environment" (PLONOR). Oil and chemical discharges can have local effects close to the facilities, and are regulated nationally through discharge permits pursuant to the *Pollution Control Act*. Use and discharge of chemicals is internationally regulated in the form of requirements for risk assessments and classification according to the chemicals' properties summarized in the following excerpt:

The operator shall classify the chemicals based on the substances' properties according to the following categories as outlined in Section 63 of the Activities Designation Regulation under the authority of the Norway Petroleum Safety Authority:

1. **Black** category (zero discharge/forbidden to use or discharge)

The black category includes substances that appear on the following lists:

- *The priority list from Storting White Paper No. 21 (2004-2005).*
- *The OSPAR List of Chemicals for Priority Action, cf. OSPAR Strategy with regard to Hazardous Substances*

In addition, substances with the following ecotoxicological properties are classified as black:

- *Substances with both a biodegradability of BOD28 < 20% and bioaccumulation potential of Log Pow ≥ 5.*

- *Substances with both a biodegradability of BOD28 < 20% and that are toxic (LC50 or EC50 ≤ 10 mg/l)*
 - *Substances that are harmful in a mutagenic or reproductive manner.*
2. **Red** category (high priority for phasing out via substitution)
The red category includes substances with the following ecotoxicological properties:
- *Non-organic substances that are acutely toxic (EC50 or LC50 ≤ 1 mg/l)*
 - *Organic substances with biodegradability BOD28 < 20%*
 - *Organic substances or compound substances that meet two of the three following criteria:*
 - *Biodegradability, BOD28 < 60% or*
 - *Bioaccumulation potential, Log Pow ≥ 3 and molecular weight < 700 or*
 - *Acute toxicity, LC50 or EC50 ≤ 10 mg/l*
- Zero discharges or a minimisation of discharges that can lead to damage to the environment by substances in the **yellow** and **green** SFT categories*
3. **Yellow** category
The yellow category includes substances that, based on their innate properties, are not defined as red or black, and which do not appear on OSPAR's PLONOR list.
4. **Green** category
The green category includes substances on OSPAR's PLONOR list, and is presumed not to have a significant impact on the environment.

3.2.3.3 Oily Water

The oil content shall not exceed 30 mg oil per litre of water as a weighted average for one calendar month and a permit is to be granted by SFT authorizing offshore discharge. Water that cannot meet this criterion is to be transported to shore for treatment with slop oil recovery systems and/or thermal management.

3.2.3.4 Onshore Waste Management

Any materials including oil-based cuttings or any materials not disposed of via downhole injection are required to be managed via onshore treatment methods which may include landfill disposal; subsurface injection; bioremediation (composting and biotreatment); stabilization / solidification (briquetting, fixation with silicates or fly ash); extraction or washing (oil, detergents, and solvents); and thermal treatment (incineration and distillation, including thermal desorption and the rotary hammer mill).

Generally, cuttings treatment methods can be grouped into chemical, physical or biological processes and further subdivided into methods that either cleans the cuttings by destroying / removing contaminants, or by stabilizing or encapsulating the waste. There are three waste to energy thermal facilities operating in Norway that are used to treat oil-based cuttings, slop oils

and other thermally manageable waste organics. Solids remaining from these operations are disposed of to an approved landfill.

3.2.4 Best Management Practices Summary

Norway's practices are influenced by the active role of the Norwegian government and the influence and interest of other European countries of the North Sea oil and gas resources, coupled with the importance of the fishing industry and other marine activities. The "zero discharge" concept has guided restrictions in use of chemicals which abide the general rule that no environmentally harmful substances should be discharged, be it added chemical substances or chemical substances that occur naturally. Best management practices applied include:

- ▶ injection of produced water: Produced water which is brought up with the oil and gas from the reservoir will, to a greater extent, be reinjected into the formations;
- ▶ injection to underground or annular disposal of drill cuttings or disposal to sea of water based cuttings;
- ▶ new and improved cleaning technology for produced water also allow for its disposal to sea;
- ▶ transport to onshore treatment facilities for non-drilling related solid wastes;
- ▶ transport to onshore treatment facilities for liquid wastes including slop oils, sludge and tank bottoms; and
- ▶ maceration and chlorine treatment of food wastes and sewage prior to offshore discharge.

In addition, as per the NORSOK standards, non-drilling wastes are managed as outlined above. The internet review also demonstrated the existence of a commercial waste treatment and disposal industry that presumably offsets the demand on municipal facilities to provide management options for those waste materials not suitable for offshore discharge. Notable commercial facilities are those capable of providing technologies to remove or reduce oil content on waste solids and liquids.

The industry is also strongly influenced by measures to reduce greenhouse gases (GHG) and closely tracks all aspects of its gaseous emissions and factors such discharges into any analysis of appropriate waste management practices including the screening and selection of "best available technology".

Appendix B provides a copy of a NORSOK standards Environmental care document that demonstrate Norwegian related best management practices actions and commitments intended to provide consistent and effective waste management practices.

3.3 Canadian – East Coast

Oil and gas operations on the east coast of Canada generate waste materials from a combination of exploration and production activities. Wastes identified in a National Energy Board/Nova Scotia Offshore Petroleum Board – Offshore Waste Treatment Guidelines (15 December 2010) include produced water, drilling muds and solids, storage displacement

water, bilge water, deck drainage, ballast water, produced sand, well treatment fluids, cooling water, desalination brine, sewage and food wastes.

E&P activities are all off-shore in Newfoundland and Labrador including the processing and recovery of oil product for transfer to market. Waste materials that cannot be discharged to the sea are recovered and transferred to Newfoundland for final treatment and disposal. The regulatory framework for these operations is based upon agreements between the federal and provincial governments. Best practices being utilized by industry have been developed in response to regulations. The key documents are government guidelines developed to address chemicals and offshore waste treatment guidelines as outlined in the balance of this section.

3.3.1 Regulatory Summary

The National Energy Board (NEB or the Board) has regulatory responsibilities for oil and gas exploration and activities on frontier lands not otherwise regulated under joint federal/provincial accords. Regulatory responsibilities are under the *Canada Oil and Gas Operations Act* and certain provisions of the *Canada Petroleum Resources Act* are administered to lands retained by the Federal government in the Northwest Territories, Nunavut, Arctic offshore, Hudson Bay, West Coast offshore, Gulf of St. Lawrence, a portion of the Bay of Fundy and onshore Sable Island.

Prior to any work being initiated, authorization from the NEB is required. Operators must contact the Chief Conservation Officer at the Board to seek approval. The Board's mandate also includes exchange of technical knowledge with the [Canada-Newfoundland and Labrador Offshore Petroleum Board \(C-NLOPB\)](#), the [Canada-Nova Scotia Offshore Petroleum Board](#), [Indigenous and Northern Affairs Canada \(INAC\)](#) and [Natural Resources Canada](#).

The National Energy Board, Canada-Nova Scotia Offshore Petroleum Board and Canada-Newfoundland and Labrador Offshore Petroleum Board (the Boards) have issued guidelines to assist operators in developing Environmental Protection Plans (EPP) as set out in the *Environmental Protection Plan Guidelines* (NEB 2011) to meet the requirements of Sections 6 and 9 under 'Part 2' of the *Canada Oil and Gas Drilling and Production Regulations* (Government of Canada 2009). The Regulations require that, as part of its application for an authorization, an operator submit an EPP that includes elements related to discharges to the natural environment. Pursuant to paragraph 9(h) of the Regulations, the EPP shall include a description of equipment and procedures for the treatment, handling and disposal of waste material. The description of limits for discharges to the natural environment, including any waste material pursuant to paragraph 9(i) of the Regulations as discussed in Section 4.5.5 of the guidelines.

3.3.2 Newfoundland Best Management Practices

The EPP shall summarize and refer to the process for the selection, evaluation and use of chemical substances including process chemicals and drilling fluid ingredients, pursuant to paragraph 9(g) of the Regulations. The *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands* (OCSG) has been prepared to assist operator's in the

development of a chemical management system and the selection of drilling fluid constituents suited to the Offshore Waste Treatment Guidelines (2010 edition).

The Offshore Waste Treatment Guidelines (OWTG), 2010 edition, outline recommended practices for the management of waste materials by operators of petroleum drilling and production operations in Canada's offshore areas. The waste materials discussed in these guidelines include effluents, emissions, and solid wastes normally associated with the operation of installations engaged in petroleum drilling and production activities.

For waste material that will not be discharged from an offshore installation, the EPP must summarize and refer to a procedure for the management of waste materials during temporary storage at the offshore installation. This description should include procedures for classifying and separating waste streams, and for handling and storing waste materials at the site. Similarly for onshore activities, the EPP should include the procedures for the temporary storage and management of waste. The description should also include the procedures for classifying and separating waste streams, and for the handling, storing and transportation of the material. The procedures should refer to the regional requirements, permits and guidelines.

The OWTG (2010) provides the following performance targets for best management practices (BMPs) for concentrations of waste materials to be discharged from offshore drilling operations (Table 4). Based on current knowledge and experience available to the Boards, waste material discharged at the concentrations and in the manner specified in these guidelines is not expected to cause significant adverse environmental effects in areas where offshore petroleum activities are anticipated to occur in the near future. In addition, the performance targets recommended in these guidelines for concentrations of specific waste materials in discharges are believed to be achievable using proven and practicable best practices in waste management and treatment.

Table 4: Performance Expectations (BMPs) for Offshore Discharges

Waste Types	Performance Target (BMPs)
Produced Water	The performance target for produced water to be discharged to sea from a production installation is as follows: <ul style="list-style-type: none"> ▶ a 30-day volume weighted average oil-in-water concentration in discharged produced water should not exceed 30 mg/L, and ▶ a 24-hour average oil-in-water concentration in discharged produced water, as calculated at least twice per day, should not exceed 44 mg
Drilling Muds	All substances that make up drilling muds are screened through the chemical management system developed by the operator in consideration of the <i>Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands</i> 22 These chemical selection and management systems are intended to be used as source control to manage the toxicity of chemicals used offshore. Acceptability of mud ingredients under this screening should not be construed as permissibility to discharge them, or the mud formulation of which they are constituents.
Drilling Solids	The performance target for “synthetic-on-cuttings” or “enhanced mineral oil-on-cuttings” concentration is as follows: <ul style="list-style-type: none"> ▶ the 48-hour mass weighted average of retained “synthetic-on-cuttings” or “enhanced mineral oil-on-cuttings” discharged to sea should not exceed 6.9 g/100 g oil on wet solids.
Storage Displacement Water	The performance target for storage displacement water is as follows: <ul style="list-style-type: none"> ▶ storage displacement water that is to be discharged to sea should have a residual

Waste Types	Performance Target (BMPs)
	oil concentration that does not exceed 15 mg/L.
Bilge Water	The performance target for bilge water is as follows: ► bilge water that is to be discharged to sea should be treated such that the residual oil concentration does not exceed 15 mg/L.
Ballast Water	The performance target for ballast water that is to be discharged to sea, if it is known or suspected to be contaminated with oil, should be treated such that the residual oil concentration does not exceed 15 mg/L.
Deck Drainage	The performance target for deck drainage that is to be discharged to sea, if there is potential for it to be contaminated with oil, should be collected and treated such that the residual oil concentration does not exceed 15 mg/L.
Produced Sand	Discharge of produced sand will depend on the concentration of oil in the produced sand and its aromatic content. In all cases, the sand should be treated to reduce oil concentrations to the lowest level practicable.
Well Treatment Fluids	The performance targets for well treatment fluids are as follows: ► on a production installation, well treatment fluids may be recovered and directed to the produced water treatment system, if feasible, and then treated as a component of produced water; or where it is not feasible to discharge well treatment fluids through a produced water treatment system, well treatment fluids should be collected and treated such that the residual oil concentration does not exceed 30 mg/L before being discharged to sea.
Cooling Water	To prevent biofouling and corrosion of piping and mechanical systems on the installation, it is typical to add biocide to the cooling water prior to circulating it through the installation. Although chlorination is typically used, other biocides may be chosen by the operator for control of corrosion and biological activity as required. All biocides should be screened through the chemical management system developed by the operator in consideration of the <i>Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands</i> .
Desalination Brine	Desalination brine recovered from the production of potable water may be discharged without treatment.
Sewage and Food Wastes	The performance target for sewage and food wastes is as follows: ► sewage and food wastes should be reduced through maceration to a particle size of 6 millimeters or less prior to discharge to sea.

The best management practices of east coast Canada exploration and production activities are similar to those of Alaska and Norway in that they focus on best available technology and the value of chemical ingredients with lower environmental risk in key operational fluids. Waste materials transported to onshore treatment and disposal facilities are those that cannot be treated economically on the drilling platform to allow offshore disposal. Onshore treatment includes chemical and physical separation, land treatment and land filling. Industry practice is to utilize, as much as possible, water-based muds that can be discharged offshore assuming the oil content is less than 6.9 g/100 g oil on wet solids. If oil-based fluids are required, they are adopting synthetic oil based muds (SBMs) with proven environmental suitability for release in accordance the *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands*, April 2009.

3.4 Canada – Alberta

The oil and gas sector has been active in Alberta for over 100 years and regulated for over 75 years. Through time, historical data exist for some waste streams whereby common acceptable treatment and disposal practices have been established, and regulatory direction/guidance has been developed.

3.4.1 Regulatory Summary

The Alberta Energy Regulator (AER) succeeds the Energy Resources Conservation Board and will take on regulatory functions related to energy development from the Ministry of Environment and Sustainable Resource Development that relate to public lands, water, and the environment. In this way, the AER will provide full-lifecycle regulatory oversight of energy resource development in Alberta—from application and construction to abandonment and reclamation, and everything in between.

The management of off-site environmental effects from oil and gas activities is the responsibility of Environment and Sustainable Resources Development (ESRD) under the authority of the *Environmental Protection and Enhancement Act* (consolidated up to 62/2013) and Alberta Regulation 192/96 - Waste Control Regulation.

The day to day management of waste generated from exploration and production activities is managed by the Alberta Energy Regulator (AER) the *Oil and Gas Conservation Act* and the regulations under that *Act*. Under this *Act*, “oilfield waste” means an unwanted substance or mixture of substances that results from the construction, operation, abandonment or reclamation of a facility, well site or pipeline include an unwanted substance or mixture of substances from such a source that is received for storage, treatment, disposal or recycling at a facility authorized for that activity pursuant to the *Environmental Protection and Enhancement Act*.

3.4.2 Alberta Waste Management Infrastructure

Wastes generated from exploration and production are managed by industry in on-site facilities including landfills (solid waste) and subsurface disposal wells (produced water and enhanced oil recovery). On-site waste management operations are approved as an “oilfield waste management facility” meaning a facility for the purposes of processing, treating and/or disposing of oilfield waste. There is also an extensive commercial waste management industry operating under approvals from the AER. Waste management infrastructure in place in Alberta for the management of E&P wastes is as follows which consists of one or more of the following components:

- ▶ waste storage area/facility;
- ▶ waste transfer station;
- ▶ waste processing facility;
- ▶ surface facilities associated with waste disposal wells;
- ▶ waste disposal well (Class Ia or Ib);
- ▶ cavern;
- ▶ landfill;
- ▶ biodegradation facility;
- ▶ thermal treatment facility; and
- ▶ other oilfield waste management technology or facility.

3.4.3 Alberta Best Management Practices

Directives are documents that set out new or amended AER requirements or processes for implementation. Licensees, permittees, and other approval holders under the jurisdiction of the AER are required to obey all directives.

E&P waste management practices are dictated by AER Directives and Guidelines established under *the Oil and Gas Conservation Act*. Key Directives that set out best management practices include:

- ▶ Directive 50: Drilling Waste Management
Sets out criteria for the approval of onsite (within the lease) treatment and disposal of drilling waste and the criteria for offsite commercial and/or industry operated drilling waste management facilities.
- ▶ Directive 51: Injection and Disposal Wells - Well Classifications, Completions, Logging, and Testing Requirements
Sets out criteria and approvals for use of injection wells for waste disposal.
- ▶ Directive 58: Oilfield Waste Management Requirements for the Upstream Petroleum Industry
Sets approval requirements for the design and operations of the waste management facilities and infrastructure.

Manual 001: Facility and Well Site Inspections

This is a resource document for AER personnel. Its purpose is to ensure that oil and gas production and processing facilities, injection and disposal facilities, custom treating plants, waste management facilities, and well sites are inspected in a consistent manner throughout Alberta.

- ▶ Manual 002: Drilling Waste Inspections
This is a resource document for AER personnel. Its purpose is to ensure that drilling waste operations are inspected in a consistent manner throughout Alberta.

3.5 Summary of Best Management Practices

This report has presented a summary of information on the standards and best management practices for oil and gas exploration and development activities in remote, isolated and extreme environments for Alaska, Norway and Canada (Newfoundland and Alberta). The data demonstrate similarities in regulatory intent and industry actions to provide responsible management of wastes generated from exploration and production activities. The availability of treatment and disposal systems and commercial waste management facilities coupled with a comprehensive regulatory system is evident in the scope of the best management practices being utilized. Regulatory drivers are shown to be key in the development and adoption of best management practices as is evidenced in Alaska and Norway. In Alaska, the actions of the federal and state governments in the late 80s led to the prohibition of reserve pits and the advancement of subsurface injection well facilities and strict controls on all aspects of the E&P wastes. Equivalent actions by OSPAR in the 90s with support from the countries bordering the North Sea led to the adoption of key best management practices for both jurisdictions. The

move to impose specific criteria for permissible drilling fluids and solids discharge to the North Sea proved effective in moving the industry to development of PLONOR drilling chemicals and adoption of improved wastewater treatment and recovery technologies. Actions on Canada's east coast were similar; however, with limited development and a smaller industry base, regulations are primarily goal based requiring operators to submit environmental protection plans that will meet the intent of regulations with specific targets for offshore discharge quality occurring as performance expectations. Injection disposal is limited largely to produced water with other wastes not approved for offshore disposal transported to onshore facilities for conventional treatment and disposal.

Alberta had similar drivers with actions in the late 80s focusing on the poor practices adopted by the E&P industry in the management of waste fluids and solids. The initiatives resulted in the development of the Directives listed previously and the establishment of the comprehensive commercial oilfield waste management business currently operating in Alberta.

For the reference jurisdictions, the waste management issues are common and focus primarily on the management of the large volume wastes and the overall reduction of overall waste generation. These efforts have consistently focused on the proper management of waste drilling fluids and solids/cuttings, produced water, waste chemicals, oily solids and sludge and domestic waste volumes associated with support facilities.

Best management practices common to these wastes and utilized to varying degrees by industry operating in each jurisdiction are as follows (Table 5).

Table 5: Treatment & Disposal Best Management Practices

Waste Management Option	Best Management Practice
Source Reduction – eliminate or reduce the quantity or relative toxicity of waste generated	<ul style="list-style-type: none"> ▶ Product substitution ▶ Process modification ▶ Improved process controls ▶ Good housekeeping
Recycling – reuse or reclaim materials from the waste	<ul style="list-style-type: none"> ▶ Reprocessing ▶ Energy recovery ▶ Reuse & return
Treatment – employ techniques to reduce volume, relative toxicity, or other characteristics of the waste	<ul style="list-style-type: none"> ▶ Filtration ▶ Centrifugation ▶ Chemical precipitation & flocculation ▶ Thermal treatment (incineration, desorption, phase separation) ▶ Extraction ▶ Biodegradation (landfarming, biocells, etc.)
Disposal – utilize environmentally sound methods to dispose of generated waste to minimize its impact, if any, and to protect human health	<ul style="list-style-type: none"> ▶ Landspreading ▶ Roadspreading or road surfacing ▶ Burial or landfill ▶ Underground/deepwell injection/annular ▶ Discharges to land or surface water

3.6 Jurisdiction Best Management Practice Summary

An overview of industry practices indicates common themes of waste treatment and disposal of these wastes as summarized in Table 6. This data reflects common waste management practices for the most significant waste types and volumes summarized for all jurisdictions assessed in this study.

Table 6: Comparison of Jurisdiction Waste Management Practices

Waste Management Category	BMP Jurisdiction Waste Management Comparison			
	Alaska	Norway	Canada/Newfoundland	Canada/Alberta
Produced water / Process Fluids	Deepwell Injection or reservoir pressure maintenance and enhanced oil recovery	Deepwell injection Treatment and offshore disposal or reservoir maintenance and enhanced oil recovery	Quality management and treatment and offshore disposal	Deepwell Injection and/or Treatment/ Processing to recover hydrocarbons
Drilling fluids	Recovery and reuse and/or deepwell injection	Recovery and reuse and/or deepwell injection	Tested and offshore disposal	Land Application, Third party disposal (e.g., injection)
Drill cuttings	Annular or deepwell injection	Annular or deepwell injection Oil recovery and thermal treatment in waste to energy system; final solids to landfill or use in road construction	Treatment and offshore disposal or injected by disposal well Wastes exceeding release requirements transferred to shore for further treatment and bioremediation of landfill disposal	Land Application, Third party disposal (e.g., landfill, biotreatment, thermal treatment)
Well completions fluids	Recovery and reuse and/or deepwell injection	Recovery and reuse and/or deepwell injection	Tested and offshore disposal	Recovery or Deepwell Injection
Tank bottoms and oily solids	Fluid recovery, deepwell injection, landfill or thermal treatment	Fluid recovery, bioremediation, thermal treatment and waste to energy and final solids landfilled or reused in road construction	Fluids recovery and released offshore if waste meets oil disposal criteria Transfer onshore, recover available fluids, bioremediation or landfill	Deepwell Injection and/or Treatment/ Processing to recover hydrocarbons
Industrial Solid Waste	Recycle, organics to approved incinerator, inorganics/non-combustibles to landfill	Organics thermally treated in a waste to energy system, recycle available materials, landfill non-usable materials	Transfer onshore to be recycled and landfilled	Landfill, recycle
Industrial Liquid Waste	Deepwell Injection or reservoir pressure maintenance and enhanced oil recovery	Deepwell injection Treatment and offshore disposal or reservoir maintenance and enhanced oil	Quality management and treatment and offshore disposal	Deepwell Injection and/or Treatment/ Processing to recover hydrocarbons

Waste Management Category	BMP Jurisdiction Waste Management Comparison			
	Alaska	Norway	Canada/Newfoundland	Canada/Alberta
		recovery		
Sanitary wastes (liquids and solids)	Macerate solids, chlorine or ozone treatment of fluids and discharge to sea	Macerate solids, chlorine or ozone treatment of fluids and injection disposal	Macerate solids, chlorine or ozone treatment of fluids and discharge to sea	Approved treatment and discharge to the environment

4.0 WASTE TYPES

4.1 Activities Generating Wastes

The quality of waste information (type and generation factors) directly influences the applicability and usefulness of the RWMTool. The various waste types should be of common oil and gas activities, and preferably representative of the experiences of those operating in the study area. A comprehensive internet based review of source information on the types and quantities of waste streams produced from the various phases of the oil and gas industry provided relevant baseline information. The scope of the review was based upon a GNWT fact sheet that included a query to identify commonly applied oil and gas activities terms, categorize waste types associated with the identified activities and where available, details of waste quantities and the factors that influence the quantities generated. In the absence of waste type information from the study area, the search focused on key jurisdictions in the United States at a federal level (US EPA) and the states of Alaska and Texas, the United Kingdom, Norway and in Canada, the provinces of Alberta, Saskatchewan and British Columbia.

A limitation of the data from all of the jurisdictions is the insufficient quantity of recent data with much of the available data reported from source information collated in the late 90s. The data confirmed trends in industry efficiencies to improve on drilling fluids and cuttings management and a move to environmentally friendly chemicals and practices. Generally, the data also demonstrates the relationship of waste quantities to exploration and production activities and the market value of hydrocarbons. The data is generally available in broad categories of the most common and largest volumes produced including produced water, drilling fluids and cuttings, produced sand and tank bottoms, oily solids and glycols from dehydration and associated waste such as domestics and sanitary wastes. This data reflects the greatest of the waste type and volumes common to the industry, and is readily applicable to jurisdictions where existing infrastructure is in place to provide quality treatment and disposal of these wastes.

The findings of the internet review were provided in the interim reports and reflect a general consistency across the literature and regulatory jurisdictions in the presentation of the data first by oil and gas activity, waste type, quantities and an overview of the factors that influence the waste quantities. These latter two categories, although represented in the literature, are the least well verified and represented for the selected jurisdictions.

In consultation with TAG, the waste-generating activities or “project types” selected for inclusion in the RWMTool are:

- ▶ seismic;
- ▶ exploration/drilling;
- ▶ completions / workover;
- ▶ construction / demolition;
- ▶ field support;
- ▶ production;

- ▶ camp; and
- ▶ shipping (marine).

These categories best fit the potential projects that would occur in the study area. The user of the RWMTool will determine which project type best fits each project, or group of projects, entered into the RWMTool. From this list, associated waste types and waste generation factors were identified where available. As regulators and producers obtain waste type and waste factor data through the course of completing various projects in the study area, the RWMTool can be updated to reflect the realities of waste generation on E&P projects in the NWT.

The process of acquiring data and providing a literature review on waste types and quantities included:

- ▶ determining which jurisdictions shared comparable upstream oil and gas processes, waste generation and disposal methods, environmental conditions, and geographical constraints to the NWT;
- ▶ searching a variety of government websites using key words related to oil and gas activities, types and quantities of waste streams, and management practices associated with them;
- ▶ noting similarities in provincial/federal environmental regulations between jurisdictions;
- ▶ identifying activities that generate waste, and what the waste disposal options and related costs are in each jurisdiction; and
- ▶ detailing available information from comparable jurisdictions in order to assess and manage related waste treatment and disposal issues in the NWT.

A key limiting factor in gathering data from the NWT and other jurisdictions was the limitation of current information (commonly data from mid-90s), and information in suitable detail to set the basis for determining representative waste quantities for identified activities. Waste disposal facilities and municipal/provincial/federal agencies do not report this data regularly, nor is the information readily available to the public.

4.2 Waste Types and Factors

In Alberta under the auspices of the Alberta Energy Regulator and the Canadian Association of Petroleum Producers (CAPP 2008), industry utilizes a commonly available waste listing (Table 7) for the planning and management of their waste.

Industry commonly uses the waste types presented in Table 7 as it represents an industry validated reference source for their waste planning and management decisions. The Table 7 waste types were presented to TAG to initiate discussion on an acceptable approach for TAG to the presentation of waste types as one of the model components for the RWMTool.

Table 7: Common Industry Waste Types (CAPP 2000)

Waste Types	Waste Types	Waste Types	Waste Types
Absorbents	Domestic Waste	Incinerator Ash	Sludge -Process
Antifreeze (Glycol or Methanol)	Drill Cuttings - OBM	Insulation	Sludge Tank Bottom

Waste Types	Waste Types	Waste Types	Waste Types
Batteries dry cell	Drill Cuttings - WBM	Lubricating and Hydraulic Oil	Solvents
Batteries Wet cell	Drill Fluids - OBM	Metal - Perf Guns	Thread Protectors
Cardboard	Drill Fluids - WBM	Mole Sieve Material	Tires
Cement and Concrete	Filters - Air	Mud Bags	Wash Fluids - Solvent
Cement Returns, Flushes and Interface	Filters - Chemicals	Paint and Coating Waste	Wash Fluids - Water
Chemicals	Filters - Glycol	Pigging Waste	Wastewater - Domestic
Completion Fluids	Filters - Lube Oil	Pipe Ends	Wastewater - Process
Construction Waste	Filters - Produced Water	Plastic	Wastewater - Process
Containers - Aerosol	Filters - Water	Produced Sand	Welding Rods
Containers - Drums and Barrels	Filters- Methanol	Produced Water	Well Workover Fluids - Acid Water
Containers - Gas Cylinders	Filters- Process Water	Residues, Solvent and Paint	Well Workover Fluids- Brine
Containers - Miscellaneous	Foam Pigs	Rig Waste	Well Workover Fluids- Hydrocarbons
Containers - Paints and Coatings	Contaminated Soil - Crude Oil and Condensate	Rope Separators	Well Workover Fluids- NAF (synthetic fluid)
Contaminated Soil - Crude Oil and Condensate	Freeze point depressant	Scrap Metal	Well Workover Fluids- With Cement and Solids
Contaminated Soil - Produced Water	Glycol/methanol	Sludge - Tank Bottoms	Wood
Contaminated Soil - Refined Fuels and Oils	Horizontal Directional Drilling (HDD) Waste	Sludge domestic waste water treatment	
Contaminated Soil- Chemical Solvents	Hydro (Hydrostatic) test Fluid		

The literature review demonstrated a prioritization of waste by volume and management requirement to include produced water, drilling fluid and solids, produced sand/oily solids and separation fluids (glycols from dehydration), domestic and sanitary wastes. This prioritization identifies the most common wastes by volume, and those that make the most demand on the industry to ensure cost effective and environmentally acceptable management. As presented previously, these key wastes include produced water, drilling fluids and solids, produced sand/oily solids from tank bottoms and glycols from dehydration, domestic and sanitary wastes.

Materials associated with E&P activities that, for this study, are not considered waste include:

- ▶ materials recovered from emergency events/spill recovery;
- ▶ surface water runoff;
- ▶ right-of-way and site clearing material (timber and vegetation);
- ▶ overburden;
- ▶ granular material;
- ▶ air emissions;
- ▶ noise; and
- ▶ abandonment and decommissioning material.

Consultation with TAG during the preparation of interim deliverables for this project determined that the Table 7 waste types list would be better presented corresponding to the various activities generating the waste. The wastes for which waste factors could be determined in the research, were categorized by waste generating project type. The waste factors were developed from datasets provided by several confidential planned projects. The absence of current data in this regard has and will continue to provide a challenge moving forward. Our level of confidence in the waste factors is predicated upon data from these planned projects which have not moved forward at this point in time.

The waste types and corresponding waste factors are provided in Table 8 for each of the project types listed in Section 4.1. Waste.

The intended application of the RWMTTool will be to allow users to “simulate the various oil and gas development scenarios” by combining the waste streams (WS) and waste factors (WF) composed of spatial and temporal components. It is that a noted that critical aspect of the RWMTTool and its value to users will be the validity of the base waste types and waste factors that were instrumental in its development. However, waste generation rates or waste factors can vary widely depending on the circumstances and technologies involved in the project. Key factors that are readily identifiable and influence waste types and quantities data include but are not limited to the following:

- ▶ activity locations (off-shore, near-shore and on-shore);
- ▶ is the product oil or gas and associated features (H₂S, API of the oil, presence or absence of fluids such as condensates);
- ▶ drilling types (standard or directional/horizontal);
- ▶ drilling fluids (water based, oil based);
- ▶ operating conditions and seasonal influences (i.e., operating hours per day, temperatures);
- ▶ waste conditions solid, liquid or semi-solid;
- ▶ waste management practices, i.e., on-site treatment and disposal or a need to store and transport waste to an off-site commercial management facility; and
- ▶ personnel numbers (influence materials needs to support operations such as litres/day or solid waste per person generated).

Table 8: Waste Types (next page)

Table 8: Waste Type

Waste Class	Waste Type ID	Waste Type Description	Unit Rate	Unit	Waste Factor	Waste Function	Waste Management Category ID
Camp	1	Domestic Waste / Refuse	kg/person/day	kg	10	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
	2	Domestic Waste from Camp Kitchen	kg/person/day	kg	1.75	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
	3	Incinerator Ash	kg/day	kg	90	WfXDays	Industrial Solid Waste
	4	Liquid Waste from Camp Kitchen	L/person/day	kg	20	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
	5	Wastewater - Greywater	L/person/day	L	80	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
	6	Wastewater - Sewage/Blackwater	L/person/day	L	40	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
	7	Wastewater Sludge - from sewage treatment	L/person/day	L	6	WfXPeoplexDays	Sanitary Wastes (liquids and solids)
Completions / Workover	8	Absorbents	kg/day	kg	0.8	WfXDays	Industrial Solid Waste
	9	Cement Returns, Flushes and Interface	m3/well	m3	60	WfXWells	Well Completion Fluids
	10	Completion W.O./Well treatment fluids	m3/well	m3	150	WfXWells	Well Completion Fluids
	11	Deck Drainage	m3/day	m3	2	WfXDays	Industrial Liquid Waste
	12	Drill Fluids	m3/day	m3	140	WfXDays	Drilling Fluids
	13	Hydraulic Fluid	m3/well	L	100	WfXWells	Industrial Liquid Waste
	14	Hydraulic test (BOP) fluids	m3/well	m3	20	WfXWells	Well Completion Fluids
	15	Incinerator Ash	kg/day	kg	45	WfXDays	Industrial Solid Waste
	16	Pipe and equipment scale	kg/well	kg	8	WfXWells	Industrial Solid Waste
	17	Pipe/Equipment Hydrates	m3/well	m3	0.8	WfXWells	Industrial Solid Waste
	18	Produced Sand	m3/day	m3	20	WfXDays	Industrial Solid Waste
	19	Produced Water	m3/day	m3	80	WfXDays	Produced Water / Process Liquids
	20	Sludge - Tank Bottoms	m3/drill location	m3	35	WfXWells	Tank Bottoms and Oily Solids
	21	Wash Water	L/day	L	350	WfXDays	Industrial Liquid Waste
Construction / Demolition	22	Water - non-contact, e.g. cooling water or fire water (exploration and completions projects)	L/drill location	L	650	WfXWells	Sanitary Wastes (liquids and solids)
	23	Cable and electrical wiring	kg/day	kg	80	WfXDays	Industrial Solid Waste
	24	Concrete	tonnes/location	tonnes	10	WF	Industrial Solid Waste
	25	Construction and Demolition Debris	kg/day	kg	1250	WfXDays	Industrial Solid Waste
	26	Insulation	m3/demob	m3	2	WF	Industrial Solid Waste
	27	Paint and Coating Waste	kg/day	kg	15	WfXDays	Industrial Liquid Waste
	28	Plumbing/Maintenance Materials	kg/day	kg	12	WfXDays	Industrial Solid Waste
	29	Scrap Metal/equipment parts	kg/day	kg	95	WfXDays	Industrial Solid Waste
	30	Wood	kg/day	kg	120	WfXDays	Sanitary Wastes (liquids and solids)
	Exploration / Drilling	31	Absorbents	kg/day	kg	0.8	WfXDays
32		Cement Returns, Flushes and Interface	m3/well	m3	60	WfXWells	Well Completion Fluids
33		Deck Drainage	m3/day	m3	5.5	WfXDays	Industrial Liquid Waste
34		Drill Cuttings	m3/day	m3	10	WfXDays	Drill Cuttings
35		Drill Fluids (NAF)	m3/day	m3	120	WfXDays	Drill Cuttings
36		Drill Fluids (WBM)	m3/day	m3	48	WfXDays	Drilling Fluids
37		Hydraulic Fluid	m3/well	L	150	WfXWells	Industrial Liquid Waste
38		Hydraulic test (BOP) fluids	m3/well	m3	20	WfXWells	Well Completion Fluids
39		Incinerator Ash	kg/day	kg	60	WfXDays	Industrial Solid Waste
40		Mud Bags	kg/day	kg	14	WfXDays	Industrial Solid Waste
41		Pipe and equipment scale	kg/well	kg	15	WfXWells	Industrial Solid Waste
42		Pipe/Equipment Hydrates	m3/well	m3	1	WfXWells	Industrial Solid Waste
43		Sludge - Tank Bottoms	m3/drill location	m3	50	WfXWells	Tank Bottoms and Oily Solids
44		Thread Protectors	/day	NULL	12	WfXDays	Industrial Solid Waste
45		Wash Water	L/day	L	1000	WfXDays	Industrial Liquid Waste
Field Support		46	Water - non-contact, e.g. cooling water or fire water (exploration and completions projects)	L/drill location	L	1000	WfXWells
	47	Absorbents	kg/day	kg	1	WfXDays	Industrial Solid Waste
	48	Antifreeze (Glycol or Methanol)	L/day	L	2	WfXDays	Produced Water / Process Liquids
	49	Batteries	kg/day	kg	0.5	WfXDays	Industrial Solid Waste
	50	Blasting sand/material	m3/project	m3	100	WF	Industrial Solid Waste
	51	Contaminated Snow / Water	L/day	L	2.5	WfXDays	Industrial Liquid Waste
	52	Contaminated Soil	kg/day	kg	30	WfXDays	Industrial Solid Waste
	53	Domestic Waste / Refuse	kg/day	kg	5	WfXDays	Sanitary Wastes (liquids and solids)
	54	Filters	kg/day	kg	1.4	WfXDays	Industrial Solid Waste
	55	Hydraulic Fluid	L/day	L	15	WfXDays	Industrial Liquid Waste
	56	Lab waste, sample wastes, and residues	kg/day	kg	10	WfXDays	Industrial Solid Waste
	57	Lubricating Oil / Used Oil	L/day	L	10	WfXDays	Industrial Liquid Waste
	58	Solvents	L/day	L	0.1	WfXDays	Industrial Liquid Waste
	59	Tires	kg/day	kg	0.5	WfXDays	Industrial Solid Waste
	60	Wood / Pallets	kg/day	kg	65	WfXDays	Sanitary Wastes (liquids and solids)

Waste Class	Waste Type ID	Waste Type Description	Unit Rate	Unit	Waste Factor	Waste Function	Waste Management Category ID
Production	61	Absorbents	kg/day	kg	1	WFxDays	Industrial Solid Waste
	62	Boiler blowdown	m3/blowdown	m3	2.5	WFxBxDays/365	Produced Water / Process Liquids
	63	Catalyst	tonnes/life of unit	tonnes	130	WF	Industrial Solid Waste
	64	Completion W.O./Well treatment fluids	m3/well	m3	140	WFxWells	Well Completion Fluids
	65	Condensate / Crude Oil	m3/year	m3	1	WFxDays/365	Produced Water / Process Liquids
	66	Cooling tower blowdown	tonnes/day	tonnes	16.4	WFxDays	Industrial Liquid Waste
	67	Domestic Waste / Refuse	kg/day	kg	4	WFxDays	Sanitary Wastes (liquids and solids)
	68	Incinerator Ash	kg/day	kg	0.6	WFxDays	Industrial Solid Waste
	69	Paraffin	kg/day	kg	1	WFxDays	Industrial Solid Waste
	70	Pigging Waste	kg/day	kg	1	WFxDays	Industrial Solid Waste
	71	Pipe and equipment scale	kg/day	kg	0.5	WFxDays	Industrial Solid Waste
	72	Produced Sand	kg/day	kg	170	WFxDays	Industrial Solid Waste
	73	Produced Water	m3/day	m3	80	WFxDays	Produced Water / Process Liquids
	74	Sludge - Process	m3/cleaning activity	m3	150	WFxCLEANxDays/365	Tank Bottoms and Oily Solids
	75	Sludge - Tank Bottoms	m3/day	m3	5	WFxDays	Tank Bottoms and Oily Solids
Seismic	76	Wash Water	L/day	L	4	WFxDays	Industrial Liquid Waste
	77	Water softening regeneration brine	L/change out	L	100	WFxWSCHANGExDays/365	Industrial Liquid Waste
	78	Water softening resin, spent	L/change out	L	100	WFxWSCHANGExDays/365	Industrial Liquid Waste
	79	Absorbents	kg/day	kg	1	WFxDays	Industrial Solid Waste
	80	Antifreeze (Glycol or Methanol)	L/day	L	2	WFxDays	Produced Water / Process Liquids
	81	Batteries	kg/day	kg	0.5	WFxDays	Industrial Solid Waste
	82	Cable and electrical wiring	kg/day	kg	75	WF	Industrial Solid Waste
	83	Contaminated Snow / Water	L/day	L	1	WFxDays	Industrial Liquid Waste
	84	Domestic Waste / Refuse	kg/person/day	kg	1.5	WFxPeoplexDays	Sanitary Wastes (liquids and solids)
	85	Explosives	kg/day	kg	0.5	WFxDays	Industrial Solid Waste
	86	Hydraulic Fluid	L/day	L	15	WFxDays	Industrial Liquid Waste
	87	Lubricating Oil / Used Oil	L/day	L	10	WFxDays	Industrial Liquid Waste
	88	Scrap Metal/equipment parts	kg/project	kg	500	WF	Industrial Solid Waste
	89	Tires	kg/day	kg	0.5	WFxDays	Industrial Solid Waste
	Shipping	90	Ballast Residue	tonnes/1000 m3 of ballast tank volume	tonnes	0.25	WFxBALLASTVOL/1000
91		Batteries	kg/day	kg	0.38	WFxDays	Industrial Solid Waste
92		Bilge Water	m3/1000 Dead Weight Tonnes/month of operation	m3	1.25	WFxDWT/1000XDays/30	Industrial Liquid Waste
93		Cargo Associated Waste / Dunnage	kg/day	kg	49.3	WFxDays	Industrial Solid Waste
94		Cargo Sweepings	% of total cargo transported	tonnes	0.0006	WFxCARGO	Industrial Solid Waste
95		Domestic Waste / Refuse	kg/person/day	kg	3	WFxPeoplexDays	Sanitary Wastes (liquids and solids)
96		Electronics, fluorescent lights, E-waste	kg/day	kg	0.25	WFxDays	Industrial Solid Waste
97		Fuel sludge	% of daily fuel consumption	L	15	WFxDays/100xFUEL	Tank Bottoms and Oily Solids
98		Incinerator Ash	kg/person/day	kg	0.45	WFxPeoplexDays	Industrial Solid Waste
99		Lubricating Oil / Used Oil	g/kWh	g	0.6	WFxkWh	Industrial Liquid Waste
100		Oil Content of Bilge Water	% of the volume of bilge water generated	m3	0.19	WFxDWT/1000XDays/30	Industrial Liquid Waste
101		Paint and Coating Waste	L/day	L	0.06	WFxDays	Industrial Liquid Waste
102		Washings - holds or liquid storage areas	L/day	L	0.75	WFxDays	Industrial Liquid Waste
103		Wastewater - Greywater	L/person/day	L	125	WFxPeoplexDays	Sanitary Wastes (liquids and solids)
104		Wastewater - Sewage/Blackwater	L/person/day	L	31.8	WFxPeoplexDays	Sanitary Wastes (liquids and solids)
105		Wastewater Sludge - from sewage treatment	L/person/day	L	4.8	WFxPeoplexDays	Sanitary Wastes (liquids and solids)

Given that the waste factors can vary (from operator to operator, by geography, by technology implemented, etc.), and that the basis of variation is dependent a large number of factors, this is seen as an opportunity for continuous improvement in the RWMTool to make it more relevant to the location and technologies used in study area. As more 'real' data are gathered in the course of conducting projects in the study area, the RWMTool can be updated to better reflect project implementation in the north.

Additionally, not all waste types listed in the CAPP table had waste factors associated with them. When waste factors for these waste types are determined by regulators or operators, the RWMTool could be updated for their inclusion. These waste types, for which no waste factors could be determined, include:

- ▶ Cardboard;
- ▶ Chemicals;
- ▶ Containers - Aerosol;
- ▶ Containers - Drums and Barrels;
- ▶ Containers - Gas Cylinders;
- ▶ Containers - Miscellaneous;
- ▶ Containers - Paints and Coatings;
- ▶ Foam Pigs;
- ▶ Horizontal Directional Drilling (HDD) Waste;
- ▶ Hydro (Hydrostatic) test Fluid;
- ▶ Metal - Perf Guns;
- ▶ Mole Sieve Material;
- ▶ NORM;
- ▶ Pipe Ends;
- ▶ Plastic;
- ▶ Rig Waste;
- ▶ Rope Separators;
- ▶ Refractory waste;
- ▶ Salt bath heater salt;
- ▶ Scrubber liquid, hydrogen sulphide;
- ▶ Sweetening/dehydration liquids;
- ▶ Sweetening/dehydration solids;
- ▶ Wash Fluids - Solvent;

- ▶ Wastewater - Process; and
- ▶ Welding Rods.

Each of the waste types listed in Section 4.2 correspond to a category of wastes that are associated with Best Management Practices from Section 3.

5.0 ONLINE REGIONAL WASTE MANAGEMENT TOOL

5.1 Methodology

To further leverage the waste factors and functions developed in this project, Amec Foster Wheeler was asked to develop an online, interactive tool where users can create hypothetical regional scenarios of oil & gas activity in order to understand the quantity and distribution of waste streams over time.

The project team envisioned a simple, map-based interface where users could create regional scenarios of projects (individual, point-based activities) and project areas (polygon-shaped areas containing one or more projects, analogous to exploration or production licenses). Those scenarios could be saved and later opened and edited.

Once a scenario had been developed, users could generate reports on the waste streams generated in the scenario. The report would include a breakdown and summary of the waste produced by waste type, graphs showing the waste produced by project over time, and the cumulative waste produced over time by all projects, as well as a summary of best practices from other jurisdictions for the selected waste types.

The following sections describe the methodology used to develop the Regional Waste Management Tool (RWMTTool).

5.2 Waste Stream Model

One part of the project team was dedicated to researching and developing the list of waste types, waste factors, and waste functions. These were captured in an Excel model, where one could enter details of a single project, and the spreadsheet would calculate, using references to the waste factors, the amount of waste generated for each waste type. This Excel model formed the foundation for the web application.

5.3 Functional Requirements

The project team produced a document describing the requirements of the web application (Appendix C – RWMTTool Functional Requirements). Those requirements captured the specific abilities that the application was to demonstrate, with respect to security, mapping, creating and saving scenarios, reporting, and documentation.

A few of the requirements were not met in the delivered application because of dependencies on GNWT ArcGIS Server resources; specifically, those requirements for finding the nearest road, protected area, or waste disposal site to each project. Those tasks required the FindNearest method on an ArcGIS GeoProcessing service, which was not available at the time.

5.4 Application Architecture

Early on in the project, GNWT's technical point of contact, Colin Avey, visited Amec Foster Wheeler's Ottawa office to meet the development team, and to review the technologies selected for the application. Since the application was to be hosted by GNWT, and was dependent on GNWT's web, database, and geospatial infrastructure, it was important to choose technologies that would fit.

The technologies selected for the application, as well as a description of the application architecture, can be found in Appendix C – RWMTool Application Architecture.

5.5 Information Architecture

Using the initial Excel waste streams model as a guide, Amec Foster Wheeler created a relational database in SQL Server to store waste types and classes, projects and project areas, scenarios, and users. The initial data model also included the waste functions, as scalar-valued functions, but these were later moved to the client-side (calculated on the user's browser) to allow non-authenticated users to generate reports.

A detailed description of the database schema, including descriptions of all of the entity attributes, is presented in Appendix C – RWMTool Information Architecture.

5.6 Development and Testing

Development of the application proceeded smoothly, with several progress-update meetings involving the entire project team. Amec Foster Wheeler developed the application using local resources, coupled to GNWT ArcGIS Server services, and deployed the application to the Amec Foster Wheeler staging environment for testing.

5.7 Deployment

Amec Foster Wheeler provided a deployment package including the web application, database, and detailed deployment instructions (Appendix C – RWMTool Deployment Instructions) to GNWT for installation in their production environment.

The application includes an online help document (Appendix C – RWMTool Online Help) to familiarize users with the operation of the tool.

5.8 Suggestions for Further Enhancements

5.8.1 Understand the Spatial Distribution of Waste Streams

The RWMTool does a good job of describing the amount of waste generated in each waste type over time, and with the project-by-project and cumulative waste graphs, effectively illustrates the temporal distribution of waste over time.

Aside from the positions of projects and project areas, the tool does not effectively illustrate the spatial distribution of waste. Nor does it capture the relationship of generated waste to transportation and disposal infrastructure.

The tool could be enhanced to map the quantity of waste using variations of marker size or fill colour, and perhaps even animated to map the waste quantity generated over time. Mapping of disposal facilities, and inclusion of the proximity functions (an ArcGIS Server GeoProcessing service is required) would also be a useful addition.

5.8.2 Give Users the Ability to Add, Remove, and Edit Waste Factors and Functions

As it stands now, the waste types, classes, waste factors, and waste functions are stored in the database and used in every scenario. Waste factors can be easily adjusted by GNWT by editing the data tables, but users of the tool have no way to adjust the waste factors themselves.

An interesting enhancement to the tool might be to allow users to configure the waste types and waste factors used in their scenario. That way, the analysis of a scenario not only explores the waste generated according to the projects within the scenario, but it also can explore the waste generated when waste factors change (either by improved understanding of the waste factors, or by improvements to on-site processes and procedures that might generate less waste).

5.8.3 Add a Temporal Filter to the Report

The RWMTTool allows users to create reports on a selected subset of the projects and project areas in a scenario, but it always reports on the entire time frame from the beginning of the first project to the end of the last project. A useful enhancement to the tool might be to filter the report not only on the projects and project areas included, but also on the time frame included.

5.8.4 Display Reports in Separate Browser Windows

Many stakeholders work on computers with multiple monitors. Since the RWMTTool is developed entirely within a single browser window, pop-ups (like the on-screen report) cannot be moved outside of the browser window. Popping up the report in a separate browser window would allow it to be moved to a second screen, leaving the map unobstructed.

5.8.5 Display Current Projects/Areas as a Tree View

The list of current projects and project areas on the RWMTTool is a simple list and doesn't distinguish between projects and project areas. To edit a project within a project area, one must first open the properties of the project area, and then open the properties of the project.

If the current projects and project areas list were a tree-view, instead of a simple list, then users could instantly see the projects contained within project areas, and directly access the properties of projects within project areas with a single click.

5.8.6 Provide More Efficient Ways to Add Projects to Scenarios

Key to the use of the RWMTTool is creating a regional scenario by adding projects and project areas. We have provided ways of doing that, but, with the use and feedback of the end-user community, there may be better or more efficient ways of capturing the projects in a regional scenario.

5.8.7 Allow Collaboration or Sharing of Scenarios

Saved scenarios are available only to the user that saved them. In order to share scenarios between people, usernames and passwords must be shared. A potential enhancement to the tool might be to allow users to generate links to scenarios that could be e-mailed, or to allow a single scenario to be available to multiple users.

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Appendix A

Alaska Waste Disposal and Reuse Guide

February 2013

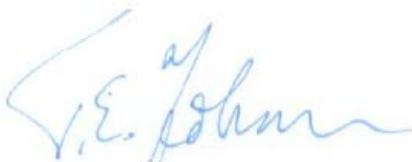
Dear Employees and Contractors:

The *Alaska Waste Disposal and Reuse Guide* has been issued jointly by ConocoPhillips Alaska, Inc., and BP Exploration (Alaska) Inc.

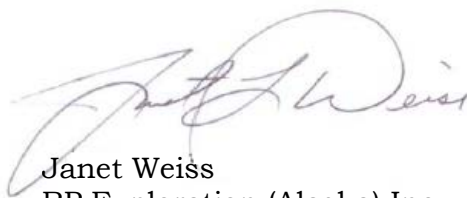
This document provides consistent waste management guidance for all employees and contractors in all of our Alaska operations to help ensure compliance with applicable regulations and company policies.

We expect each of you to use this guidance and the associated training program to make sound decisions on the job.

Please contact your supervisor or field environmental staff if you have any questions about using this guide, or about environmental compliance, waste minimization, pollution prevention, and recycling opportunities.



Trond-Erik Johansen
ConocoPhillips Alaska, Inc.




Janet Weiss
BP Exploration (Alaska) Inc.

ALASKA WASTE DISPOSAL AND REUSE GUIDE

NOTES, QUESTIONS, AND SUGGESTIONS

Your input is important. Please contact your environmental representative whenever you have comments, questions, or suggestions (see back of this page for phone numbers). Use this page to keep track of any issues you would like to discuss.



The environmental staff will forward these comments to the periodic review team. All suggestions will be considered for inclusion in the next revision of this document.

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AUTHORITY AND REVISIONS

The *Alaska Waste Disposal and Reuse Guide* has been jointly prepared by BP Exploration (Alaska) Inc. (BP) and ConocoPhillips Alaska, Inc. (CPAI). It has been reviewed by BP and CPAI environmental and legal professionals. It is fully authorized for use by staff and contract personnel at all BP and CPAI facilities in Alaska.

Our goal is to provide practical, accurate, and consistent guidelines that ensure compliance with applicable regulations and company policies. We do not expect everyone to become regulatory experts; however, we do expect you to use tools such as this document, and its associated training program, to make sound decisions in the workplace. Most importantly, we expect you to contact your supervisor and interface with your field environmental staff if you have any questions about waste management, waste minimization, or recycling.

This document will be periodically reviewed and revised as needed to reflect changing regulations, policies, and practices. The review team will solicit input and feedback from each operating field. Your suggestions for changes, clarifications, or additions are welcome.

RECORD OF REVISIONS

DATE	REVISION	SUMMARY OF CHANGES
11/1/95		<ul style="list-style-type: none"> • Initial version
7/27/96	1	<ul style="list-style-type: none"> • Reformatted document • Added new waste streams (brine, diatomaceous earth)
12/31/96	2	<ul style="list-style-type: none"> • Replaced entire introductory section • Reviewed and updated all items on list • Added separate column for EOR; added EOR Specifications drawing • Added Pad 3 waste stream classifications • Expanded coverage for Milne Point and Endicott • Added "Definition of Downhole" drawings • Added PBU facilities table
7/3/97	3	<ul style="list-style-type: none"> • Reviewed and updated waste tables • Added waste mixture table • Updated PBU facilities table to include Oily Waste Skid specifications • Revised EOR Specifications to include corrosion engineering review • Added blank manifest forms as attachments
12/98	4	<ul style="list-style-type: none"> • Issued as joint BP/ARCO document; coverage expanded to include all BP/ARCO Alaskan operations • Title changed from "Waste Disposal and Reuse Options" to "Alaska Waste Disposal and Reuse Guide" • Replaced entire introductory section • Added new section on individual responsibility for complying with environmental laws • Reviewed and updated all tables, added several new items • Reorganized waste tables: deleted "Activity" column, consolidated all wastes into single alphabetical directory, added Badami Class I waste streams • Revised Attachment A ("Consequences of Mixing Wastes") • Replaced "Definition of Downhole" drawings with "Class II Disposal Guidelines" (Attachment B) • Added "Satellite Accumulation Area Guidelines" (Attachment D) and "Dumpster Guidelines" (Attachment E) • Added Facility Guides (Attachment F) for several BP/ARCO facilities
4/2000	5	<ul style="list-style-type: none"> • General review and update, all sections • Several items added to Disposal/Reuse Tables • Added Pad 3 and Badami "waste stream codes" to match North Slope Manifest • Added guidelines for Annular Pumping (Attachment D) and Manifests (Attachment H — replaces former Section 9). Renumbered Attachments. • Added Facility Guides for Alpine and Northstar
8/2002	6	<ul style="list-style-type: none"> • Updated field operator titles (ARCO Alaska, Inc. to Phillips Alaska, Inc.) and position titles • General review and update, all sections • Section 2: Added discussion of roles and responsibilities for manifesting • Section 4: Removed definition of "Generator" — see Section 2 • Section 8: Added section on New Chemical Evaluations • Disposal/Reuse Tables: Revised diesel/hydrocarbon recycling options • Disposal/Reuse Tables: Several items added • Attachment A: Renamed; added discussion of the relationship between UIC and RCRA • Attachment G: Added Facility Guides for Northstar, GTLTF, LNG Plant, Tyonek Platform • Attachment H: Revised North Slope Manifest form and instructions

RECORD OF REVISIONS

(continued)

DATE	REVISION	SUMMARY OF CHANGES
10/2005	7	<ul style="list-style-type: none"> • Repaginated entire document consecutively from beginning to end • Changed Phillips Alaska, Inc. to ConocoPhillips Alaska, Inc. (CPAI) • General review and update, all sections • Clarified EPA position on "RCRA Empty" containers • Disposal/Reuse Tables: Added several items • Disposal/Reuse Tables: Deleted Class I nonexempt waste stream codes for Pad 3 and Badami • Attachment A: Added language for further clarification of RCRA vs. UIC • Attachment B: Revised language and included 4 additional cases • Attachment C: Added requirement for AOGCC injection order and/or administrative approval • Attachment G: Added Milne Point B-50 Class I well; reviewed and updated information for other facilities as required • Attachment H: Revised North Slope manifest form and instructions
11/2008	8	<ul style="list-style-type: none"> • General review and update, all sections • Updated Contacts and added e-mail addresses • Added more instructions to contact Environmental if specific item or disposal information is not found • Section 2: Added clarification to Transporter and Receiver roles and responsibilities • Section 4: Revised the definition of DOT-Regulated Common Carrier Pipelines • Section 4: Added additional instructions to definition of Hazardous Waste; revised Universal Waste definition; added detail to EOR definition • Section 4: Updated definition of RCRA empty • Disposal/Reuse Tables: deleted "Class I" and "Class II" entries in Column 2 ("Classification"); replaced with hazardous waste or E&P exempt classifications • Disposal/Reuse Tables: deleted EOR column, clarified EOR restrictions • Disposal/Reuse Tables: clarified items from E&P exempt vs. non-E&P exempt pipelines and wells (including common carrier pipelines, source water wells and UIC Class I wells) • Disposal/Reuse Tables: added several waste streams, including Blue Goo (RG-2401, RG-2400); clay stabilizer L64; Dräger tubes; emulsion breaker; exit signs; Freon; ink cartridges/toners; lamps; lead acetate tape; pigging fluids; well casing filings/cuttings; well cellar gravel; and several waste streams associated with Class I wells and source water wells • Attachment B: Case 6 re-worded, added details to Case 7, Case 8 added • Attachment G: Updated all Facility Guides • Attachment H: Revised North Slope Manifest to include instructions for waste stream codes for GPB Pad 3 and G&I Facility, updated facility destinations • Attachment H: Added Cook Inlet Manifest

RECORD OF REVISIONS

(continued)

DATE	REVISION	SUMMARY OF CHANGES
2/2013	9	<ul style="list-style-type: none"> • General review and update, all sections • Updated Contacts • Removed assets no longer operated by BP or CPAI (e.g., Badami) • Section 3: Added new abbreviations and acronyms • Section 4: Revised or added definitions for Accumulation Area, Beneficial Reuse, Hazardous Waste Generator, Recycling, Used Oil • Section 5: Updated discussion of Wildlife Avoidance Planning • Section 6: Removed reference to BP's Oil Industry HSE Toolbox • Disposal/Reuse Tables: General cleanup, format enhancements, and technical editing for consistency and clarity • Disposal/Reuse Tables: Added Cleanouts; Flowback Fluids; Leather Articles, H₂S Monitors; Scrap Metal; Well Returns • Disposal/Reuse Tables: Updated information on medical waste to reflect current EPA guidance on epinephrine and nitroglycerine • Attachment B: Example 3 re-worded to clarify requirement for contact with oil and gas production stream • Attachment C: Reorganized EOR flowchart for clarity • Attachment E: Expanded to include several types of Accumulation Areas • Attachment G: Updated all Facility Guides • Attachment F: Updated Dumpster Guidelines, added Recyclable Wood Containers • Attachment H: Updated to illustrate current North Slope and Cook Inlet Manifests

1. INTRODUCTION

The *Alaska Waste Disposal and Reuse Guide* provides management options for the majority of routine waste streams generated by oil and gas exploration and production operations in Alaska. It is a tool for staff and contractors who have attended the BP/CPAI waste management certification training program and who, therefore, have a basic understanding of waste regulations, classification, and handling procedures.

This guide is not intended to answer every question you might have about disposal, recycling, or waste minimization.

If a waste or recycle stream is not listed, if you are unclear about the proper management, or if a classification is subject to verification, do not assume a management option and do not pick the closest match. Instead, stop and ask the appropriate environmental staff.

The *Disposal/Reuse Tables* describe various waste streams and products, which are listed in alphabetical order. The table has evolved in response to questions and suggestions from the field. A number of management options are presented for each item, but a table cannot possibly address every scenario. The final decision will depend on factors such as location, season, facilities available in the area, facility-specific operating limitations, and owner-company policies, as well as the laws and regulations.

The tables are followed by several attachments that provide additional guidance and information. These include:

- A. **Waste Classification** section, comparing the regulatory systems for wastes and disposal wells, and describing how disposal options may change if different types of waste are combined.
- B. **Class II Disposal Guidelines**, describing how wastes are evaluated for injection in a Class II Disposal Well.
- C. **Enhanced Oil Recovery Specifications**, illustrating current regulatory and technical guidelines for injection of fluids into the waterflood system.
- D. **Annular Pumping Guidelines**, providing general information about management of drilling wastes in an approved well annulus.
- E. **Accumulation Area Guidelines**, summarizing regulatory requirements for temporary management of hazardous wastes on site.
- F. **Dumpster Guidelines** for items commonly discarded as solid waste.
- G. **Facility Guides** for each operating area or site, listing the facilities available for disposal, storage, and recycling. These guides include restrictions, paperwork requirements, and contacts for each facility.
- H. **North Slope and Cook Inlet Manifest** section, explaining the proper use of these forms.

2. YOUR INDIVIDUAL RESPONSIBILITY FOR COMPLYING WITH ENVIRONMENTAL LAWS

Relationship of the *Alaska Waste Disposal and Reuse Guide* to Law, Regulations, Company Policies, and Possible Legal Positions

The information in this guide is based on regulations and policy guidelines of the U.S. Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), and the Alaska Oil and Gas Conservation Commission (AOGCC), as understood by representatives of the health, safety, and environmental (HSE) departments of BP and CPAI.

BP and CPAI recognize that the scope and meaning of many environmental laws and regulations remain unclear in some respects; therefore, it is possible that we may hold legal positions different from legal or regulatory positions taken by some of the agencies. Nevertheless, BP and CPAI have elected to incorporate agency policies and guidelines, as we understand them, into this guide. The information in the guide was compiled on this basis, often after discussions with agency personnel.

Waste disposal, recycling, and reuse activities are subject to many environmental laws. Violations of these laws may lead to enforcement actions by state or federal officials.

Criminal or civil enforcement actions may be directed against the individuals actually performing waste disposal or reuse operations, or their supervisors. This means that you may be personally at risk of criminal prosecution if you violate environmental laws or supervise individuals who do.

Civil enforcement actions may be directed against the company you work for.

You can significantly reduce or eliminate the risk of violating an environmental law by following this guide and by working closely with the environmental staff at your location.

It is especially important that you keep accurate and complete records of your waste management activities. Records must be preserved in accordance with regulatory and company record-retention requirements.

The Manifest and Your Role and Responsibility in Waste Management

The North Slope and Cook Inlet manifests are tracking tools for BP and CPAI waste disposal, beneficial reuse, and hydrocarbon recycling facilities. For some disposal locations, a manifest is also required by permits. Information provided on the manifest is input into a database and used to create reports on the composition and volume of recycled, injected, or otherwise disposed-of materials. The database is also used for accounting purposes.

All personnel who sign a North Slope or Cook Inlet manifest (generator, transporter, receiver) must attend certification training every two years. This training is intended to make each person aware of the guidelines on waste classification and waste disposal on the North Slope, from the initial waste-generating process to final disposal.

Certified Generator

A certified generator is the person with excess or discarded material that requires disposal or recycling, or a person in charge of the process that produces this material. The generator is responsible for accurately describing, classifying, and selecting the proper disposal method for the material according to this guide; therefore, the generator should be the person with the best knowledge of the composition of the waste and how it was generated, regardless of his/her company of employment. He/she must ensure that proper paperwork (sample results, prior approval, if necessary) is provided. It is the generator's responsibility to contact the Environmental Advisor/Coordinator in the field if there are any questions about the manifesting process, or if specific or written approval is needed for the material. A "certified generator" is not necessarily the same person as a "generator" under the Resource Conservation and Recovery Act (RCRA). These are different terms used for different purposes.

Certified Transporter

A certified transporter of waste or recyclable material that is tracked using the manifest must attend the same level of training as a generator. Transporters review the manifest and are encouraged to ask questions prior to loading the material for delivery to the destination described on the form. Transporters work with many types of materials and are often able to resolve manifest issues before the material leaves the point of generation.

Certified Receiver

A certified receiver is the individual who accepts and recycles, treats, stores, or disposes of the manifested material and represents the final step in the process. This individual thoroughly reviews the manifest for accuracy and checks the list of certified individuals to ensure that the generator and transporter are current on their training. The receiver must understand the restrictions and policies of the receiving facility and determine if the material meets the facility's acceptance criteria. Facility acceptance criteria are included in Attachment G. The receiver should resolve any questions by contacting the generator and/or the environmental staff prior to offloading at the facility.

Certification training is mandatory for generators, transporters, and receivers who sign manifests accompanying shipments of wastes or recyclable materials at or to BP/CPAI facilities. Please contact the BP or CPAI environmental staff for more information about training requirements and class schedules.

3. ABBREVIATIONS AND ACRONYMS USED IN THIS GUIDE

AAC	Alaska Administrative Code	LNG	Liquefied natural gas
ACM	Asbestos-containing material	LPC	Lisburne Production Center
ACS	Alaska Clean Seas	LQG	Large Quantity Generator
ADEC	Alaska Department of Environmental Conservation	MEG	Monoethylene glycol
AME	Alaska Materials Exchange	mg/L	milligrams per liter
AOGCC	Alaska Oil and Gas Conservation Commission	MPI	Main Production Island (Endicott)
BP	BP Exploration (Alaska) Inc.	MPU	Milne Point Unit
BRU	Beluga River Unit	MSDS	Material Safety Data Sheet
CESQG	Conditionally Exempt Small Quantity Generator	NCE	New Chemical Evaluation
CFP	Central Facilities Pad	NGLs	Natural gas liquids
CFR	Code of Federal Regulations	NSB	North Slope Borough
COTU	Crude Oil Topping Unit	PCBs	Polychlorinated biphenyls
CPAI	ConocoPhillips Alaska, Inc.	PPE	Personal protective equipment
CPF	Central Production Facility/ Central Processing Facility	ppm	Parts per million
DOT	U.S. Department of Transportation	PS	Pump Station
EOA	Eastern Operating Area	RAA	Recyclable Accumulation Area
EOR	Enhanced oil recovery	RCRA	Resource Conservation and Recovery Act
E&P	Exploration and Production	SA 10	Service Area 10 (North Slope Borough utility area)
EPA	Environmental Protection Agency	SAA	Satellite Accumulation Area
FS	Flow Station	SQG	Small Quantity Generator
G&I	Grind and Inject Facility	TCLP	Toxicity characteristic leaching procedure
GC	Gathering Center	TEG	Triethylene glycol
GPB	Greater Prudhoe Bay	UAA	Universal Waste Accumulation Area
GTL	Gas-to-Liquids Facility	UIC	Underground Injection Control
HSE	Health, Safety, and Environmental Department	VMS	Vehicle Maintenance Shop
KPB	Kenai Peninsula Borough	WAA	Waste Accumulation Area
KUTP	Kuparuk Unit Topping Plant	WOA	Western Operating Area
LCM	Lost circulation material		

4. PRACTICAL DEFINITIONS FOR FIELD USE

Several important terms are described below in plain language. Also see the list of abbreviations and acronyms in the preceding section.

Do not use these definitions by themselves to classify wastes or make decisions about disposal. If you need a precise regulatory or technical definition, please contact your environmental staff.

Accumulation Area

See Attachment E. An area for the collection of small amounts of waste or recyclable materials prior to consolidation in a Central Accumulation Area (CAA) for disposal or recycling. Accumulation areas include:

WAA (Waste Accumulation Area): general collection point for Conditionally Exempt Small Quantity Generator wastes (see below).

SAA (Satellite Accumulation Area): for regulated hazardous waste (see below) at or near the point of waste generation.

UAA (Universal Waste Accumulation Area): for universal wastes (see below) such as batteries and light bulbs.

RAA (Recyclable Accumulation Area): for used oil, glycol, and other materials that can be recycled or reused.

Annular Pumping

See Attachment D. Placement of specifically approved drilling-related materials from new well construction into the open annulus of an approved well. Annular pumping is regulated by AOGCC and is approved for individual wells with an Application for Sundry Approvals. Contact your drilling or environmental representative for site-specific information.

Beneficial Reuse

Returning used material to service. The material is not considered a waste if it can be used again as-is. However, the product must replace in-kind and serve the same function as a similar volume of new product that would normally be used for the purpose. Beneficial uses, other than those specifically included in the tables, should be approved by the environmental representative on a case-by-case basis.

Class I Disposal Well

See Attachment A. An injection well for disposal of non-hazardous waste or RCRA-exempt waste (see definitions below). Class I wells are permitted and regulated by EPA through the Underground Injection Control (UIC) Program. Class I wells may also accept wastes that are eligible for injection in Class II disposal wells (see below).

Class II Disposal Well

See Attachments A and B. An injection well for disposal of materials which are brought to the surface in connection with conventional oil and gas exploration and production or are generated from production systems that directly support the processing of oil, gas, and produced water. EPA has delegated authority for Class II disposal wells to AOGCC, under the UIC Program.

Class II Recovery (Class II EOR) Well — see Enhanced Oil Recovery.

DOT-Regulated Common Carrier Pipelines

Common carrier pipelines are used to transport sales-quality crude oil and natural gas from the oil field, downstream of production, separation, and custody transfer. These pipelines are subject to U.S. Department of Transportation (DOT) regulation under 49 CFR Part 195. Fluids, solids, and other wastes from these DOT-regulated common carrier pipelines are not E&P (exploration and production) exempt under RCRA (see Exempt Waste) and must be evaluated on a case-by-case basis for proper recycling or disposal options. Recovered oil from these pipelines often may be reintroduced to pipelines or production facilities as “oil-bearing hazardous secondary materials,” but may not be disposed of as E&P exempt wastes.

DOT-regulated common carrier pipelines include:

1. Trans Alaska Pipeline System

Trans Alaska Pipeline System from Pump Station (PS) 1 to Valdez

2. North Slope

Alpine Pipeline

Badami Pipeline

Badami Utility Gas Pipeline

Endicott Pipeline

Kuparuk Pipeline

Milne Point Pipeline

Northstar Pipeline

Northstar Utility Gas Pipeline

Oliktok Natural Gas Liquids (NGLs) Pipeline

3. Cook Inlet

Beluga Pipeline

The DOT also regulates other pipelines that are not common carrier pipelines, such as the Prudhoe Bay oil transit lines and the Prudhoe Bay NGL line; however, although regulated by DOT, these lines remain part of the exploration and production operations, and waste from these lines is still considered E&P exempt.

Please check with the field environmental staff or DOT Advisors for the exact starting points of the DOT-regulated common carrier pipelines, because waste management options are different for wastes generated from these pipelines.

Downhole

Material that originates below the ground surface during the oil and gas exploration, drilling, and production process OR otherwise meets the Class II disposal criteria as shown in Attachment B (*Class II Disposal Guidelines*).

Enhanced Oil Recovery (EOR)

(See Attachment C.) Injection of fluids into the producing formation to increase the production of oil. Common types of EOR include “waterflood (WF)” or “water recycle”, “water alternating gas (WAG)”, miscible gas”, and “immiscible gas”. EOR is a beneficial use of fluid, not disposal. Fluids must be non-hazardous and must meet technical specifications established by each field’s reservoir and corrosion engineers. The most common fluids for EOR are similar, chemically and physically, to seawater and produced water, which are the primary fluids used in WF and WAG. EOR injection wells are regulated by AOGCC as Class II recovery wells (Class II EOR), with entirely different criteria than Class II disposal wells.

Exempt Waste

This term is used broadly in the field to describe wastes that are not regulated as hazardous waste under RCRA. Exemptions are based on the source of the waste, not on its actual properties or composition. There are several RCRA exemptions that are important to oil and gas operations:

1. The **Exploration and Production (E&P) exemption** is for drilling fluids, produced water, and other wastes uniquely associated with oil and gas exploration, development, and production. Associated wastes include fluids that come in contact with the oil and gas production stream during the removal of produced water or other contaminants from the crude oil. E&P exempt wastes are not regulated as hazardous waste regardless of their composition or properties.

To be E&P exempt, materials must have been actually used for exploration, development, or production work, usually by coming from downhole or as a result of contact with oil or gas streams during production or subsequent processing to remove water or other contaminants. New or unused leftover products, such as acids, methanol, seawater, diesel, drilling mud, and cement, are not E&P exempt.

Use the Disposal/Reuse Tables in this guide to help determine if a specific waste is exempt, or contact your field environmental staff. Even if the waste is associated with a well, not all wells inside an oil field generate wastes that are E&P exempt. The determination is not always straightforward, so do not guess or extrapolate.

2. The **empty container exemption** applies to residues in containers. These residues are not regulated as hazardous waste while they remain in the container if the container is “RCRA empty” (see below).
3. The **household exemption** applies to light bulbs, aerosol cans, and other waste derived from homes, hotels, kitchens (but not restaurants), bunkhouses, and crew quarters.

Hazardous Waste

Waste that meets the specific regulatory definitions under RCRA in 40 CFR 261.3. The generation, accumulation, storage, transportation, and disposal of hazardous waste are regulated by the EPA. Hazardous waste from oil and gas operations may include non-exempt wastes such as discarded paints, thinners, solvents, corrosives (acids, caustics), gasoline, diesel, xylene, and methanol.

1. **Characteristic hazardous waste** has one or more of the following properties:

Ignitability (EPA waste code D001): includes liquids with a flash point less than 140 degrees F.

Corrosivity (D002): includes aqueous material with pH less than or equal to 2.0, or greater than or equal to 12.5.

Reactivity (D003): inherently unstable under ordinary conditions or when exposed to water, capable of detonation, etc.

Toxicity: exceeds allowable concentrations of regulated metals, pesticides, or organic compounds such as benzene. The toxicity characteristics, concentrations and waste codes are in 40 CFR 261.24.

2. Listed hazardous waste appears on lists published by the EPA in 40 CFR 261.31-261.33.
3. Acutely hazardous waste is a subcategory of listed hazardous waste with particularly toxic properties and more stringent management standards for amounts exceeding 1 kilogram or 1 quart. Examples include epinephrine, nitroglycerin, and dioxin-containing wastes.

Contact BP/CPAI Environmental for the hazardous waste procedures and documentation requirements in your work area.

Hazardous waste may not be moved from one field (Kuparuk, Greater Prudhoe Bay, Milne Point, etc.) to another or brought into or out of a BP/CPAI field, except under rare circumstances and with explicit approval from the BP or CPAI environmental staff.

Hazardous waste may be transported within the same field to a centralized hazardous waste accumulation area or storage unit according to site-specific procedures. BP and CPAI ship hazardous waste to permitted treatment, storage, and disposal facilities in the Lower 48.

Hazardous Waste Generator

A hazardous waste generator is any person or site whose processes and actions create hazardous waste. Generators fall into three categories according to the amount of hazardous waste generated per month. Generators producing less than 220 pounds (lbs) per month are *conditionally exempt* from many of the rules for storage, transport, and disposal. The rules become increasingly strict as the amount of waste increases. Some of the rules are shown on the following table.

(continued)

Hazardous Waste Generator (continued)

	Conditionally Exempt Small Quantity Generator (CESQG)	Small Quantity Generator (SQG)	Large Quantity Generator (LQG)
Quantity Limits	≤220 lbs/month ≤1 kg/month of acute hazardous waste	Between 220 – 2,200 lbs/month	≥2,200 lbs/month >2.2 lbs/month of acute hazardous waste
Total Quantity Accumulated On-Site	≤2,200 lbs ≤2.2 lbs acute	≤13,228 lbs	No limit
Accumulation Time Limits	None	≤ 180 days on site or ≤ 270 days if shipped 200 miles or more	≤90 days

Non-Hazardous Waste

A waste that does not meet the EPA’s criteria for hazardous waste as defined by RCRA (see definition above). However, this waste is still regulated as solid waste under the state’s solid waste regulatory programs. It is still a liability and can present hazards to employees who handle it. Always follow all recommended safety and handling practices.

Operationally Empty

This is a term developed by BP and CPAI for **non-hazardous** or **RCRA E&P exempt** residues in vacuum trucks or other large containers. “Operationally empty” is a concept discussed in the BP and CPAI waste training programs — it is not a legal or regulatory term. If the truck or container has been emptied to the extent practicable using normal means, the remaining non-hazardous residue is considered to be a negligible or *de minimis* quantity that does not affect the classification of the next load. Operationally empty applies only to non-hazardous or E&P exempt residues (such as fresh water, seawater, unused drilling mud, or exempt fluid). Containers that have carried new diesel, new methanol, new xylene, new acid, or any other hazardous material that would be considered a hazardous waste must first become “**RCRA empty**” (see definition below) before being rinsed or used to pick up a load of different material.

RCRA Empty

This regulatory term applies to **hazardous** residues remaining in containers. Containers that have carried new diesel, new methanol, new xylene, new acid, or any other hazardous material that would be considered a hazardous waste must first become “RCRA empty” before being rinsed or used to pick up a load of different material. Containers are portable devices; therefore, the term does not apply to residues in stationary tanks.

Even if the container is RCRA empty, subsequent rinse fluids are newly-generated wastes, and they are subject to a hazardous waste determination for hazardous waste characteristics. E&P exempt fluids will still be E&P exempt when they are rinsed from the container using non-hazardous fluids.

(continued)

RCRA Empty (continued)

The contents of a container are not regulated as hazardous waste if the container:

Has been emptied as much as possible by normal means (e.g., pouring, pumping, aspirating), **AND**

There is no more than 1 inch of residue, or no more than 3 percent by weight of the total capacity in containers that hold 119 gallons or less, or no more than 0.3 percent by weight if the container is larger than 119 gallons.

Recycling

Recycling differs from beneficial reuse. Recycling waste requires some type of reclamation, processing, or treatment to make the material usable again. Recycling may be regulated when the material would be classified as hazardous waste if it were discarded instead of recycled. Check with your environmental or HSE representative before attempting to recycle.

Solid Waste

This term is commonly used in the field to describe trash, garbage, refuse, and debris that are actually in a solid physical state; however, the RCRA regulatory definition is much broader and includes any discarded material, including some recyclables, whether they are solids, liquids, or contained gases.

Universal Waste

A special subset of hazardous waste subject to an alternative (less stringent) regulatory scheme under 40 CFR Part 273. Universal wastes include batteries (Ni-Cad, mercury, lithium, etc.), thermostats, discarded mercury-containing equipment (instruments, thermostats, barometers, manometers, temperature and pressure gauges, mercury switches), and lamps (fluorescent tubes, incandescent light bulbs, mercury vapor lamps, etc.). They are collected and managed in accumulation areas, and are shipped off site to approved facilities for recycling, but the weights or volumes do not have to be counted towards the facility's hazardous waste generator status. Facilities can accumulate universal waste on site for up to one year.

Used Oil

Any oil that has been refined from crude oil, or any synthetic oil, that has been used and as a result of such use is contaminated by physical or chemical impurities. Used oil is presumed to be recycled. Until used oil is mixed with crude oil, so that the used oil is less than one percent of the mixture, any tank or container holding the used oil must be labeled "USED OIL" and the requirements of 40 CFR 269.10 must be followed.

5. WASTE MANAGEMENT PLANNING

Waste management must be included in the planning process for all projects and operations. Do not assume that any waste generated on a project can be accepted by the nearest BP or CPAI disposal facility. Inadequate waste management planning can have very costly consequences.

First:

- Identify products that will be used, such as fuels, lubricants, cleaners, and other chemicals.
- Identify the type and amount of waste likely to be generated.
- Evaluate waste minimization, recycling, and pollution prevention opportunities. These efforts may significantly reduce disposal costs, environmental impact, and regulatory liabilities.
- Substitute suitable products that are less toxic and less hazardous.
- Think of alternative approaches to your project or task that could avoid the generation of waste altogether.
- Identify beneficial reuses or recycling opportunities for your excess materials before your work begins.

Next:

- Review this information with the BP or CPAI environmental staff.
- Determine disposal or recycling options for each waste stream.
- Select the appropriate facilities for managing each waste stream.
- Determine (in advance) what waste analysis plans, sampling, documentation, permits or other agency approvals, or training will be required.
- Set up procedures for transportation and delivery to the selected facilities.
- Communicate the plan to personnel involved in the work.

Seismic, Exploration, and Remote Drilling Programs

Waste management plans are especially critical for seismic, exploration, and remote drilling operations. This is also true for one-time abandonment and remediation projects. On-site storage and disposal options are limited, and logistics for off-site disposal are complicated. A written waste management plan must be prepared and approved by the appropriate BP or CPAI environmental representative well before any field work begins.

Wildlife Avoidance Planning

Wildlife Avoidance and Interaction Plans have been prepared in several North Slope operating areas to protect both workers and wildlife and to minimize interactions between them. Proper waste management and disposal are critical to the success of these plans. It is especially important to store materials and waste in a way that prevents access to wildlife (bears, foxes, birds). This discourages wildlife from associating humans and facilities with food. Contact your local environmental representative for more information.

6. CONTRACTORS AND THIRD PARTIES

These disposal/reuse guidelines apply **only** to materials generated on BP/CPAI-operated facilities. If you generate hazardous or solid waste on BP/CPAI-operated sites, you are expected to closely coordinate waste management with BP/CPAI. This is essential for all persons and parties involved to assure systematic compliance with all federal, state, and local environmental laws and regulations. Other materials at other sites, such as those generated at a contractor's shop in Deadhorse, are the responsibility of that contractor unless specific arrangements have been made for management by BP or CPAI.

Contractors are an integral and essential part of BP and CPAI operations. Where contractor operations are under direct management by BP or CPAI, wastes can often be managed at BP/CPAI facilities.

Contractors and third parties **may not bring any waste materials generated outside field boundaries** into BP or CPAI facilities for disposal, recycling, or beneficial reuse without prior written approval. Similarly, contractors and third parties **may not take any waste materials generated on BP/CPAI facilities off site** without explicit instructions or approval from BP/CPAI.

BP and CPAI are willing to review contractor and third-party operations on a case-by-case basis. Materials generated outside the field will be considered for BP/CPAI management if (a) the contractor or third-party provides sufficient information about the waste stream or product, (b) the contractor or third party can demonstrate that they have an effective on-site waste management plan, (c) lease agreements and ballot agreements among the owners allow the acceptance of third-party wastes at that facility, and (d) waste management by BP/CPAI is consistent with contracts between the contractor and BP/CPAI and (e) is in the best interest of BP/CPAI. Please contact a BP or CPAI field environmental representative if you would like more information or assistance.

Contractors who would like more information about managing wastes at their own facilities are encouraged to contact environmental consultants and hazardous waste transportation and disposal contractors for technical assistance, as well as the EPA (www.epa.gov) and ADEC (www.dec.state.ak.us).

7. BENEFICIAL REUSE AND RECYCLING WITHIN BP AND CPAI FIELD BOUNDARIES

A variety of products can be collected and reused **within field boundaries**. BP and CPAI personnel, as well as contractors under BP and CPAI supervision, are encouraged to consider beneficial reuse as an alternative to disposal. Several approved reuse options are listed in the *Disposal/Reuse Tables*. **Other uses may be possible**, but these should be evaluated in consultation with the field environmental staff on a case-by-case basis.

The reused material must be an effective replacement for a similar volume of raw ingredient or new product that would normally be needed for the job. **Improper disposal through sham recycling or reuse is not allowed.** RCRA regulations prohibit the recycling of materials “used in a manner constituting disposal.” Therefore, if this guide does not clearly identify a specific reuse option for your waste stream, you must consult the appropriate BP or CPAI environmental representative for case-by-case approval before you reuse the material. Remember that contractors and third parties **may not bring any materials generated outside field boundaries** into BP or CPAI facilities for disposal, recycling, or beneficial reuse without prior written approval.

In each operating area, collection stations have been set up for materials like paper, cardboard, wood, metals, lamps, electronics, and plastic, which can be sent off site for recycling. Used oil, diesel, and other hydrocarbons should be recycled back into the production facilities. Check the *Facility Guides* (Attachment G) for information about hydrocarbon recycling in each operating area.

Green Star Program

BP and CPAI are firmly committed to waste minimization, source reduction, recycling, and beneficial reuse. Both companies are members of the Green Star program. This program, which was initiated by various regulatory agencies, recognizes companies that integrate pollution prevention and waste minimization into daily operations. All contractors are encouraged to enroll in the Green Star program. For information about Green Star certification, contact a BP or CPAI environmental representative or call the Green Star program headquarters at 278-7827 (www.greenstarinc.org).

Alaska Materials Exchange

The Alaska Materials Exchange (AME) is maintained by Green Star as a resource for businesses wishing to reuse materials and find alternatives to disposal. AME subscribers can publicize surplus and unwanted materials that can be made available to other companies. This can result in significant cost savings. Contact a BP or CPAI environmental representative for instructions and documentation requirements.

8. NEW CHEMICALS AND RESTRICTED PRODUCTS

New Chemical Evaluation

The New Chemical Evaluation (NCE) Program allows BP/CPAI Industrial Hygienists and other HSE staff to systematically evaluate regulations, health and safety issues, and disposal options for new chemicals prior to use. Any BP/CPAI employee, contractor, or third party who wants to bring new chemicals onto BP/CPAI-operated facilities must first submit a NCE request to BP/CPAI. Based on the NCE, the BP/CPAI HSE staff may suggest alternatives, start keeping records required by regulations, and/or restrict or control the use of the chemical.

If you are interested in ordering or trying a new product, be sure to contact your BP/CPAI Industrial Hygienist or environmental staff first, and allow time for the NCE.

Evaluate **all** products before purchase or use. Make sure you are aware of health risks, handling precautions, incompatibilities with other materials, and disposal requirements. Be aware that even “environmentally friendly” products may have hazardous properties and disposal restrictions.

Chlorinated or Halogenated Solvents

BP and CPAI strongly discourage the use of products containing chlorinated or halogenated solvents unless absolutely no other product will do the job. Chlorinated compounds are found in many popular commercial solvents, degreasers, and cleaners. Although these are very effective solvents, they pose serious health and environmental hazards, as well as liabilities for improper disposal and accidental releases. In addition to the EPA, the Occupational Safety and Health Administration, and ADEC, note that landowners may also restrict products. For example, the Bureau of Land Management bans the use of chlorinated solvents in the National Petroleum Reserve-Alaska.

Check the Material Safety Data Sheet (MSDS) for all products that you intend to purchase or use. If the product contains a chlorinated or halogenated solvent, look for an alternative. Examples of these solvents include:

1,1,1-trichloroethane	Methylene chloride
1,1,2-trichloroethane	Ortho-dichlorobenzene
1,1,2-trichloro-1,2,2-trifluoroethane	Tetrachloroethylene
Carbon tetrachloride	Trichloroethylene
Chlorobenzene	Trifluoroethane
Chlorinated fluorocarbons	Trichlorofluoromethane

If there is no suitable alternative, advise your field environmental representative. Follow instructions for proper management and disposal as hazardous waste.

Do not mix chlorinated solvents with used oil or any other wastes, since the entire mixture may have to be managed as hazardous waste.

9. DISPOSAL/REUSE TABLES: INSTRUCTIONS

STEP 1: Look for your material in Column 1.

Materials are listed in alphabetical order. There may be several listings for the same material. **Read each listing carefully!**

Select the listing that matches your situation or waste-generating process.

Be sure to note the difference between **used** and **unused** material, and material that has circulated through the well system (i.e., was “brought to the surface” or came “from downhole”) vs. excess or unused material that has not been circulated downhole.

If an item or disposal/reuse option is not in these tables, do not guess and do not use the closest match! Contact your environmental representative for a case-by-case determination.

STEP 2: Note the classification in Column 2.

You will need this information to select an appropriate disposal facility.

Wastes for Class I disposal on the North Slope must be non-hazardous or RCRA-exempt.

Note that wastes eligible for Class II disposal are also eligible for disposal in a Class I well (subject to operational restrictions).

Wastes for Class II disposal must meet the criteria shown in Attachment B, *Class II Disposal Guidelines*, and be authorized by an AOGCC Area Injection Order or Disposal Injection Order.

If you are not sure of the classification, store “unknown” wastes separately and **immediately** contact the environmental staff for assistance.

Do not mix wastes of different classification until you definitely know that both wastes are allowed to go to the same facility for disposal, you know that the two wastes are compatible with each other chemically and physically, and you know how to properly prepare manifests for a mixed load!

Do not mix potentially hazardous wastes with used oil or other wastes!

If your waste is hazardous, contact the environmental staff for assistance.

STEP 3: Check the disposal/reuse options in Column 3.

Several options are presented. Selection will depend on practical considerations, such as season and location, each facility’s operating limits, company policies, and other restrictions.

Note: if EOR is listed as an option, all fluids must still meet the specifications in Attachment C, *Enhanced Oil Recovery Specifications*.

(continued)

STEP 4: Check the *Facility Guides* for site-specific information.

A series of tables called *Facility Guides* are attached (Attachment G). They summarize the management options that are available at each location.

Each facility has its own operating restrictions and paperwork requirements.

Contact the facility or the environmental staff in advance if there are any questions about procedure.

Only certified generators, transporters, and receivers may manifest materials to or receive materials at BP or CPAI facilities.

If an item or disposal/reuse option is not in these tables, do not guess and do not use the closest match! Contact your environmental representative for a case-by-case determination.

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
ACID Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Use for intended purpose <ul style="list-style-type: none"> – Hold for a well stimulation – Small amounts: rinse truck on location with displacement fluid and utilize as part of the displacement If not used for intended purpose, contact Environmental to discuss neutralization options prior to disposal
Returned from downhole ⁵ (stimulation flowback) and neutralized to meet receiving facility specifications	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
Battery acid removed from batteries	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Manage in accumulation area
AEROSOL CANS	<ul style="list-style-type: none"> Recyclable as scrap metal (follow site-specific procedures) Hazardous waste³ if discarded due to contents and/or container pressurization 	<ul style="list-style-type: none"> Use contents entirely, if possible Manage aerosol cans in accumulation area⁶ or as specified by Environmental staff Follow site-specific procedures for puncturing (and disposal of filters from collection drum - contact Environmental) In GPB, may bring directly to Hazardous Waste Process Facility (contact GPB Waste Coordinator)
AFFF FIRE-FIGHTING FOAM	<ul style="list-style-type: none"> Non-hazardous 	<ul style="list-style-type: none"> Stabilize and landfill Pad 3 may be an option (contact Pad 3 operators)
AMINE (MEA) Used to remove CO ₂ from feed stream at LNG Plant	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Contact Environmental Do not discharge into LNG plant wastewater system
ANTI-FOAM Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Do not mix different products Class I disposal well if non-hazardous Contact Environmental
ARCTIC PACK (<i>Diesel-based freeze-protection product</i>) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Recover for freeze protection for intended purpose May not be injected in disposal well if hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recover for freeze protection or other approved use Class I disposal well Class II disposal well Annular pumping at AOGCC-approved wells⁴

- Notes:**
- Typically non-hazardous, subject to verification
 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 - “Downhole” means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 - See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
ASBESTOS Asbestos debris, asbestos-containing material (ACM)	<ul style="list-style-type: none"> • Solid waste • Not RCRA-hazardous, but regulated under other programs 	<ul style="list-style-type: none"> • Follow company's asbestos management procedures (contact Environmental, Safety, or Industrial Hygiene) • Double bag and label • Send to permitted landfill off Slope (follow landfill operator's procedures)
ASH From waste incinerator	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Do not discard in dumpster • Class I disposal well (if non-hazardous) as slurry • Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
From fuel-burning heaters	<ul style="list-style-type: none"> • RCRA-exempt 40 CFR 261.4(b)(4) • Not E&P exempt 	<ul style="list-style-type: none"> • Do not discard in dumpster • Class I disposal well (if non-hazardous) as slurry • Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
BATTERIES Alkaline	<ul style="list-style-type: none"> • See Dumpster Guidelines • Non-hazardous 	<ul style="list-style-type: none"> • Landfill dumpster or • Collect in accumulation area⁶ and recycle
Lead-acid, unbroken	<ul style="list-style-type: none"> • Recyclable 40 CFR 266.80 • Universal waste 	<ul style="list-style-type: none"> • Return to supplier (follow specific handling and collection procedures in your operating area) • Manage in accumulation area⁶
Lead-acid, broken	<ul style="list-style-type: none"> • Recyclable 40 CFR 266.80 • Universal waste 	<ul style="list-style-type: none"> • Contact Environmental • Will require special handling prior to recycling • Manage in accumulation area⁶
Ni-Cad, mercury, lithium, silver-oxide, other	<ul style="list-style-type: none"> • Universal waste 	<ul style="list-style-type: none"> • Manage in accumulation area⁶ or designated collection area • Tape ends (recommended) to reduce potential fire hazard • Contact Environmental
BATTERY ACID <i>See "Acid"</i>		

- Notes:**
1. Typically non-hazardous, subject to verification
 2. Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 3. Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 5. "Downhole" means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 6. See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
BIOCIDES Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous and operationally acceptable (CAUTION: some biocide reacts with water to form an un-injectable solid) EOR (must meet the specifications in Attachment C) Triple-rinse and crush empty containers
Used in non-process vessels or lines not containing downhole ⁵ materials)	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous and operationally acceptable EOR (must meet the specifications in Attachment C)
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well if operationally acceptable Class II disposal well if operationally acceptable EOR (must meet the specifications in Attachment C)
BIOCIDES/DRILLING MUD MIXTURES Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
BIOZAN <i>See "Gel"</i>		
BLEED TRAILER FLUIDS Not returned from downhole ⁵	<ul style="list-style-type: none"> Recyclable Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental Recycle hydrocarbons in production stream Class I disposal well if non-hazardous, subject to testing and approval
Returned from downhole ⁵	<ul style="list-style-type: none"> Recyclable E&P exempt 	<ul style="list-style-type: none"> Contact Environmental Beneficial reuse as approved by Environmental Recycle hydrocarbons in production stream Class I disposal well Class II disposal well
BLUE GOO (RG-2401, RG-2400) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Use for intended purpose Contact Environmental
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recondition and reuse Contact Environmental

- Notes:**
- Typically non-hazardous, subject to verification
 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 - "Downhole" means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 - See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
BOILER BLOWDOWN WATER	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental <ul style="list-style-type: none"> – Use as makeup water for mud and workover mixtures – Use as rigwash • Class I disposal well if non-hazardous • Annular pumping (if generated on drilling rig) at AOGCC-approved wells⁴ • EOR (must meet the specifications in Attachment C)
BOILER SCALE	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Class I disposal well (if non-hazardous) capable of handling solids • Solids (no liquids) to Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
BRINE/KCl (<i>Potassium chloride</i>) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Recondition and reuse • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴ • EOR (must meet the specifications in Attachment C)
CALCIUM CARBONATE Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous
Rinsate (fresh or seawater) from unused, leftover product in tanks/trucks	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental • Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴
CARBOLITE (<i>Frac sand</i>) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well capable of handling solids, if non-hazardous • Approved solid waste storage area (always verify location with Environmental)
Oil-free, returned from reverse-out	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids
Oily, returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well subject to facility limitations on solids and hydrocarbon content • Class II disposal well subject to facility limitations on solids and hydrocarbon content

- Notes:**
1. Typically non-hazardous, subject to verification
 2. Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 3. Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 5. "Downhole" means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 6. See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
CARBON, ACTIVATED Unused, dry	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Return to distributor • Landfill disposal with NSB approval
Used to remediate contaminated groundwater or surface water	<ul style="list-style-type: none"> • Potentially hazardous² waste if discarded 	<ul style="list-style-type: none"> • Manage in accumulation area⁶
CAUSTIC Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • Use for intended purpose <ul style="list-style-type: none"> – Example: hold for a well stimulation • If no other use, contact Environmental
Returned from downhole ⁵ (stimulation flowback) and neutralized to meet receiving facility specifications	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
CEMENT Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous • Solids to Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
Returned from downhole ⁵ (may be contaminated with mud and contain retarder)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴ • Solids to Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
CEMENT RINSATE Cement residual not returned from downhole ⁵	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded (pH) 	<ul style="list-style-type: none"> • Use for intended purpose on another job (if pH adjustment is required, contact Environmental) • Class I disposal well if non-hazardous <ul style="list-style-type: none"> – May require solids separation – NOTE: GPB Pad 3 requires pH ≤11 • Annular pumping at AOGCC-approved wells⁴
Cement residual returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Use on another job (if pH adjustment is required, contact Environmental) • Class I disposal well <ul style="list-style-type: none"> – May require solids separation – NOTE: GPB Pad 3 requires pH ≤11 • Class II disposal well • Annular pumping at AOGCC-approved wells⁴

- Notes:**
1. Typically non-hazardous, subject to verification
 2. Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 3. Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 5. “Downhole” means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 6. See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
CEMENT SPACER <i>(Chemical)</i> Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
CHEM CLEAR <i>(Commercial hydrocarbon-based cleaner)</i> Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ (verify flash point) 	<ul style="list-style-type: none"> Use for intended purpose Recycle in production stream Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have not been downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous Recycle in production stream EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have been downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recycle in production stream Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
CHEMICALS AND REAGENTS Unused, leftover, not returned from downhole ⁵ <ul style="list-style-type: none"> Anti-foam Corrosion inhibitor Emulsion breaker Scale inhibitor Drilling mud reagents Other additives 	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Do not mix different products Contact Environmental as soon as disposal is required Manage in accumulation area⁶
CLAY STABILIZER L64 <i>(Tetramethyl-ammonium chloride)</i> Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recondition and reuse Class I disposal well Class II disposal well

- Notes:**
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 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 - “Downhole” means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 - See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
<p>CLEANOUTS</p> <p>Residues from lines, vessels, or equipment, not returned from downhole⁵</p> <p><i>See also "Tank/Vessel Solids"</i></p>	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Recycle hydrocarbon-based fluids in production stream Oily solids to approved solid waste storage area (always verify location with Environmental) Class I disposal well if non-hazardous
<p>Residues from lines, vessels, or equipment containing E&P exempt materials such as vessel sediments, pigging solids, crude oil</p> <p><i>See also "Tank/Vessel Solids", "Well Returns"</i></p> <p>May include non-hazardous surfactants and detergents, non-hazardous hydrocarbon-based cleaning agents</p>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recycle hydrocarbon-based fluids in production stream Oily solids to approved solid waste storage area (always verify location with Environmental) Class I disposal well capable of handling solids Class II disposal well capable of handling solids
<p>COMPLETION FLUID</p> <p>Unused, leftover, not returned from downhole⁵ such as weighted brine with lost circulation material (LCM)</p>	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous
<p>Returned from downhole⁵, such as weighted brine with LCM</p>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
<p>COMPUTER EQUIPMENT</p> <p><i>See "Electronic Equipment"</i></p>		
<p>CONDENSATES</p> <p>Drain sump and blow case discharge (i.e., bridle blowdown); lineup of reboiler condensate knockout pots during gas plant upsets</p>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recycle hydrocarbon-based fluids in production stream Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
<p>CORROSION INHIBITOR</p> <p>Unused, leftover, not returned from downhole⁵</p>	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded (verify with Environmental) 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
<p>Returned from downhole⁵</p>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)

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DISPOSAL/REUSE TABLES

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CRUDE OIL Sales-quality crude oil from DOT-regulated common carrier pipelines and crude oil topping plants (COTU, KUTP)	<ul style="list-style-type: none"> • Recyclable • Not E&P exempt – but meets the “recovered oil” exemption 40 CFR 261.4(a)(12)(ii) 	<ul style="list-style-type: none"> • Recycle in production stream • Contact Environmental
From in-field wells, flowlines, production facilities (including dead crude), DOT-regulated non -common carrier lines	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Use for freeze protection • Contact Environmental • Class I disposal well only if recycling is not possible • Class II disposal well only if recycling is not possible
CRUDE OIL TOPPING UNIT (COTU/KUTP) Crude oil storage tank sediment	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental • Recycle in production stream per 40 CFR 261.4(a)(12) • Manage as hazardous waste (K169) if not recycled • Rinsate from tank, truck, vessel, if not recycled, requires additional waste determination – contact Environmental
Process fluids (crude oil, diesel, aviation fuel, arctic heating fuel)	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental • Recycle in production stream per 40 CFR 261.4(a)(12)
Heat exchanger bundle cleaning sludge	<ul style="list-style-type: none"> • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental • Manage as hazardous waste (K050)
CRUDE/DIESEL MIXTURES Mix of crude and unused, leftover, diesel (diesel has not been downhole ⁵)	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Contact Environmental
Mix of crude and returned diesel (diesel used downhole ⁵)	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Class I disposal well only if recycling is not possible • Class II disposal well only if recycling is not possible
CUTTINGS Returned to surface when drilling UIC disposal well or source water well	<ul style="list-style-type: none"> • Contact Environmental 	<ul style="list-style-type: none"> • Contact Environmental
Returned from downhole ⁵ , including those removed when reconditioning mud	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids • Annular pumping at AOGCC-approved wells⁴

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DESCALER Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Manage in accumulation area⁶
DESSICANT From air compressors	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well capable of handling solids (if non-hazardous) Minimize dust while handling
Used in gas conditioning skids	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well capable of handling solids Class II disposal well capable of handling solids Borough landfill if non-hazardous (subject to preapproval by Borough) Minimize dust while handling
DETECTOR TUBES Dräger and similar tubes (Sensidyne, Gastec, RAE, etc.)	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Manage in accumulation area⁶
DIATOMACEOUS EARTH Used to filter new seawater and brine that has not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Fluid: see “Brine” Class I disposal well (if non-hazardous) capable of handling solids Solids to Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
Used to filter returned seawater and brine	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Fluid: see “Brine” Class I disposal well capable of handling solids Class II disposal well capable of handling solids

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<p>DIESEL AND DIESEL MIXTURES</p> <p>Unused, leftover, not returned from downhole⁵</p> <p>New product remaining in temporary service hookups at wellhead (lines have not contained downhole⁵ materials)</p> <p>New product used to pressure test new or non-process lines (lines have not contained downhole⁵ materials)</p> <p>New product used to clean or flush production lines or vessels, even if they contain downhole⁵ materials</p> <p><i>See also "Freeze Protection Fluids from Above-ground Well Operations"</i></p>	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • NOTE: BP and CPAI discourage disposal of hydrocarbons if recycling is possible • Do not use new product diesel for pressure testing or solvent properties without consulting Environmental in advance! • Recover fluids for approved reuse (fuel, freeze protection, well work) • Recycle in production stream • Do not dispose of new product diesel in Class I or Class II disposal wells even if mixed with exempt or Class II-eligible wastes • Contact Environmental in your operating area for site-specific options and procedures
<p>Used downhole⁵ on a source water well or Class I disposal well for freeze protection, downhole testing, etc.</p>	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recover fluids for approved reuse (fuel, freeze protection, well work) • Recycle in production stream
<p>Used downhole⁵ on an E&P well for freeze protection, downhole testing, etc.</p> <p>Used to pressure test existing production flowlines (lines have contained downhole⁵ fluids)</p> <p>Reused to clean production lines, vessels, or equipment containing downhole⁵ materials (mixture of returned diesel + E&P exempt waste)</p>	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recover fluids for approved reuse (fuel, freeze protection, well work) • Recycle in production stream • Class I disposal well • Class II disposal well

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<p>DIRT</p> <p>Dry floor sweepings, incidental soil or road/pad dirt that is not from downhole⁵</p> <p><i>See also "Cuttings," "Gravel," "Sandblast Media," "Sump Solids"</i></p>	<ul style="list-style-type: none"> Potentially hazardous waste² if contains metal filings, paint chips, chemical spill residues 	<ul style="list-style-type: none"> Small quantities (mixed with regular trash) in landfill dumpsters if non-hazardous Significant amounts – approved solid waste storage area (always verify location with Environmental – testing may be required) Class I disposal well (if non-hazardous) capable of handling solids Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
<p>Wet solids from sumps, tanks, etc.; not from downhole⁵</p>	<ul style="list-style-type: none"> Potentially hazardous waste² if contains metal filings, paint chips, chemical spill residues 	<ul style="list-style-type: none"> Approved solid waste storage area (always verify location with Environmental – testing may be required) Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well (if non-hazardous) capable of handling solids <ul style="list-style-type: none"> Waste stream usually determined by the "carrier" fluid (such as "Sump Fluid", "Equipment/Facility Wash Water", etc.)
<p>E&P exempt solids, may be mixed with E&P exempt fluids</p>	<ul style="list-style-type: none"> Classification depends on process (evaluate on case-by-case basis) 	<ul style="list-style-type: none"> Approved solid waste storage area (always verify location with Environmental – testing may be required) Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well capable of handling solids Class II disposal well capable of handling solids
<p>DIRTY WATER OR SLOP OIL TANK</p> <p>Fluids consisting only of E&P exempt fluids and/or recyclable used oil</p>	<ul style="list-style-type: none"> Recyclable (oil) E&P exempt 	<ul style="list-style-type: none"> Hydrocarbons skimmed and recycled in production stream Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
<p>Solids removed during cleanout of dirty water tank at production facility</p>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Oily solids to approved solid waste storage area (always verify location with Environmental) Class I disposal well capable of handling solids Class II disposal well capable of handling solids
<p>DOMESTIC WASTEWATER</p> <p><i>See "Sewage"</i></p>		

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1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
DRAG REDUCING AGENT (DRA) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Physical properties require special handling Approved solids storage area (always verify location with Environmental)
DRÄGER TUBES <i>See "Detector Tubes"</i>		
DRILLING MUD <i>See "Mud"</i>		
DRUMS/BARRELS Not empty	<ul style="list-style-type: none"> Contents may be hazardous waste (product-specific) 	<ul style="list-style-type: none"> Use contents completely If unusable, contact Environmental
Empty	<ul style="list-style-type: none"> May be recyclable Non-hazardous¹ 	<ul style="list-style-type: none"> Barrel Crushing Facility or approved scrap metal recycler/drum reconditioner Collect as instructed prior to delivery See facility-specific procedures
ELECTRONIC EQUIPMENT Used or discarded computers, monitors, keyboards, televisions, VCRs, etc.	<ul style="list-style-type: none"> May be recyclable Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Contact Environmental for site-specific collection and recycling procedures
EMPTY CONTAINER RESIDUE Residue and rinsate inside RCRA-empty vessels or containers (see Definitions)	<ul style="list-style-type: none"> RCRA-exempt only while remaining in container Potentially hazardous waste² when removed from container Not E&P exempt 	<ul style="list-style-type: none"> Requires hazardous waste determination if removed from container Class I disposal well if non-hazardous Contact Environmental
EMULSION BREAKER Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded (flash point) 	<ul style="list-style-type: none"> Use for intended purpose Contact Environmental if disposal is required
EPINEPHRINE <i>See "Medical Waste"</i>		
EXIT SIGNS Self-illuminating (contain tritium)	<ul style="list-style-type: none"> Radioactive (low-level) 	<ul style="list-style-type: none"> Do not discard in trash Contact Environmental (will be returned to manufacturer if possible)

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DISPOSAL/REUSE TABLES

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FILTERS Diesel	<ul style="list-style-type: none"> Non-hazardous¹ solid, subject to testing 	<ul style="list-style-type: none"> Recover fluids for approved reuse Place drained filter in oily waste bag Oily waste dumpster (no free liquids) – subject to NSB testing requirement Beluga incinerator
Glycol or motor oil	<ul style="list-style-type: none"> Non-hazardous¹ See Dumpster Guidelines 	<ul style="list-style-type: none"> Hot drain and puncture, place in oily waste bag Oily waste dumpster (no free liquids) Beluga incinerator
TEG, from production facility; may be contaminated with crude oil when changed out	<ul style="list-style-type: none"> E&P exempt See Dumpster Guidelines 	<ul style="list-style-type: none"> Hot drain and puncture, place in oily waste bag Oily waste dumpster (no free liquids) Beluga incinerator Fluids to Class II disposal well or Class I disposal well
Other	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental
FIN FAN FOAM (<i>Non-hazardous commercial product</i>) Used to clean inlet coolers at production facilities; typically mixed with freshwater and particulates after use	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Class I disposal well capable of handling solids, if non-hazardous EOR (must meet the specifications in Attachment C) Contact Environmental for possible alternatives
FIRE EXTINGUISHING POWDER	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
FLARE/RELIEF PIT WATER Freshwater in unused or closed out pits (pits do not contain downhole ⁵ residuals)	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Recover fluid for reuse Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Freshwater in used or active pits that contain downhole ⁵ residuals	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recover fluid for reuse Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
FLOWBACK FLUIDS <i>See "Well Returns"</i>		
FLUORESCENT TUBES <i>See "Lamps"</i>		
FOAM, POLYURETHANE Leftover chemical products from spray job	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental

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FORMALDEHYDE Including formaldehyde-soaked rags and PPE	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Manage in accumulation area⁶
FRAC FLUIDS Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Use for intended purpose Recycle as approved (if gel is broken) Class I disposal well if non-hazardous Contact Environmental to determine if testing required
Returned, flowback from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
FRAC SAND <i>See "Carbolite"</i>		
FREEZE PROTECTION FLUIDS Diesel and/or methanol/water mixtures not in contact with downhole ⁵ fluids <ul style="list-style-type: none"> Used to freeze-protect new pipelines Used during well work on a source water well or Class I disposal well <i>See also "Methanol and Methanol/Water Mixtures"</i>	<ul style="list-style-type: none"> Recyclable hydrocarbons (diesel mixtures only) Hazardous waste³ if discarded Not E&P exempt 	<ul style="list-style-type: none"> Do not dispose of new product diesel or methanol in Class I or Class II disposal wells Recover fluids for approved reuse (including hydrocarbon recycle and EOR after hydrocarbons are recovered) Contact Environmental in your operating area for site-specific options and procedures
Diesel and/or methanol/water mixtures in contact with downhole ⁵ fluids <ul style="list-style-type: none"> Used for above-ground freeze protection during well work on an E&P well (as in coil tubing unit) 	<ul style="list-style-type: none"> Recyclable E&P exempt 	<ul style="list-style-type: none"> If possible, segregate fluid that has not been returned from downhole⁵, and use for intended purpose Recover fluids for approved reuse (including hydrocarbon recycle and EOR after hydrocarbons are recovered) Class I disposal well <ul style="list-style-type: none"> Describe on manifest (Section 2) as "Surface freeze protection fluids commingled with downhole fluids from (coil tubing, drilling, etc.) operation" Class II disposal well
FREON (refrigerant)	<ul style="list-style-type: none"> Non-hazardous¹ if reclaimed per 40 CFR 261.4(b)(12) 	<ul style="list-style-type: none"> Contact Environmental for storage/disposal/ reclaiming instructions
FRICTION REDUCER <i>See "Drag Reducing Agent"</i>		
GARBAGE, FOOD WASTE	<ul style="list-style-type: none"> Solid waste Non-hazardous¹ 	<ul style="list-style-type: none"> Do not discard in outdoor dumpsters except for specifically marked food dumpsters with animal-proof lids Discard indoors in marked containers or kitchen dumpsters

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GASOLINE – Clean	<ul style="list-style-type: none"> • Usable product – not a waste 	<ul style="list-style-type: none"> • Recover and use for intended purpose
– Contaminated, not usable	<ul style="list-style-type: none"> • Recyclable • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Manage in accumulation area⁶ • Contact Environmental
GEL + CARBOLITE + DIESEL Mixture of leftover gel, carbolite, and unused diesel (diesel not used downhole ⁵) <i>See “Frac Fluids” for mixture returned to surface</i>	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Use for intended purpose • Recycle as approved (if gel is broken) • Skim and reuse diesel • Class I disposal well capable of handling solids, if non-hazardous • Contact Environmental to determine testing requirements
Mixture of leftover gel, carbolite, and diesel returned from downhole ⁵ <i>See “Frac Fluids” for mixture returned to surface</i>	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Segregate for future reuse • Skim and reuse diesel • Class I disposal well capable of handling solids, only if diesel is E&P exempt (e.g., previously used for freeze protection in E&P well) • Class II disposal well capable of handling solids, only if diesel is E&P exempt (e.g., previously used for freeze protection in E&P well)
GEL, BIOZAN, OR DUAL POLY Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous • Contact Environmental to determine testing requirements • EOR (must meet the specifications in Attachment C)
Returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)

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<p>GLYCOL</p> <p>Unused, leftover, not returned from downhole⁵, any type:</p> <ul style="list-style-type: none"> – Monoethylene (MEG) – Triethylene (TEG) – Propylene (PG) <p><i>See also "Production Facility Fluids"</i></p>	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Recover fluid for reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used <u>antifreeze</u> (MEG, PG, etc.) from vehicles and equipment	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Recover fluid for reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used to <u>freeze protect</u> lines/vessels that have not contained downhole ⁵ fluids	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Recover fluid for reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used to <u>freeze protect</u> existing production flowlines (lines have contained downhole ⁵ fluids)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
Used to <u>pressure test</u> lines/vessels that have not contained downhole ⁵ fluids	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Recover fluid for reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used to <u>pressure test</u> existing production flowlines (lines have contained downhole ⁵ fluids)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
<p>GRAVEL</p> <p>Clean</p>	<ul style="list-style-type: none"> • Not a waste 	<ul style="list-style-type: none"> • Stockpile in designated areas for reuse • Do not place in dumpsters
From spill cleanups, contaminated with fluids that have not been downhole ⁵ (e.g., new mud, diesel)	<ul style="list-style-type: none"> • Potentially hazardous waste², depending on material spilled • Subject to testing 	<ul style="list-style-type: none"> • Do not discard in dumpster • Class I disposal well (if non-hazardous) capable of handling solids • Non-hazardous gravel (if excavated) to approved storage area for future remediation (always verify location with Environmental) • Hazardous gravel (if excavated) managed as hazardous waste in accumulation area⁶ or hazardous waste storage area
From well cellars, spill cleanups, contaminated with fluids from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Do not discard in dumpster • Class II disposal well capable of handling Class II solids • Gravel (if excavated) to approved solid waste storage area for future remediation (always verify location with Environmental)

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DISPOSAL/REUSE TABLES

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GRAYWATER <i>See "Sewage"</i>		
GREASE – Lubricating Non-lead, used to lubricate fittings, pipes, etc. <i>See also "Kitchen Grease"</i>	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Contact Environmental for site-specific procedures
Containing metallic lead	<ul style="list-style-type: none"> • Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • Manage in accumulation area⁶
H₂S MONITORS (personal)	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Collect and return to supplier (contact Environmental for assistance) • Manage as recyclable electronic equipment
HAZARDOUS WASTE May include paints, thinners, chlorinated solvents, xylene, acids, caustics, methanol, etc.	<ul style="list-style-type: none"> • Hazardous waste if discarded³ 	<ul style="list-style-type: none"> • Do not transport across field boundaries • Manage in accumulation area⁶ • Contact Environmental • Do not mix with other waste or add to recyclable fluids such as used oil or glycol
HYDRATES	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well
HYDROTEST FLUIDS <i>See "Methanol", "Water"</i>		
INVESTIGATIVE-DERIVED WASTE (IDW) Waste (including PPE) from various sampling and remediation projects	<ul style="list-style-type: none"> • Potentially hazardous² waste 	<ul style="list-style-type: none"> • Handling of IDW should be clearly identified in any environmental consultant's sampling plan
INK CARTRIDGES, TONERS <i>See "Office Machine Supplies"</i>		
IRON SULFIDE/IRON SPONGE From DOT-regulated common carrier pipelines and topping plants (COTU, KUTP)	<ul style="list-style-type: none"> • Hazardous waste³ if discarded • Spontaneously ignites when dry and exposed to oxygen • Not E&P exempt 	<ul style="list-style-type: none"> • Follow applicable safety procedures for handling and storage • Store wet in leak-proof container in accumulation area⁶ • Contact Environmental and disposal facility
Polyphoric iron sulfide scale from production vessels and lines	<ul style="list-style-type: none"> • E&P exempt • Spontaneously ignites when dry and exposed to oxygen 	<ul style="list-style-type: none"> • Follow applicable safety procedures for handling and storage • Store wet in leak-proof container • Class II or Class I disposal well as slurry – subject to special approval and procedures • Contact Environmental and disposal facility

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KCL (<i>Potassium chloride</i>) <i>See "Brine"</i>		
KILL WEIGHT FLUID Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well Class II disposal well
KITCHEN GREASE	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Contact Environmental for site-specific procedures
KNOCKOUT LIQUIDS From normal process separation	<ul style="list-style-type: none"> Recyclable E&P exempt 	<ul style="list-style-type: none"> Recycle hydrocarbon-based fluids in production stream Class I disposal well Class II disposal well
LABORATORY WASTES <i>See "Chemicals", "Samples", "Solvent"</i>	<ul style="list-style-type: none"> Contact Environmental Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Follow site-specific Chemical Hygiene Plan (approved by Environmental)
LAMPS (<i>Light bulbs</i>) <u>Whole</u> , all types (incandescent, fluorescent, halogen)	<ul style="list-style-type: none"> Recyclable Universal waste 	<ul style="list-style-type: none"> Manage in accumulation area⁶ Contact Environmental for site-specific collection procedures
Accidentally broken (all types)	<ul style="list-style-type: none"> Universal waste 	<ul style="list-style-type: none"> Manage in accumulation area⁶ Contact Environmental for site-specific collection procedures
LEAD ACETATE TAPE	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Contact Environmental for storage and disposal instructions Manage in accumulation area⁶
LEATHER ARTICLES <i>Gloves, etc.</i>	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental in your operating area for site-specific options and procedures
LIGHT BULBS <i>See "Lamps"</i>		
LITHIUM HYPOCHLORITE	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Do not mix with other chemicals – contact Environmental for disposal instructions

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LOST CIRCULATION MATERIAL Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Borough landfill if non-hazardous (subject to testing and preapproval by Borough) • Approved solid waste storage area (always verify location with Environmental) • Not recommended for disposal by injection
Returned from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Use for intended purpose (as approved by Environmental) • Wash and send to Borough landfill if non-hazardous (subject to testing and preapproval by Borough) • Approved solid waste storage area (always verify location with Environmental) • Disposal by injection not recommended for (contact injection facility for instructions)
MEDICAL WASTE Equipment <u>without</u> mercury (sharps, razors, swabs, etc.)	<ul style="list-style-type: none"> • Solid waste • Potentially infectious and/or biohazard waste 	<ul style="list-style-type: none"> • Collect sharps in “Sharps” containers (provided by clinics and Housekeeping) • Contact clinic for biohazard storage (bloody articles, etc.) • Biohazard waste collected in “biohazard” bags; sent to approved treatment facility or vendor (contact Environmental) • Special handling required for mercury debris
Medical clinic pharmaceuticals	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Refer to site-specific medical waste handling procedure • Manage in accumulation area⁶ • Return to medical contractor for disposal or recycling • Contact Environmental for instructions • NOTE: Discarded medical epinephrine and nitroglycerine formulations are not hazardous waste
Personal medications	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Avoid discarding in trash • Contact Environmental or medical clinic for assistance
MERCURY / MERCURY DEBRIS Broken thermometers, contaminated rags, etc.	<ul style="list-style-type: none"> • Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • Manage in accumulation area⁶ • Contact Environmental
Lamps (light bulbs), thermostats, other equipment	<ul style="list-style-type: none"> • Universal waste 	<ul style="list-style-type: none"> • Manage in accumulation area⁶ • Contact Environmental
METAL, SCRAP <i>See “Scrap Metal”</i>		

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<p>METHANOL AND METHANOL/WATER MIXTURES</p> <p>Unused, leftover, not returned from downhole⁵</p> <ul style="list-style-type: none"> - New product remaining in temporary service hookups at wellhead (lines have not contained downhole⁵ materials) - New product used to <u>pressure test</u> new or non-process lines (lines have not contained downhole⁵ fluids) - New product recovered from <u>spill cleanups</u> <p><i>See also:</i></p> <ul style="list-style-type: none"> - "Freeze Protection Fluids from Above-ground Well Operations" - "Production Facility Fluids" - "Turbine Washwater" 	<ul style="list-style-type: none"> • Contact Environmental in local operating area • Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • New product methanol may not be disposed of in Class I or Class II disposal wells • Do not use new methanol to pressure test new lines without consulting Environmental in advance! • Recover fluids for freeze protection or other approved reuse • Contact Environmental in your operating area for site-specific options and procedures
<p>Not in contact with downhole materials</p> <p>Used on well that is not E&P (e.g., source water well, Class I wells) for well work (freeze protection, downhole testing, etc.)</p>	<ul style="list-style-type: none"> • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recover fluids for freeze protection or other approved reuse (contact Environmental) • Contact Environmental in your operating area for site-specific options and procedures
<p>Used downhole⁵ for E&P well work (freeze protection, downhole testing, etc.)</p> <p>Used to <u>pressure test</u> existing production flowlines (lines have contained downhole⁵ fluids)</p>	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Recover fluids for freeze protection or other approved reuse (contact Environmental) • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
<p>MINERAL OIL</p> <p><i>See "Oil, Mineral"</i></p>		
<p>MOLECULAR SIEVE (<i>Activated alumina</i>)</p>	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Do not discard in dumpster • Borough landfill if non-hazardous (subject to testing and preapproval by Borough)

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MUD, DRILLING (<i>Water or oil-based</i>) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Use to displace annulus prior to workover • Class I disposal well if non-hazardous
Returned from downhole ⁵ (production well or Class II well)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴
MUD RINSATE Fresh or seawater used to rinse leftover or unused mud from tanks, trucks, mud pits, lines, equipment (mud has not gone downhole ⁵)	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental • Class I disposal well if non-hazardous • Annular pumping at AOGCC-approved wells⁴
Fresh or seawater used to rinse returned product from tanks, trucks, rig mud pits, and lines (mud has been downhole ⁵)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴
MUD SOLIDS Solids from downhole ⁵ , removed when reconditioning returned mud <i>See also "Cuttings"</i>	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids
MUD TITRATION WASTE	<ul style="list-style-type: none"> • Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • Manage in accumulation area⁶
MUTUAL SOLVENT (<i>Commercial product containing ethylene glycol monobutyl ether</i>) – "Musol" (Halliburton); "U-66" (Dowell)		
Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have not been downhole ⁵	<ul style="list-style-type: none"> • Mixture may be hazardous waste² if discarded 	<ul style="list-style-type: none"> • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have been downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)

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NATURAL GAS LIQUIDS (NGLs) Exported via DOT-regulated common carrier pipelines	<ul style="list-style-type: none"> • Recyclable • Not E&P exempt Hazardous waste³ if discarded 	<ul style="list-style-type: none"> • Caution: NGLs are very volatile • Recycle in production stream
Generated at field production facility as part of process or from the DOT-regulated NGL pipeline, which is not a common carrier pipeline	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Caution: NGLs are very volatile • Recycle in production stream • Class I disposal well • Class II disposal well
NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM)	<ul style="list-style-type: none"> • E&P exempt, but regulated under separate program 	<ul style="list-style-type: none"> • Contact Environmental and/or Safety for special handling requirements • Class I or II disposal well capable of handling solids, if approved for NORM
OFFICE MACHINE SUPPLIES Toners, etc. from printer, copier, fax	<ul style="list-style-type: none"> • Potentially recyclable • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Follow collection procedures in each operating area • Return to manufacturer if possible • Contact Environmental prior to disposal
OIL, CRUDE <i>See "Crude Oil", "Production Facility Fluids"</i>		
OIL, HYDRAULIC OR LUBRICATING, UNUSED – Gear/motor oil – Lube oil – Hydraulic fluid – Transmission fluid, etc.	<ul style="list-style-type: none"> • Recyclable • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Recycle in production stream • Class I disposal well if non-hazardous • NOTE: BP and CPAI discourage disposal of hydrocarbons if recycling is possible.

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OIL, HYDRAULIC OR LUBRICATING, USED From vehicles, maintenance, and/or non-process equipment	<ul style="list-style-type: none"> • Recyclable • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental for approval to recycle in production stream or to reuse as fuel (testing may be required) • Class I disposal well if non-hazardous
From production facility, <u>not in contact</u> with produced fluids – Used oil from <u>surface</u> safety valves: – Transmission fluid used in gear boxes (e.g., TEG transfer pump) – Hydraulic oil leakage from turbine engines – Lube oil leakage from compressors, vent gas blower, turbines, blowcases – Leaks to the drain sump via hard piping	<ul style="list-style-type: none"> • Recyclable • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Class I disposal well if non-hazardous • NOTE: BP and CPAI discourage disposal of hydrocarbons if recycling is possible.
<u>In contact</u> with produced fluids – Hydraulic oil from <u>subsurface</u> safety valve system	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Class I disposal well • Class II disposal well
OIL, MINERAL Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Recyclable • Non-hazardous¹ 	<ul style="list-style-type: none"> • Recycle in production stream. NOTE: check with Operations prior to recycling through production facility – may cause problems in plant. • Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream. NOTE: check with Operations prior to recycling through production facility – may cause problems in plant. • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴
OIL, SEAL – used Compressor seal oil in contact with gas stream, collected from knockout pots	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle in production stream • Class I disposal well • Class II disposal well
OILY SAND, SOIL <i>See “Gravel”</i>		

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PAINTING WASTES Paints, thinners (used or unused)	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Use for intended purpose Manage in accumulation area⁶ Contact Environmental for disposal
Rags and sorbents contaminated with oil-based paint, solvent-based thinners	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Manage in accumulation area⁶ Contact Environmental
Paint sludge	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Manage in accumulation area⁶ Contact Environmental
Paint chips	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Contact Environmental for storage and disposal instructions Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
PAPER PRODUCTS Office paper, cardboard, newspaper	<ul style="list-style-type: none"> Recyclable Non-hazardous¹ 	<ul style="list-style-type: none"> Follow recycling procedures/restrictions in each area Landfill dumpster if not recyclable
PARAFFIN From DOT-regulated common carrier pipelines and crude oil topping plants (COTU, KUTP)	<ul style="list-style-type: none"> Recyclable Not E&P exempt 	<ul style="list-style-type: none"> Recycle in production stream Contact Environmental
From in-field wells, flowlines, production facilities, and DOT-regulated non -common carrier pipelines prior to the point of custody transfer	<ul style="list-style-type: none"> Recyclable E&P exempt 	<ul style="list-style-type: none"> Recycle in production stream Class I disposal well capable of handling solids Class II disposal well capable of handling solids
PCB WASTE Includes light ballasts, ballasts, transformers, capacitors	<ul style="list-style-type: none"> Regulated under TSCA and 40 CFR Part 761 	<ul style="list-style-type: none"> Contact Environmental
PHOTO PROCESSING/X-RAY FLUID Includes developer, stop bath, fixer, wash, detergent	<ul style="list-style-type: none"> Hazardous waste³ if discarded prior to silver recovery Non-hazardous¹ after recovery of silver 	<ul style="list-style-type: none"> Manage in accumulation area⁶ if not immediately processed Process through silver recovery unit (contact Environmental for assistance) Ship silver cartridge to approved off-site precious metals reclaimer Fluid to Class I disposal well (if non-hazardous after silver recovery)

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1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
PIGGING FLUIDS From water or seawater line	<ul style="list-style-type: none"> • Non-hazardous¹ • Not E&P exempt 	<ul style="list-style-type: none"> • Beneficial reuse as approved by Environmental • Class I disposal well if non-hazardous
From DOT-regulated common carrier pipeline From chemical feed lines that have not held material from downhole ⁵	<ul style="list-style-type: none"> • May be recyclable • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Recycle hydrocarbons in production stream • Class I disposal well if non-hazardous
From production pipelines (not DOT-regulated common carrier pipelines) that have held material from downhole ⁵	<ul style="list-style-type: none"> • May be recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle hydrocarbons in production stream • Class I disposal well • Class II disposal well
PIGGING SOLIDS From water or seawater line	<ul style="list-style-type: none"> • Non-hazardous¹ • Not E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental) • Class I disposal well capable of handling solids (if non-hazardous)
From DOT-regulated common carrier pipelines From chemical feed lines that have not held material from downhole ⁵	<ul style="list-style-type: none"> • May be recyclable • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental) • Recycle hydrocarbons in production stream • Class I disposal well (if non-hazardous) capable of handling solids
From production pipelines (not DOT-regulated common carrier pipelines) that have held material from downhole ⁵	<ul style="list-style-type: none"> • May be recyclable • E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental) • Recycle hydrocarbons in production stream • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids
PIPE DOPE Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Use for intended purpose • Approved solid waste storage area (always verify location with Environmental) • Landfill if non-hazardous (subject to testing and preapproval by Borough)
Used, returned from downhole ⁵ (on rags used to wipe pipe threads)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental)
POLYSHIELD (<i>Polymer liner material</i>) Leftover from spraying product	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Contact Environmental
PRODUCED WATER From hard piping, drains, sumps, separators, vessels, etc.	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Recycle hydrocarbon-based fluids • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)

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<p>PRODUCTION FACILITY FLUIDS <u>not in contact</u> with production stream</p> <p>Methanol (from bulk storage or non-process freeze protection)</p>	<ul style="list-style-type: none"> • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Use for intended purpose • May not be injected for disposal in Class I or Class II disposal well
<p>Methanol solutions used for turbine wash</p>	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded (flash point) • Not E&P exempt 	<ul style="list-style-type: none"> • Recover fluids for freeze protection or other approved reuse (contact Environmental) • Class I disposal well if non-hazardous
<p>Other chemicals <u>not</u> in contact with production stream:</p> <ul style="list-style-type: none"> – Antifoam agent (bulk storage) – Corrosion inhibitor (bulk storage) – Emulsion breaker (bulk storage) – Scale inhibitor (bulk storage) – Lime scale remover – Lube/hydraulic oil 	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C) • NOTE: BP and CPAI discourage disposal of hydrocarbons if recycling is possible.
<p>Non-process fluids</p> <ul style="list-style-type: none"> – Fire water (from deluge system) – H₂S or O₂ scavenger – MEG (from bulk storage, sulzer seal buffer fluid, lube oil cooling, oil transit cooling, waste heat recovery system, utility heat) – Water (non-process water from boiler blowdown, air compressors, waste heat makeup, backflush, general housekeeping) 	<ul style="list-style-type: none"> • Non-hazardous¹ • Not E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C) • NOTE: If these fluids are later used as process fluids in other sections of the plant, they may become eligible for Class II disposal well

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PRODUCTION FACILITY FLUIDS in contact with production stream <ul style="list-style-type: none"> – Condensates – Produced water – Crude oil (see also “Crude Oil”) – MEG (from heating/cooling processes) – TEG (from dehydration process) – Methanol (process freeze protection) – Process wastewater (from treatment of produced fluids) 	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle hydrocarbons in production stream • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C) • NOTE: BP and CPAI discourage disposal of hydrocarbons if recycling is possible.
<ul style="list-style-type: none"> – BS&W testing samples – Pigging returns (from process maintenance) 	<ul style="list-style-type: none"> • Recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recycle hydrocarbons in production stream • Class I disposal well • Class II disposal well
RADIOACTIVE TRACERS Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Not regulated under RCRA but potentially regulated as radioactive 	<ul style="list-style-type: none"> • Return to manufacturer or supplier following established protocols
Used downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • Contact Environmental for handling instructions before storing or sending to disposal well
RAGS <i>See “Sorbents,” also see name of contaminant</i>		
RESERVE PIT FLUIDS Freshwater in unused or closed out pits (pits do not contain downhole ⁵ residuals)	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Recover fluid for reuse (example: cold water frac) • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Freshwater in used or active pits that contain downhole ⁵ residuals	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Recover fluid for reuse (example, cold water frac) • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
Crude, returned mud, other material from downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴ • EOR (must meet the specifications in Attachment C)

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RIGWASH Primarily water from the cleaning of downhole ⁵ wastes (e.g., from rig floor, tools, walls)	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well Annular pumping at AOGCC-approved wells⁴
RINSATE (RINSE FLUIDS) Seawater, freshwater, non-hazardous cleaning agents – Used to remove waste residual (which has not been downhole ⁵) from trucks, tanks, or vessels	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Beneficial reuse as approved by Environmental Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Seawater, freshwater, non-hazardous cleaning agents – Used to remove residues from drums, trucks, tanks, or vessels – Used to remove residues from RCRA-empty vessels or containers – Used to remove residue from DOT-regulated common carrier pipelines (see Definitions)	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded Not E&P exempt 	<ul style="list-style-type: none"> Truck or vessel must meet RCRA-empty criteria prior to rinsing (RCRA-empty usually achieved by blowing down to storage tank) Beneficial reuse as approved by Environmental Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
From non-process pipes, valves, vessels, etc., that have not contained produced fluid from downhole – Examples: fuel storage tanks and lines, bulk chemical storage facilities, camp wastewater piping	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental prior to generating rinsate Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Freshwater/non-hazardous detergent rinses used to remove waste residual (which has been downhole ⁵) from trucks, tanks, or vessels	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Beneficial reuse as approved by Environmental Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C) Annular pumping at AOGCC-approved wells⁴
From DOT-regulated common carrier pipelines	<ul style="list-style-type: none"> Recyclable Potentially hazardous waste² if discarded Not E&P exempt 	<ul style="list-style-type: none"> Recycle hydrocarbons in production stream Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
From production pipelines, valves, vessels that have contained produced fluid from downhole ⁵ ; cleaned with water and non-hazardous detergent	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)

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SALT Precipitation from seawater treatment plants	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
SAMPLES Crude oil, production fluids, produced water, emulsion breaker from BS&W, spinouts	<ul style="list-style-type: none"> • Recyclable • E&P exempt • Verify classification of associated solvents or reagents 	<ul style="list-style-type: none"> • Recycle hydrocarbon-based fluids in production stream • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
SAND BLAST MEDIA (GRIT) Associated with maintenance, cleaning, not in contact with E&P material	<ul style="list-style-type: none"> • May be recyclable • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Do not discard in dumpster • Other uses as approved by Environmental • Borough landfill if non-hazardous (subject to testing and preapproval by Borough) • Class I disposal well (if non-hazardous) capable of handling solids
Non-hazardous media used to clean out oily scale from slug catchers, etc. at production facilities, in contact with E&P material	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental) • Class I disposal well capable of handling solids (subject to facility's acceptance criteria) • Class II disposal well capable of handling solids (subject to facility's acceptance criteria)
SAND JETTING SOLIDS Used to clean established production lines, vessels, tanks	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Approved solid waste storage area (always verify location with Environmental) • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids (subject to facility's acceptance criteria)
SAP (<i>Sodium acid pyrophosphate gel breaker</i>) Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use for intended purpose • Class I disposal well if non-hazardous
Mixed with excess water/gel mixtures that have not been downhole ⁵	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Mixed with water/gel that has been downhole ⁵	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴ • EOR (must meet the specifications in Attachment C)

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SCALE INHIBITOR Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ (verify with Environmental) 	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Used in production lines, vessels, used to treat fluids from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
SCHMOO-B-GONE Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Contact Environmental before disposal
Used downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
SCRAP METAL	<ul style="list-style-type: none"> Recyclable Potentially hazardous waste if not properly recycled 	<ul style="list-style-type: none"> Collect in scrap metal dumpster (see “Dumpster Guidelines”) or in other designated location for recycling
SEAWATER <i>See “Water”</i>		
SEWAGE Sanitary/domestic wastewater and graywater	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Sewage treatment plant if possible Class I disposal well if non-hazardous <ul style="list-style-type: none"> – Not typically accepted at Pad 3 EOR (must meet the specifications in Attachment C) Check with Environmental for other options
SHEETROCK	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Small amounts in landfill dumpster if non-hazardous Deliver to Borough landfill if non-hazardous, with prior approval
SILICA POWDER OR SAND From water softener	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Borough landfill if non-hazardous (subject to testing and preapproval by Borough)
SLOP OIL <i>See “Dirty Water” and/or “Crude”</i>		
SMOKE DETECTORS Ionization type (contain Americium-241)	<ul style="list-style-type: none"> Radioactive (low-level) 	<ul style="list-style-type: none"> Do not discard in trash Contact Environmental (will be returned to manufacturer if possible)

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SNOW Contaminated with fluids that have not been downhole ⁵ (e.g., new mud, diesel, chemicals)	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Do not mix with other wastes or with spills of downhole⁵ fluids Contact Environmental Class I disposal well (melted snow) if non-hazardous EOR (must meet the specifications in Attachment C)
Contaminated with fluids returned from through the wellbore (from downhole ⁵)	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Do not discard in dumpster Class I disposal well Class II disposal well (melted snow) EOR (must meet the specifications in Attachment C)
SNOWMELT OR RAINWATER (STORMWATER) From pads, tank farms, impoundments – Not in contact with fluids from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> No surface discharge without explicit approval from Environmental Beneficial reuse (for example, road watering) as approved by Environmental – subject to testing Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
From well cellars, reserve pits – In contact with returned muds, cuttings, fluids from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Beneficial reuse as approved by Environmental Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
SOAP (<i>Non-hazardous detergents, cleaning agents</i>) Unused, leftover, not returned from downhole ⁵	Non-hazardous ¹	<ul style="list-style-type: none"> Use for intended purpose Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have not been downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Used, mixed with residues that have been downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
SODA ASH Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Non-hazardous¹ (verify pH) 	<ul style="list-style-type: none"> Borough landfill if non-hazardous (subject to testing and preapproval by Borough)

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SOLVENT/DEGREASER Chlorinated solvent such as 1,1,1-trichloroethane, commonly found in industrial cleaning products and degreasers	<ul style="list-style-type: none"> Hazardous waste³ if discarded (evaluate for F- and U-listings) 	<ul style="list-style-type: none"> Evaluate products carefully prior to purchasing – select non-chlorinated alternatives if possible Restrict to essential uses Manage spent solvent in accumulation area⁶ Contact Environmental to determine classification Not recyclable in production stream
Citrus-based	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded (flash point) 	<ul style="list-style-type: none"> Manage in accumulation area⁶ Contact Environmental to determine classification
Stoddard	<ul style="list-style-type: none"> Hazardous waste³ if discarded (flash point) 	<ul style="list-style-type: none"> Manage in accumulation area⁶ Contact Environmental to discuss recycling options
Other – Green Brakleen – B-12 – Solvent with >10% toluene – Others not described above	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded (evaluate for F- and U-listings) 	<ul style="list-style-type: none"> Evaluate products carefully prior to purchasing to determine handling and disposal restrictions Contact Environmental to determine classification Manage spent product in accumulation area⁶ until classification is confirmed
SORBENTS/RAGS Contaminated with RCRA-hazardous wastes, including but not limited to paint, thinner, solvent (acetone, toluene, xylene, hexane, chlorinated solvents)	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Manage in accumulation area⁶ Contact Environmental
Saturated with diesel, gasoline	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Do not discard in dumpster Manage in accumulation area⁶ Contact Environmental
Lightly contaminated (not saturated) with oil, diesel, gasoline, Stoddard solvent, non-hazardous products	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded (if free liquid is present) 	<ul style="list-style-type: none"> Collect in oily waste bag No free liquids Oily waste dumpster (see <i>Dumpster Guidelines</i>)
Contaminated with E&P exempt fluids, including returned diesel, returned crude	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Collect in oily waste bag No free liquids Oily waste dumpster (see <i>Dumpster Guidelines</i>)
SOURCE WATER From shallow groundwater well (not production well)	<ul style="list-style-type: none"> Non-hazardous¹ Not E&P exempt 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
SPILL CLEANUP WASTE Contaminated soil, snow, water, sorbents, equipment	<ul style="list-style-type: none"> Classification depends on source and composition of spilled material Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental to determine classification and disposal options See individual product listings in this table Manage in accordance with ADEC-approved waste disposal plan

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STIMULATION FLUID Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose <ul style="list-style-type: none"> Rinse truck on location with displacement fluid and utilize as part of the displacement Hold for another well Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well
STUCK-PIPE FREEING AGENTS Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose Contact Environmental Class I disposal well if non-hazardous
Returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well Annular pumping at AOGCC-approved wells⁴
SUBSURFACE PUMP CONTROL CABLE Electrical submersible pump (ESP)	<ul style="list-style-type: none"> Recyclable (fluids and cable) E&P exempt 	<ul style="list-style-type: none"> Purge/clean all internal and external fluids at rig or shop Recycle hydrocarbon fluids in production stream Class I disposal well (fluids) Class II disposal well (fluids) Cleaned cable to metal recycling (copper)
SUBSURFACE VALVE CONTROL LINES –Unencapsulated	<ul style="list-style-type: none"> Recyclable (fluids and tubing) E&P exempt 	<ul style="list-style-type: none"> Purge/clean all internal and external fluids at rig or shop Recycle hydrocarbon fluids in production stream Class I disposal well (fluids) Class II disposal well (fluids) Purged metal tubing to scrap metal recycling
Encapsulated/coated	<ul style="list-style-type: none"> Recyclable (fluids) E&P exempt (fluids) Non-hazardous¹ (cleaned control line) 	<ul style="list-style-type: none"> Purge/clean all internal and external fluids at rig or shop Recycle hydrocarbon fluids in production stream Class I disposal well (fluids) Class II disposal well (fluids) Purged control line (wiped clean) to landfill

- Notes:**
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 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 - “Downhole” means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 - See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

CAUTION! If you do not find exactly what you are looking for in these tables, contact a ConocoPhillips or BP Environmental representative for a case-by-case determination. Do not guess and do not choose the closest match!

1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
SUMP WASTES Fluids not returned from downhole ⁵ (from equipment, maintenance shops, etc.) <i>See also "Production Facility Fluids"</i>	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Recover usable products Recycle hydrocarbons in production stream Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Fluids returned from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Recycle hydrocarbons in production stream Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
Solids not from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Approved solid waste storage area (always verify location with Environmental – testing may be required) Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well (if non-hazardous) capable of handling solids
Solids accumulating in sumps dedicated to materials from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Approved solid waste storage area (always verify location with Environmental – testing may be required) Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well capable of handling solids Class II disposal well capable of handling solids
SURPLUS PRODUCTS Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Use for intended purpose whenever possible Return to vendor if appropriate Contact Environmental or Materials
TANK/VESSEL SOLIDS Removed from tanks that have not held materials from downhole ⁵ (seawater, chemicals, potable water, sewage, etc.)	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> Contact Environmental prior to cleanout if possible Approved solid waste storage area (always verify location with Environmental) Borough landfill if non-hazardous (subject to testing and preapproval by Borough) Class I disposal well (if non-hazardous) capable of handling solids
Removed from tanks that have held used/returned materials from downhole ⁵	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Approved solid waste storage area (always verify location with Environmental) Class I disposal well capable of handling solids Class II disposal well capable of handling solids (subject to facility's acceptance criteria)

- Notes:**
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 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 - "Downhole" means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 - See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

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1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
TEG WITH TEA (<i>Triethylamine</i>) Wastewater from gas processing dehydration system <i>See also "Glycol"</i>	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
THERMINOL <i>(commercial heat-exchange product)</i> Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded (benzene) 	<ul style="list-style-type: none"> Use for intended purpose Contact Environmental if unusable
Used, mixed with residues that have not been downhole ⁵	<ul style="list-style-type: none"> Hazardous waste³ if discarded 	<ul style="list-style-type: none"> Contact Environmental prior to disposal
TURBINE WASH WATER	<ul style="list-style-type: none"> Potentially hazardous waste² if discarded (metals, flash point) 	<ul style="list-style-type: none"> Contact Environmental prior to or immediately upon generation regarding storage and analytical requirements Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
USED OIL <i>See "Oil, Hydraulic or Lubricating"</i>		
WASH BAY FLUIDS Water collected in sumps from washing vehicles in shops <i>See also "Sump Fluids"</i>	<ul style="list-style-type: none"> Non-hazardous¹ 	<ul style="list-style-type: none"> Class I disposal well if non-hazardous EOR (must meet the specifications in Attachment C)
Water used to remove fluids and solids returned from downhole ⁵ from equipment and drilling tools	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Class I disposal well Class II disposal well EOR (must meet the specifications in Attachment C)
WASHING MACHINE WATERS Used to clean downhole ⁵ fluids from clothing	<ul style="list-style-type: none"> E&P exempt 	<ul style="list-style-type: none"> Use as makeup water for mud and workover mixtures Other beneficial reuse as approved by Environmental Class I disposal well Class II disposal well Annular pumping at AOGCC-approved wells⁴ EOR (must meet the specifications in Attachment C)

- Notes:**
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 - Could contain listed or characteristic hazardous waste, subject to case-by-case determination
 - Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 - Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
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DISPOSAL/REUSE TABLES

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1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
WATER (<i>Fresh or Seawater</i>) Not returned from downhole ⁵ <i>See also "Flare/Relief Pit Water," "Reserve Pit Water," "Snowmelt," and "Sump Fluids"</i>	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use on other job (mud makeup water or other use) • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Circulated or reversed out from downhole ⁵ (e.g., when setting kickoff plug)	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Reuse on other job (mud makeup water or other approved use) • Class I disposal well • Class II disposal well • Annular pumping at AOGCC-approved wells⁴ • EOR (must meet the specifications in Attachment C)
Used to pressure test new lines or valves, or existing lines that do not contain residual downhole ⁵ fluids	<ul style="list-style-type: none"> • Non-hazardous¹ 	<ul style="list-style-type: none"> • Use on other job • Class I disposal well if non-hazardous • Possible discharge under NPDES permit (contact Environmental well in advance) • EOR (must meet the specifications in Attachment C)
Used to pressure test existing production flowlines or valves that contain residual downhole ⁵ fluids	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)
WATER SOFTENER BACKWASH EFFLUENT <i>See "Brine"</i>		
WAX <i>See "Paraffin"</i>		
WELL CASING FILINGS/CUTTINGS From milling out casings on wells that are not E&P (i.e., source water or Class I wells)	<ul style="list-style-type: none"> • Potentially hazardous waste² if discarded 	<ul style="list-style-type: none"> • Class I disposal well capable of handling solids (if non-hazardous) – contact Environmental for testing requirements
From milling out casings on sidetracks, downhole ⁵ activity	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well capable of handling solids • Class II disposal well capable of handling solids
WELL CELLAR FLUIDS Fluids from downhole ⁵ (crude, produced water) collected in cellar, plus rainwater or snowmelt in contact with downhole ⁵ fluids	<ul style="list-style-type: none"> • E&P exempt 	<ul style="list-style-type: none"> • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C)

- Notes:**
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 3. Known to contain a listed hazardous waste or to be a characteristic hazardous waste
 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
 5. "Downhole" means that material meets criteria for Class II Disposal shown in Attachment B (does **not** apply to source water wells or Class I disposal wells)
 6. See Accumulation Area guidance in Attachment E

DISPOSAL/REUSE TABLES

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1. MATERIAL AND SOURCE	2. CLASSIFICATION	3. DISPOSAL/REUSE OPTIONS <i>See Facility Guides for options in each operating area.</i>
WELL CELLAR GRAVEL <i>See "Gravel"</i>		
WELL RETURNS Fluids/solids returned from <u>source water well</u> during drilling, well testing, or workovers	<ul style="list-style-type: none"> • Potentially recyclable • Potentially hazardous² • Not E&P exempt 	<ul style="list-style-type: none"> • Recover for approved reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Fluids/solids returned from <u>disposal well</u> during drilling, well testing, or workovers	<ul style="list-style-type: none"> • Potentially recyclable • Potentially hazardous² • Not E&P exempt 	<ul style="list-style-type: none"> • Recover for approved reuse • Class I disposal well if non-hazardous • EOR (must meet the specifications in Attachment C)
Fluids/solids returned from <u>oil and/or gas well</u> (producer or injector) during drilling, well testing, or workovers	<ul style="list-style-type: none"> • Potentially recyclable • E&P exempt 	<ul style="list-style-type: none"> • Recover for approved reuse • Class I disposal well • Class II disposal well • EOR (must meet the specifications in Attachment C) Class II disposal well
WOOD	<ul style="list-style-type: none"> • Potentially recyclable 	<ul style="list-style-type: none"> • Check for site-specific collection and recycling procedures
XYLENE Unused, leftover, not returned from downhole ⁵	<ul style="list-style-type: none"> • Recyclable hydrocarbon • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental in your operating area for site-specific options and procedures • Recycle as hydrocarbon in production stream • Beneficial reuse as approved by Environmental • New product xylene may not be injected in Class I or Class II disposal wells
Used as solvent	<ul style="list-style-type: none"> • Hazardous waste³ if discarded • Not E&P exempt 	<ul style="list-style-type: none"> • Contact Environmental in your operating area for site-specific options and procedures • Beneficial reuse as approved by Environmental • New product xylene may not be injected in Class I or Class II disposal wells
Returned from downhole ⁵	<ul style="list-style-type: none"> • Recyclable hydrocarbon • E&P exempt 	<ul style="list-style-type: none"> • Recycle as hydrocarbon in production stream • Recover fluids for freeze protection or other approved reuse (contact Environmental) • Class I disposal well • Class II disposal well

- Notes:**
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 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
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DISPOSAL/REUSE TABLES

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- Notes:**
1. Typically non-hazardous, subject to verification
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 4. Annular pumping (Attachment D) is only authorized for drilling wastes at approved wells
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ATTACHMENTS

- A. Waste Classification
 - A.1 Relationship between UIC and RCRA
 - A.2 Consequences of Mixing Waste
- B. Class II Disposal Guidelines
- C. Enhanced Oil Recovery Specifications
- D. Annular Pumping Guidelines
- E. Accumulation Area Guidelines
- F. Dumpster Guidelines
- G. Facility Guides — By Operating Area
 - G.1 Alpine
 - G.2 Reserved
 - G.3 Beluga
 - G.4 Endicott
 - G.5 Kuparuk
 - G.6 Milne Point
 - G.7 Northstar
 - G.8 Greater Prudhoe Bay
 - G.9 Gas-to-Liquids Facility (Nikiski)
 - G.10 Liquefied Natural Gas Plant (Kenai)
 - G.11 Tyonek Platform
- H. North Slope and Cook Inlet Manifest

A. WASTE CLASSIFICATION

A.1 Relationship between UIC and RCRA

The chart below shows the general relationship between the UIC program and RCRA. **RCRA** determines the classification of **wastes** and regulates the wastes themselves until the point of injection. **UIC** regulates the classification and operation of **injection wells** and is designed to protect underground sources of drinking water. They are two distinct programs.

Attachment B shows the criteria for injection in a Class II Disposal well. It is important to remember that some types of RCRA-exempt wastes may **not** be injected into a Class II Disposal well. E&P exempt wastes are eligible for injection into a Class II Disposal well as long as they have not been mixed with other non-E&P exempt wastes.

RCRA		UIC Program	
Waste Classification	Examples	Eligible for Disposal in Class I Well	Eligible for Disposal in Class II Disposal Well
Exempt, Household	Waste from residential camps	Yes	No
Exempt, E&P	Crude, produced water, NGL condensate, mud/cement well returns, acid/gel/diesel well returns, processing center vessel cleanouts, flowline pigging waste from non-DOT-regulated common carrier pipelines	Yes	Yes see Attachment B
	Wastes resulting from natural gas processing to remove impurities to meet sales specifications	Yes	Yes see Attachment B, Examples 6 & 8
Non-exempt, Non-hazardous¹	Seawater, certain sump fluids, certain water-based gels and polymers	Yes	No unless situation fits one of the examples in Attachment B
	Non-hazardous rinsates removed from RCRA-empty drums, containers ¹	Yes	No
Hazardous	Discarded paints, solvents (used or unused) Xylene, methanol, diesel (not circulated downhole)	No	No

¹ Test results, MSDS, or generator knowledge may be required to confirm non-hazardous.

A. WASTE CLASSIFICATION (continued)

A.2 Consequences of Mixing Waste

Mixing wastes together can change their classification and make disposal of the resulting mixture more complicated — and expensive. Keep wastes separate until you have confirmed their classification and understand the consequences of mixing. Unless you have consulted with Environmental on a specific case, assume this conservative rule-of-thumb applies:

- Hazardous waste + non-hazardous waste = hazardous waste
- Exempt waste + non-exempt waste = non-exempt waste
- Class I-eligible waste + Class II-eligible waste = Class I-eligible waste

A general definition of a “mixed load” is when a truck must make more than one connection to take on fluids prior to offloading. A separate manifest must be prepared for each waste stream in a mixed load. Generally, if waste materials are eligible to go to the same facility and are compatible, then it is appropriate to mix them. If you are mixing wastes with different classifications or wastes that are destined for different disposal facilities, consider the points below and contact environmental staff if you have any questions.

Never mix new methanol, new diesel, or any hazardous waste with a load destined for a disposal facility.

Things to Consider Before Mixing:

- Mixed Class I-eligible and Class II-eligible waste must go to a Class I well. Refer to the facility restrictions in Attachment G prior to mixing.
- Do not mix wastes with recyclable materials, like used oil.
- Do not mix incompatible wastes.
- If a mixed load requires more than one North Slope Manifest, list all related manifest numbers in the “Comments” section at the bottom of the form.

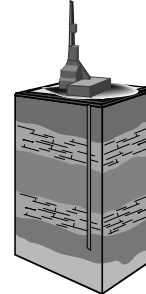
B. CLASS II DISPOSAL GUIDELINES

Class II Disposal wells are for injection of fluids that are brought to the surface in connection with conventional oil and natural gas production or have been in contact with such materials, and that may be commingled with wastewaters from gas plants which are an integral part of production operations, unless those waters are classified as hazardous waste at the time of injection.

Examples of Wastes Eligible for Class II Disposal

EXAMPLE 1: Material that originates below ground*

- Crude oil (not including refined products like diesel or gasoline)
- Produced water
- Produced sand
- Condensates
- Formation cuttings
- Sludges and solids collecting in production lines and vessels
- Brines



EXAMPLE 2: Products that are used or circulated within the well system for a specific purpose related to drilling, workovers, or production.* Does not include unused or surplus product remaining in temporary service lines or portable service equipment. NOTE: Fluids may not be circulated through the well system for the purpose of reclassifying them for disposal.

- Returned drilling mud
- Returned seawater
- Returned workover and stimulation fluids
- Returned frac sand
- Returned cement
- Returned freeze-protection fluids from well tubing, annulus, or production lines
- Fluids returned during pressure bleedoff
- Fluids used for essential pressure testing at the wellhead
- Used hydraulic fluid from subsurface safety valve system
- Fluids used for displacement

EXAMPLE 3: Wastes that are generated by contact with the oil or gas production stream during the removal of produced water or other contaminants.

- Water and non-hazardous cleaners used to remove downhole materials during E&P exempt pipeline or vessel cleanouts
- Diatomaceous earth used to filter returned brine
- Fresh water, seawater, or boiler blowdown water used to rinse off returned E&P exempt fluids or solids from tools and equipment

EXAMPLE 4: Fluids used to freeze-protect existing production-related flowlines.

EXAMPLE 5: Snowmelt or rainwater in contact with downhole materials in reserve pits or well cellars.

EXAMPLE 6: Wastewaters from gas plants which are an integral part of production operations, unless those waters are classified as hazardous waste at the time of injection.

- TEG (triethylene glycol) dehydrators at gas plants

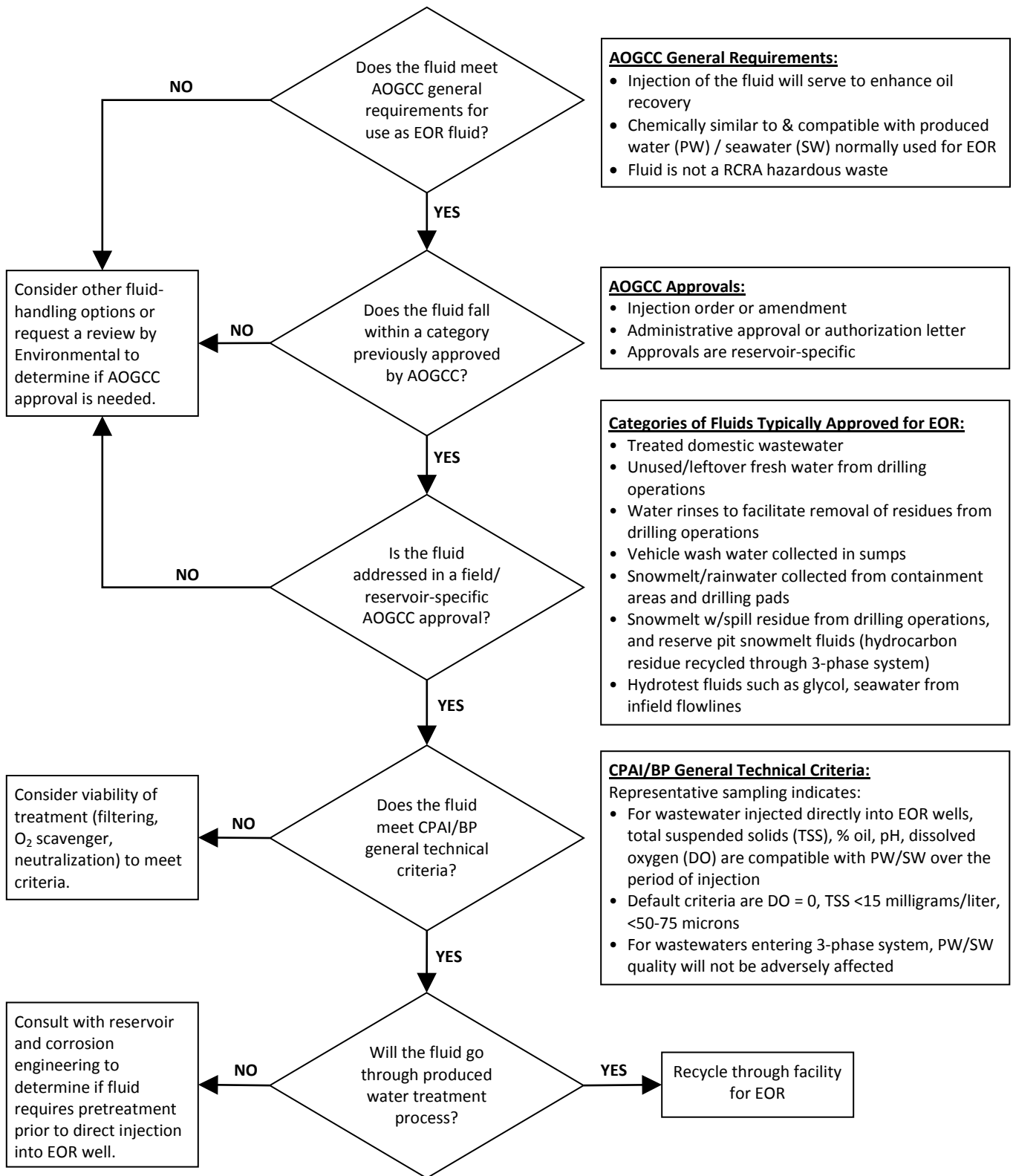
EXAMPLE 7: Fresh water (containing <10,000 milligrams per liter total dissolved solids) added to or substituted for produced water, as long as the only use of the water is for purposes integrally associated with oil and gas production or storage). NOTE: fresh water and seawater used to pressure test new lines or valves (hydrotest water) cannot be disposed of in a Class II Disposal well even if it is tied to the same piping network as EOR wells.

EXAMPLE 8: Fluids specifically identified for disposal in an AOGCC Disposal Injection Order (DIO) or Area Injection Order (AIO). Such approval is applicable only to the Class II Disposal well specified in the DIO or AIO.

* If not identified here, check with Environmental.

C. CLASS II ENHANCED OIL RECOVERY SPECIFICATIONS

Guidance for Fluid Reuse in Waterflood System



D. ANNULAR PUMPING GUIDELINES

Annular pumping refers to the placement of specifically approved materials into the open annulus of an approved E&P well. It applies to drilling-related materials from new well construction. Annular pumping is regulated by AOGCC (see 20 AAC 25.080) and is approved for individual wells with an Application for Sundry Approvals.

Annular disposal of drilling wastes is considered incidental to drilling a well. It is not regulated under the Underground Injection Control Program and is not subject to "Class I" and "Class II" permit restrictions. However, there are restrictions on volume and location so that annular pumping does not become a permanent disposal method.

These guidelines are for general information only. Since stipulations may vary from place to place, contact your drilling or environmental representative for site-specific information.

- Not authorized for workovers or production wastes
- Maximum 35,000 barrels total fluid per approved annulus
- Sundry approval valid for one year, but duration of disposal not to exceed 90 days
- Fluids must be generated on the same gravel pad or platform as the approved annulus unless otherwise approved by AOGCC
- Approved for materials listed in the *Disposal/Reuse Tables*, generated during drilling and completion operations. These fall into three categories:
 - Drilling mud, cuttings, reserve pit fluids, cement-contaminated drilling mud, completion fluids, and formation fluids
 - Drill rigwash fluids and drill rig domestic wastewater
 - Other fluids that are approved by AOGCC (e.g., cement rinsate)
- Records must be kept of all fluids pumped down annulus

E. ACCUMULATION AREA GUIDELINES

Accumulation areas are temporary collection sites for small quantities of recyclable materials and regulated hazardous wastes¹. They are typically set up by the environmental staff. Day-to-day management is the responsibility of designated personnel where the accumulation areas are located. Different types of accumulation areas are described in the following table. For details and site-specific procedures, contact your field environmental staff.

Do not move hazardous waste from one accumulation area to another.

Type	Used For	Quantity Limits	Time Limits	Other Requirements
RAA Recyclable Accumulation Area	<ul style="list-style-type: none"> Used oils Used antifreeze Diesel from fuel filters & spill cleanups Undamaged lead-acid batteries Recyclable electronics 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> <u>Containers</u> compatible with contents; in good condition; securely closed except when adding or removing material; labeled with actual contents <u>Used oil containers</u> must be labeled "Used Oil"
WAA Waste Accumulation Area	<ul style="list-style-type: none"> Collection area not subject to full RCRA¹ regulation 	<ul style="list-style-type: none"> No limits for CESQGs 	<ul style="list-style-type: none"> No limits for CESQGs 	<ul style="list-style-type: none"> Follow site-specific procedures
SAA Satellite Accumulation Area	Hazardous waste: <ul style="list-style-type: none"> Aerosol cans Waste paint, thinners, solvents, lab reagents Solvent-contaminated rags Some medical waste 	<ul style="list-style-type: none"> Up to 55 gallons hazardous waste Up to 1 quart acutely hazardous waste² Multiple SAAs can be located in same general area, each with 55-gallon limit 	<ul style="list-style-type: none"> Once volume limit is reached, waste must be moved to CAA within 3 days 	<ul style="list-style-type: none"> <u>Containers</u> compatible with contents; at or near point of generation; in good condition, securely closed except when adding or removing waste <u>Containers</u> labeled "Hazardous Waste" (or with actual contents) <u>Documented inspections</u> recommended at regular intervals
UAA Universal Waste Accumulation Area	<ul style="list-style-type: none"> Spent light bulbs (lamps) – do not crush! Spent batteries (lithium, Ni-Cad, Ni-MH) Mercury-containing equipment (thermostats, etc.) 	<ul style="list-style-type: none"> Up to 11,000 pounds for small quantity handlers of Universal Waste 	<ul style="list-style-type: none"> 1 year storage limit (starting from date waste is first placed into the container) 	<ul style="list-style-type: none"> <u>Containers</u> compatible with contents; at or near point of generation; in good condition, securely closed except when adding or removing waste <u>Containers</u> labeled "Universal Waste" – followed by description of contents
CAA Central Accumulation Area	<ul style="list-style-type: none"> Storage, sampling, processing, and shipment preparation 	<ul style="list-style-type: none"> Depends on generator status¹ (CESQG, SQG, LQG) 	<ul style="list-style-type: none"> Depends on generator status¹ (CESQG, SQG, LQG) 	<ul style="list-style-type: none"> <u>Documented inspections</u> required at least monthly

¹ See Definitions.

F. DUMPSTER GUIDELINES

Dumpster policies are subject to change.

Please contact your field environmental staff or local waste service utility for current information.

LANDFILL (C&D) DUMPSTERS

and

MUNICIPAL SOLID WASTE (MSW) DUMPSTERS (Colville)

"Landfill" dumpsters are for material that is sent to the Borough landfill.

In the Colville Environmental service area (generally west of the Kuparuk River), covered MSW dumpsters are provided for food/kitchen waste as well as ordinary landfill waste.

Note: In some areas, MSW Dumpsters are also used for scrap metal collection.

See Facility Guide G.8 for additional GPB recycling information.

YES

- Banding*
- Batteries*, small alkaline or carbon ("A," "AA," "AAA," "C," "D"), in small quantities
- Cable with insulation, non-recyclable
- Concrete, set up, less than 1 drum
- Electrical ballast, non-PCB
- Electrical wire, small pieces*
- Flexible duct, "elephant trunk"
- Food and kitchen waste ONLY if dumpsters have animal-proof lids (Colville MSW dumpsters are approved for food waste)
- Glass
- Hoses
- Insulation (no asbestos)
- Metal cuttings, free of oil*
- Pails and buckets, metal or plastic (empty and free of liquids)*
- Paint cans/buckets, empty (dry)
- Paper products that are bagged*
- Piping, plastic and metal, less than 4' lengths
- Pit liner material (free of oil contamination — no free liquids), not larger than 20 x 20'
- Styrofoam
- Wire*
- Wood and broken pallets*
- Visqueen

* These items may be recyclable – collect in designated recycle containers when possible

NO

- Aerosol cans
- Chemicals or hazardous waste
- Food waste, unless dumpsters are equipped with animal-proof lids (Colville MSW dumpsters are approved for food waste)
- Free liquids
- Gravel or snow
- Incinerator ash, molecular sieve, sandblast sand — these materials should be delivered directly to the landfill, after they are tested and preapproved by the North Slope Borough (NSB)
- Oily waste
- Recyclables that are collected separately
- Refrigeration equipment w/Freon and/or oil
- Wood or paper that can be recycled
- Timbers (longer than 10')

"BURNABLE" DUMPSTERS (Camp Incinerator Dumpsters)

"Burnable" dumpsters are still used in some locations for kitchen/household waste and other material that is burned on site.

These are very general guidelines — always verify site-specific procedures.

YES

- Food waste if dumpsters are equipped with animal-proof lids
- Lightweight, burnable cans, buckets, containers
- Paper products that are bagged (if not recycled)
- Styrofoam
- Wood and broken pallets (if not recycled), within size limits

NO

- Chemicals or hazardous waste
- Free liquids
- Oily waste

F. DUMPSTER GUIDELINES (continued)

OILY WASTE DUMPSTERS

All oily waste must be bagged in clear bags (with yellow stripe in many areas) before placing into dumpster. Each bag must be tied and may not exceed 50 pounds.

YES

- Grease or pipe dope cans, empty and wiped clean (no liquids)
- Empty, drained motor oil cans
- Oil filters (must be punctured with ¼" hole and hot-drained)
- Oil filters: cloth (must be drained)
- Oily pit liner material (no free liquid, dirt, or gravel), cut <4' wide x 25' long, rolled and tied
- Sorbents, rags, floor sweepings, or other oily debris containing only non-hazardous or RCRA-exempt waste

NO

- Aerosol cans, batteries
- Food waste — use kitchen dumpsters only
- Kitchen grease and oil
- Contaminated gravel or snow
- Free liquids in bags
- Sorbents/rags contaminated with RCRA-hazardous wastes including: paint, thinner, solvent (acetone, toluene, xylene, hexane, chlorinated products)

RECYCLABLE (SCRAP) METAL BINS

YES

- Banding: metal (**must** be cut up and contained in either mud boxes or drums)
- Cable: electrical, spooled or rolled
- Cable: other, wound neatly and secured (no "bird nests")
- Canisters: depressurized and open
- Conduit: metal, and fittings
- Cuttings: metal, containerized
- Drums: empty, clean, and crushed
- Lead tire weights
- Pipe: black iron, galvanized, steel
- Pipe: insulated (**only** in special containers provided by Mukluk Yard)
- Pipe spools
- Plate steel
- Pup joints
- Scrap metal, including short pipe, steel, channel, I-beam
- Sheet metal that is flat
- Stainless steel, copper, aluminum
- Valves: metal (must be open and drained)
- Wire cable/drilling line, spooled or rolled (except slickline wire)

- Aerosol cans may be recycled **only** if they are completely empty (no product or propellant inside). Do not place cans directly into recyclable (scrap) metal dumpster. Follow site-specific procedures for collecting cans prior to recycling. Cans may only be punctured and drained by authorized personnel.

NO

- Accumulators (unless control valve has been completely removed and vessel is open)
- Asbestos-containing material
- Batteries, capacitors, liquid-type transformers
- Closed containers (fire extinguishers, propane bottles, sealed cans or drums, fuel tanks)
- Explosives
- Fluorescent light ballast
- Food waste
- Hazardous material or hazardous waste of any kind
- Insulation (except pipe in approved containers)
- Liquids (except water)
- Mercury switches
- Office furniture or junk equipment
- Oily waste
- Paint cans containing product
- Scaled motors/compressors
- Slickline wire
- Trash (wood, paper, food, food cans, concrete, cement, rubber, glass, plastic, dirt, rocks, weeds, garbage)

RECYCLABLE WOOD CONTAINERS

As part of a growing effort to keep usable wood out of landfills, many areas collect wood in designated containers.

YES

- Pallets
- Plywood
- Wood scraps
- Timber
- Wood packaging (crates, etc.)

NO

- Oily or contaminated wood
- Green (pressure treated) wood
- Creosote-treated wood
- Painted wood

G. FACILITY GUIDES — BY OPERATING AREA

- G.1 Alpine
- G.2 (Reserved)
- G.3 Beluga
- G.4 Endicott
- G.5 Kuparuk
- G.6 Milne Point
- G.7 Northstar
- G.8 Greater Prudhoe Bay
- G.9 Gas-to-Liquids Facility (Nikiski)
- G.10 Liquefied Natural Gas Plant (Kenai)
- G.11 Tyonek Platform

G.1 ALPINE FACILITY GUIDE (page 1 of 2)

	HYDROCARBON RECYCLING	EOR	CLASS II DISPOSAL	CLASS I DISPOSAL	
Name	Alpine Production Facility A1 Recycle	Alpine Production Facility	Alpine Class I Disposal Wells WD-02, CD1-01A	Alpine Class I Disposal Well WD-02	Alpine Class I Disposal Well CD1-01A
Location	Alpine	Alpine	Alpine	Alpine	Alpine
Operator	CPAI	CPAI	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbon-containing mixtures • Crude oil/water mixtures • Used oil, non-exempt lubricating oils, hydraulic fluids, transmission fluids • Exempt well fluids, production fluids, including petroleum distillate-based production chemicals 	<ul style="list-style-type: none"> • Approved fluids in specific circumstances (contact Environmental) • Treated camp effluent mixed with seawater • Sump fluids, hydrotest fluids, mud-truck rinse fluids, and non-hazardous excess wellwork fluids 	<ul style="list-style-type: none"> • Class II-eligible waste • Class I-eligible non-hazardous and RCRA-exempt fluids 	<ul style="list-style-type: none"> • Class II-eligible wastes • Class I-eligible non-hazardous and RCRA-exempt fluids 	<ul style="list-style-type: none"> • Class II-eligible wastes • Class I-eligible non-hazardous and RCRA-exempt fluids
Restrictions	<ul style="list-style-type: none"> • Non-Alpine use by pre-approval only • pH 5-10 • No chlorinated solvents (contact Environmental to discuss other solvents) • No hazardous wastes 	<ul style="list-style-type: none"> • Above fluids approved only when Class I well is unavailable • Limited to 10,000 gallons per week • Must be sampled as required by AOGCC Administrative Approval and subsequent clarification 	<ul style="list-style-type: none"> • No hazardous wastes at point of injection • All wastes must be characterized by testing or generator knowledge • Non-Alpine use by prior approval only • CD1-01A: low-solids only • WD-02: no solids, no sand, no flammable liquids 	<ul style="list-style-type: none"> • No hazardous waste at point of injection • All wastes must be characterized by testing or generator knowledge • Non-Alpine use by prior approval only • No solids, no sand, no flammable liquids 	<ul style="list-style-type: none"> • No hazardous waste at point of injection • All wastes must be characterized by testing or generator knowledge • Non-Alpine use by prior approval only • Low solids
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest • MSDS sheets or laboratory results, as required 	<ul style="list-style-type: none"> • North Slope Manifest • MSDS sheets or laboratory results, as required 	<ul style="list-style-type: none"> • North Slope Manifest • MSDS sheets or laboratory results, as required
Facility Contact	<ul style="list-style-type: none"> • Alpine Operations 670-4222 	<ul style="list-style-type: none"> • Alpine Operations 670-4017 	<ul style="list-style-type: none"> • CD1-01A: Alpine Operations 670-4222 • WD-02: MI Injection Skid Operator 670-4420 	<ul style="list-style-type: none"> • Alpine Operations 670-4222 	<ul style="list-style-type: none"> • Alpine Operations 670-4222
Compliance Contact	<ul style="list-style-type: none"> • Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> • Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> • Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> • Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> • Alpine Environmental Coordinator 670-4200
Notes	<ul style="list-style-type: none"> • Manifest not required if hard-piped from in-field lines 	<ul style="list-style-type: none"> • Manifest not required if hard-piped from in-field lines 	<ul style="list-style-type: none"> • Alpine does not have a dedicated Class II disposal well. Use Class I disposal wells for Class I- and Class II-eligible fluids. 	<ul style="list-style-type: none"> • Offloading for WD-02 occurs at L2 • Permit AK-11003-A 	<ul style="list-style-type: none"> • Permit AK-11003-A

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.1 ALPINE FACILITY GUIDE (page 2 of 2)

	ANNULAR INJECTION	SOLID WASTE ¹			HAZARDOUS WASTE ²
Name	Alpine Annular Injection (Approved E&P Wells Only)	Class I Storage Cells	Class II Storage Cells	Alpine Incinerator	Waste Central Accumulation Area (WCAA)
Location	Alpine	Alpine CD2 Temporary Cells (all pads)	Alpine CD2 Temporary Cells (all pads)	Alpine	Alpine
Operator	CPAI	CPAI	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> Approved mud products and drilling fluids Returned muds/cuttings 	<ul style="list-style-type: none"> Contaminated gravel and soil only Contaminated snow pending snow melting For temporary cells check with Environmental for specific restrictions 	<ul style="list-style-type: none"> Class II-eligible solids only Check with Environmental for specific restrictions 	<ul style="list-style-type: none"> Non-hazardous burnable waste Food waste Household waste Sewage sludge Non-hazardous oily waste 	<ul style="list-style-type: none"> Hazardous or potentially hazardous waste from Alpine only (including drilling rigs operating at Alpine) to be sent offsite Non-hazardous wastes to be sent offsite
Restrictions	<ul style="list-style-type: none"> For in-field use by Alpine Drilling only Injection per "Sundry Notice" approvals and only for specified, wells, periods, streams, and volumes 	<ul style="list-style-type: none"> For in-field use only No hazardous waste Pending analytical results, washed gravels are staged in the Class I storage cell Testing may be required to verify that material is non-hazardous prior to disposal or recycling No liquids Temporary storage (<1 year) 	<ul style="list-style-type: none"> For in-field use only No hazardous waste No liquids Temporary storage (<1 year) 	<ul style="list-style-type: none"> No listed or characteristic hazardous waste No aerosol cans, batteries, light bulbs, aluminum cans Waste must be visually inspected before burning Medical/infectious waste limited to 10% by weight (sharps to WCAA) Solid waste to sewage sludge ratio 90:10 	<ul style="list-style-type: none"> All waste requires proper characterization, labeling, packaging, and storage All materials from Accumulation Areas must be manifested to WCAA storage area
Paperwork Required	<ul style="list-style-type: none"> North Slope Manifest 	<ul style="list-style-type: none"> North Slope Manifest Material Receipt Log 	<ul style="list-style-type: none"> North Slope Manifest 	<ul style="list-style-type: none"> Visual inspection for received wastes Incinerator operator must keep record of material composition 	<ul style="list-style-type: none"> North Slope Manifest unless otherwise approved by Environmental Waste Tracking Log MSDS sheets and/or laboratory results
Facility Contact	<ul style="list-style-type: none"> CPAI Company Man 670-4300 	<ul style="list-style-type: none"> Alpine Operations 670-4222 Alpine ACS 670-4586 	<ul style="list-style-type: none"> Alpine Roads/Pads/Drilling Support 670-4044 O&M OPS 670-4393 	<ul style="list-style-type: none"> Incinerator Operator 670-4105 	<ul style="list-style-type: none"> Alpine ECC Technician 670-4868
Compliance Contact	<ul style="list-style-type: none"> Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> Alpine Environmental Coordinator 670-4200 	<ul style="list-style-type: none"> Alpine Environmental Coordinator 670-4200
Notes				<ul style="list-style-type: none"> Manifest not required 	<ul style="list-style-type: none"> Alpine typically RCRA CESQG

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.2 (RESERVED)

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.3 BELUGA FACILITY GUIDE (page 1 of 2)

	USED OIL RECYCLING	CLASS II DISPOSAL	CLASS I DISPOSAL	SOLID WASTE ¹
Name	Used Oil Burner	Beluga River Waste Injection Facility (BRWD-1)	Beluga River Waste Injection Facility (232-09)	Central Drilling Waste Disposal Facility (CWDF)
Location	Auto Shop/Welding Building	Beluga River Field DW-2 Pad	Beluga River Field DW-1 Pad	Beluga
Operator	CPAI	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> • Approved used oils and hydrocarbons burned for energy recovery: <ul style="list-style-type: none"> – Crankcase & gear oil – Diesel – Drum rinsate – Hydraulic fluid – Lube oil • Other fluids require case-by-case approval 	<ul style="list-style-type: none"> • Class II-eligible fluids (see <i>Disposal/Reuse Tables</i>) including: <ul style="list-style-type: none"> – Rig wash – Used TEG from gas-dehydration systems • Rainwater or snowmelt from: <ul style="list-style-type: none"> – BRWD-1 tank impoundment – CWDF – Produced-water impoundments – Well cellars • Non-hazardous wastes specifically approved under DIO 3, including: <ul style="list-style-type: none"> – Cement rinsate – Excess fluids associated with well operations 	<ul style="list-style-type: none"> • Non-hazardous or RCRA-exempt wastes including: <ul style="list-style-type: none"> – Produced water – Air compressor condensation – BRWD-1 and 232-09 pump sump fluids – Rain/snowmelt collected in containments – Hydrotest water – CWDF dewatering fluids – Fresh water – Rig/truck washwater 	<ul style="list-style-type: none"> • Drilling waste (RCRA-exempt exploration and production waste) • Contaminated soil (RCRA non-exempt, non-hazardous)
Restrictions	<ul style="list-style-type: none"> • No dielectric oil w/ PCBs • No hazardous chemicals • No hazardous wastes 	<ul style="list-style-type: none"> • No hazardous chemicals • No hazardous wastes • No fluids that have not been analyzed / pre-approved 	<ul style="list-style-type: none"> • No hazardous waste at point of injection • No NORM • No fluids that have not been analyzed / pre-approved in accordance with 232-09 WAP 	<ul style="list-style-type: none"> • No hazardous waste • No municipal solid waste, PCBs, construction/demolition debris, asbestos-containing material, medical waste, radioactive materials, lead-acid batteries, pesticides • No non-exempt oily wastes
Paperwork Required	<ul style="list-style-type: none"> • BRU Used Oil Heater Log 	<ul style="list-style-type: none"> • Cook Inlet Manifest • Fluid Transfer Log 	<ul style="list-style-type: none"> • Cook Inlet Manifest • Fluid Transfer Log • BRWD Injection Log 	<ul style="list-style-type: none"> • Central Waste Disposal Facility Log
Facility Contact	<ul style="list-style-type: none"> • Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> • Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> • Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> • Beluga Operations Supervisor 263-3930
Compliance Contact	<ul style="list-style-type: none"> • Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> • Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> • Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> • Environmental Coordinator 776-2092
Notes	<ul style="list-style-type: none"> • Cook Inlet Manifest required if not used in Used Oil Burner 	<ul style="list-style-type: none"> • DIO 3 	<ul style="list-style-type: none"> • Permit AK-11014-A 	<ul style="list-style-type: none"> • Remove all pumpable fluids from CDWF cell as soon as possible

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.3 BELUGA FACILITY GUIDE (page 2 of 2)

Name	SOLID WASTE ¹			HAZARDOUS WASTE ²	
	Covered Drum Storage	Incinerator	Beluga Landfill	Universal Waste Accumulation Area (UAA)	Accumulation Area
Location	Beluga River Field, Piping & Storage (P&S) Yard	Beluga River Field, P&S Yard	Near South End of Field	Warehouse	Beluga Electric Shop
Operator	CPAI	CPAI	Kenai Peninsula Borough (KPB)	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> Centralized storage area for non-hazardous waste 	<ul style="list-style-type: none"> RCRA-exempt and non-hazardous solids Containers, if burnable Filters, air and water Filters, oil (non-terne-plated or exempt), hot-drained Filters, glycol – exempt or non-hazardous (confirm by testing) Glycol regenerator still column saddles 	<ul style="list-style-type: none"> Non-hazardous solid wastes that comply with KPB guidelines Prior approval may be required for non-routine disposal activities Sampling and other waste characterization may be required Contact Environmental with any questions 	<ul style="list-style-type: none"> Universal wastes including batteries and fluorescent lamps 	<ul style="list-style-type: none"> See <i>Accumulation Area Guidelines</i>
Restrictions	<ul style="list-style-type: none"> Contact Operations prior to placing any waste in storage area All containers must be in good condition and properly identified No hazardous waste No hazardous chemicals 	<ul style="list-style-type: none"> No hazardous wastes No liquids Must maintain a mix ratio of at least 30% municipal solid waste to industrial waste to comply with applicable air regulations 	<ul style="list-style-type: none"> No asbestos-containing materials No hazardous wastes No liquids No oil filters No aerosol cans or batteries No PCB-containing material No recyclable or reclaimable materials No solids containing oil or chemicals (rags, sorbent, gravel) 	<ul style="list-style-type: none"> Materials must be stored in proper containers with required labels and dates Contact Environmental for assistance Lead-acid batteries managed per 40 CFR 266.80 	<ul style="list-style-type: none"> See <i>Accumulation Area Guidelines</i>
Paperwork Required	<ul style="list-style-type: none"> Drum Log 	<ul style="list-style-type: none"> Burnable Solid Waste Incinerator Log 	<ul style="list-style-type: none"> BRU Municipal Solid Waste Disposal Log 	<ul style="list-style-type: none"> Cook Inlet Manifest required for transport to another CPAI facility 	<ul style="list-style-type: none"> Drum Log
Facility Contact	<ul style="list-style-type: none"> Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> Beluga Operations Supervisor 263-3930 	<ul style="list-style-type: none"> Beluga Operations Supervisor 263-3930
Compliance Contact	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092
Notes					<ul style="list-style-type: none"> BRU typically RCRA CESQG

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.4 ENDICOTT FACILITY GUIDE (page 1 of 2)

	HYDROCARBON RECYCLING	EOR	CLASS II DISPOSAL	
Name	Snowmelt Tank	Snowmelt Tank	Well 2-02/P-18	GPB Grind and Inject (G&I) Facility
Location	Endicott Main Production Island (MPI)	Endicott MPI	Endicott MPI	GPB EOA DS 4
Operator	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbons • Crude oil/water mixtures • Non-exempt lubricating oils, hydraulic fluids, transmission fluids, diesel, other refined petroleum products • Used oil • Kitchen grease 	<ul style="list-style-type: none"> • Seawater, produced water, fresh water, and other exempt and non-hazardous fluids that meet AOGCC EOR guidelines (Attachment C) • Fluids compatible with the reservoir and meeting technical specs for dissolved O₂, suspended solids, etc. • Recyclable hydrocarbons (segregated for recovery) 	<ul style="list-style-type: none"> • Class II-eligible fluids, including: • Produced waters and other fluids originating below the ground surface • Drilling and wellwork fluids used within the wellhead or below the ground surface • Fresh or seawater used for injection of Class II-eligible fluids • Well cellar and reserve pit fluids 	<ul style="list-style-type: none"> • see Facility Guide G.8
Restrictions	<ul style="list-style-type: none"> • No solvents • <200 ppm organic chlorides • No hazardous wastes • Contact Environmental for testing requirements • Used oil from rigs and VMS is collected in drums and screened prior to recycling via snowmelt tank 	<ul style="list-style-type: none"> • No hazardous waste • No fluids that would be chemically or physically incompatible 	<ul style="list-style-type: none"> • <10% solids • Particle size <1/8" • Wastes from Endicott only 	<ul style="list-style-type: none"> • see Facility Guide G.8
Paperwork Required	<ul style="list-style-type: none"> • Control Room Injection/Recycle Log • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest • 2-02/P-18 Injection Log • Injection/Recycle Log 	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork requirements for non-GPB and third-party users (see GPB Facility Guide G.8)
Facility Contact	<ul style="list-style-type: none"> • Lead Tech 659-6520 • Control Room Operator 659-6700 	<ul style="list-style-type: none"> • Lead Tech 659-6520 	<ul style="list-style-type: none"> • Lead Tech 659-6520 	<ul style="list-style-type: none"> • G&I Control Room 659-8419
Compliance Contact	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893
Notes				

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.4 ENDICOTT FACILITY GUIDE (page 2 of 2)

Name	CLASS I DISPOSAL		SOLID WASTE ¹		HAZARDOUS WASTE ²
	GPB Pad 3	GPB G&I Facility	Class II Storage Pit	Class I Storage Pit	Environmental Warehouse (608)
Location	GPB EOA DS 6	GPB EOA DS 4	Endicott MPI	Endicott MPI	Endicott MPI
Operator	BP	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • Gravel contaminated with exempt spill residues • Exempt vessel sand and sediment 	<ul style="list-style-type: none"> • Gravel contaminated with non-exempt, non-hazardous spill residues 	<ul style="list-style-type: none"> • Known or suspected hazardous waste generated at Endicott (including drilling rigs)
Restrictions	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • Subject to approval • Bagged and tagged with required information 	<ul style="list-style-type: none"> • Subject to approval and testing • Bagged and tagged with required information 	<ul style="list-style-type: none"> • Access restricted to Environmental personnel • No deliveries without prior arrangement with Endicott Environmental Technician
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork requirements for non-GPB and third-party users (see GPB Facility Guide G.8) 	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork requirements for non-GPB and third-party users (see GPB Facility Guide G.8) 	<ul style="list-style-type: none"> • Gravel Log 	<ul style="list-style-type: none"> • Gravel Log 	<ul style="list-style-type: none"> • Material Receipt (MR) Log
Facility Contact	<ul style="list-style-type: none"> • Pad 3 Operator 659-5533 	<ul style="list-style-type: none"> • G&I Control Room 659-8419 	<ul style="list-style-type: none"> • Endicott Environmental Technician 659-6541 	<ul style="list-style-type: none"> • Endicott Environmental Technician 659-6541 	<ul style="list-style-type: none"> • Endicott Environmental Technician 659-6541
Compliance Contact	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810
Notes	<ul style="list-style-type: none"> • MSDS and/or lab data may be required 	<ul style="list-style-type: none"> • MSDS and/or lab data may be required 			

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.5 KUPARUK FACILITY GUIDE (page 1 of 2)

	HYDROCARBON RECYCLING	EOR	CLASS II DISPOSAL	
Name	Kuparuk CPF-1 Hydrocarbon Recycle Facility	Kuparuk CPF-1 Water Recycle Facility	Kuparuk Class II Disposal Well	GPB G&I Facility
Location	CPF-1	CPF-1	DS1R-18	GPB EOA DS 4
Operator	CPAI	CPAI	CPAI	BP
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbon-containing mixtures • Lube oils, hydraulic fluids, transmission fluids, grease • Crude oil/water mixtures • Well fluids, production fluids, including petroleum distillate-based production chemicals • Diesel 	<ul style="list-style-type: none"> • Seawater, produced water, fresh water, and other exempt and non-hazardous fluids that meet AOGCC EOR guidelines (Attachment C) • Fluids compatible with the reservoir & meeting CPAI technical specs for dissolved O₂, suspended solids, etc. • Chemicals normally designed for use in EOR or to treat EOR fluids (glycol, biocides, corrosion inhibitor) 	<ul style="list-style-type: none"> • Produced waters and other fluids originating below the ground surface • Drilling, wellwork, and production fluids used within the well system or below ground surface • Reserve-pit snowmelt waters • Fresh or seawater used to assist in injection of Class II-eligible fluids 	<ul style="list-style-type: none"> • see Facility Guide G.8
Restrictions	<ul style="list-style-type: none"> • pH 6-9, minimum temp. 60°F • Organic chlorides <200 ppm • Solids content <2% – may not plug screens • Gels must be broken • No hazardous waste such as unused methanol or xylene • No chlorinated solvents (contact Environmental to discuss other solvents) 	<ul style="list-style-type: none"> • No hazardous waste such as unused methanol or xylene • No fluids that would be chemically or physically incompatible • pH 6-9 • Solids content <2% • Gels must be broken • Flash point >100°F 	<ul style="list-style-type: none"> • No cement rinsate without processing through MI Swaco Mud Unit • Solids <1/16" • Loads with >30% crude oil must be >70°F • All drilling muds must pass through a minimum 50 mesh screen • If the filter pots plug during injection, the load will be rejected • All crude oil shipments must be analyzed for Reid Vapor Pressure (RVP) per safety requirements • Drilling fluids containing lost circulation material (LCM) will be accepted only when access to Prudhoe Bay facilities is blocked 	<ul style="list-style-type: none"> • see Facility Guide G.8
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest • Daily Receiving/Injection Log 	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork for non-GPB and third-party users (see GPB Facility Guide G.8)
Facility Contact	<ul style="list-style-type: none"> • Facility Operator 659-7330 	<ul style="list-style-type: none"> • Facility Operator 659-7330 	<ul style="list-style-type: none"> • Wells Foreman 659-7634 	<ul style="list-style-type: none"> • G&I Control Room 659-8419
Compliance Contact	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893
Notes			<ul style="list-style-type: none"> • AIO 2 	

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.5 KUPARUK FACILITY GUIDE (page 2 of 2)

	CLASS I DISPOSAL	SOLID WASTE ¹		HAZARDOUS WASTE ²
Name	GPB Pad 3 or G&I Disposal	Oily Waste Storage Facility (Class I)	Oily Waste Storage Cell (Class II)	RCRA Accumulation Area
Location	GPB EOA DS 6 or DS 4	DS 1H	CPF-1	Kuparuk C/D Warehouse
Operator	BP	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • Exempt and non-exempt, non-hazardous solids • Vessel and tank bottoms • Residues from spills of exempt or non-hazardous fluids • Contaminated snow (exempt/non-hazardous) on space-available basis • Frac sand and other wellwork solids 	<ul style="list-style-type: none"> • Exempt solids • Exempt vessel and tank bottoms • Residues from spills of exempt (Class II-eligible) fluids • Contaminated snow (exempt) on space-available basis • Frac sand and other wellwork solid returns 	<ul style="list-style-type: none"> • Hazardous or potentially hazardous waste from Kuparuk sources only (including drilling rigs operating at Kuparuk) • Non-hazardous wastes to be sent offsite
Restrictions	<ul style="list-style-type: none"> • see Facility Guide G.8 	<ul style="list-style-type: none"> • No spill residues from hazardous waste such as unused methanol or xylene • No used solvents or degreasers • No liquids 	<ul style="list-style-type: none"> • No spill residues from hazardous waste such as unused methanol or xylene • No used solvents or degreasers • No liquids • Class II-eligible material only 	<ul style="list-style-type: none"> • No hazardous waste from outside Kuparuk • Access restricted to authorized personnel only • No deliveries without prior arrangement with Environmental Coordinator • All waste requires proper characterization, labeling, packaging • All materials from in-field Accumulation Areas must be manifested when sent to WCAA storage area
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork requirements for non-GPB and third-party users (see GPB Facility Guide G.8) 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest
Facility Contact	<ul style="list-style-type: none"> • Pad 3 Operator 659-5533 • G&I Control Room 659-8419 	<ul style="list-style-type: none"> • Roads and Pads Equipment Dispatcher 659-7949 	<ul style="list-style-type: none"> • Roads and Pads Equipment Dispatcher 659-7949 	<ul style="list-style-type: none"> • Materials Warehouse Foreman 659-7583
Compliance Contact	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • Environmental Coordinator 659-7212
Notes	<ul style="list-style-type: none"> • No dedicated Class I disposal well located at Kuparuk 	<ul style="list-style-type: none"> • Large loads of Class I- or Class II-eligible solids may be diverted to GPB G&I (EOA DS 4) (see Facility Guide G.8) 	<ul style="list-style-type: none"> • Large loads of Class II-eligible solids may be diverted to GPB G&I (EOA DS 4) (see Facility Guide G.8) 	<ul style="list-style-type: none"> • Kuparuk typically RCRA SQG

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.6 MILNE POINT FACILITY GUIDE (page 1 of 2)

	HYDROCARBON RECYCLING	EOR		CLASS II DISPOSAL
Name	Oil Recovery Tank (ORT)	In-Field Water Inject Wells	Kuparuk Dedicated Disposal Wells	GPB G&I Facility
Location	MPU Central Facilities Pad	All Pads	DS1R-18 or other approved wells	GPB EOA DS 4
Operator	BP	BP	CPAI	BP
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbons • Crude oil/water mixtures • Non-exempt lubricating oils, hydraulic fluids, transmission fluids, diesel, other refined petroleum products subject to current facility restrictions 	<ul style="list-style-type: none"> • Used mainly for seasonal pad dewatering 	<ul style="list-style-type: none"> • See Facility Guide G.5 	<ul style="list-style-type: none"> • see Facility Guide G.8
Restrictions	<ul style="list-style-type: none"> • For in-field use only (including drilling rigs in MPU) • <200 ppm organic chlorides • Minimal solids • No hazardous wastes • No non-exempt solvents 	<ul style="list-style-type: none"> • No hazardous waste • No fluids that would be chemically or physically incompatible 	<ul style="list-style-type: none"> • See Facility Guide G.5 	<ul style="list-style-type: none"> • see Facility Guide G.8
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest • MPU Fluid Transfer Permit 	<ul style="list-style-type: none"> • North Slope Manifest • MPU Fluid Transfer Permit 	<ul style="list-style-type: none"> • North Slope Manifest • Daily Receiving/ Injection Log 	<ul style="list-style-type: none"> • North Slope Manifest • Additional paperwork for non-GPB and third-party users (see GPB Facility Guide G.8)
Facility Contact	<ul style="list-style-type: none"> • Control Room 670-3318 	<ul style="list-style-type: none"> • MPU Wells Operations Supervisor 670-3330 	<ul style="list-style-type: none"> • CPAI Wells Foreman 659-7634 	<ul style="list-style-type: none"> • G&I Control Room 659-8419
Compliance Contact	<ul style="list-style-type: none"> • MPU Environmental Advisor 670-3382 	<ul style="list-style-type: none"> • MPU Environmental Advisor 670-3382 	<ul style="list-style-type: none"> • CPAI Environmental Coordinator 659-7212 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893
Notes				<ul style="list-style-type: none"> • MSDS and/or lab data may be required

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.6 MILNE POINT FACILITY GUIDE (page 2 of 2)

	CLASS I DISPOSAL		SOLID WASTE ¹		HAZARDOUS WASTE ²	
Name	MPU B-50 (Direct Injection at Wellhead)	GPB G&I Facility	Central Reserve Pit (CRP)	D Pad Snow Hopper	D Pad Gravel Storage	MPU Hazardous Waste Storage Module
Location	MPU B Pad	GPB EOA DS 4	MPU A Pad	MPU D Pad	MPU D Pad	MPU Central Facilities Pad
Operator	BP	BP	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> Non-hazardous and RCRA-exempt fluids in pre-established waste-stream categories 	<ul style="list-style-type: none"> See Facility Guide G.8 	<ul style="list-style-type: none"> Water-based Class II-eligible drilling fluids 	<ul style="list-style-type: none"> Exempt or non-hazardous snow from spill cleanups 	<ul style="list-style-type: none"> Exempt or non-hazardous gravel from spill cleanups 	<ul style="list-style-type: none"> Hazardous or potentially hazardous waste from MPU facilities only and drilling rigs operating within MPU
Restrictions	<ul style="list-style-type: none"> No hazardous wastes (e.g., non-exempt methanol or diesel) Minimal solids (<5% by volume) 	<ul style="list-style-type: none"> See Facility Guide G.8 No MPU solids 	<ul style="list-style-type: none"> CRP is to be used only when G&I is unavailable or is inaccessible because of road conditions Pre-approval from MPU Environmental is required 	<ul style="list-style-type: none"> Testing may be necessary to verify that material is non-hazardous prior to placing it in storage 	<ul style="list-style-type: none"> Testing may be necessary to verify that material is non-hazardous prior to placing it in storage 	<ul style="list-style-type: none"> Access restricted to authorized personnel No deliveries without approval of MPU Environmental
Paperwork Required	<ul style="list-style-type: none"> North Slope Manifest 	<ul style="list-style-type: none"> North Slope Manifest Additional paperwork for non-GPB and third-party users (see GPB Facility Guide G.8) 	<ul style="list-style-type: none"> North Slope Manifest MPU Fluid Transfer Permit 	<ul style="list-style-type: none"> MPU Snow Hopper Receipt Log (completed by Environmental) 	<ul style="list-style-type: none"> MPU Gravel Log (completed by Environmental) 	<ul style="list-style-type: none"> Material Receipt Log
Facility Contact	<ul style="list-style-type: none"> MPU Well Ops. Coordinator 670-3293/ 943-1429 	<ul style="list-style-type: none"> G&I Control Room 659-8419 	<ul style="list-style-type: none"> MPU Environmental Advisor 670-3382 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473
Compliance Contact	<ul style="list-style-type: none"> MPU Environmental Advisor 670-3382 MPU Environmental Technician 659-0606/ Harmony 2338 	<ul style="list-style-type: none"> GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473 	<ul style="list-style-type: none"> MPU Environmental Technician 670-3473
Notes						

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.7 NORTHSTAR FACILITY GUIDE (page 1 of 2)

	HYDROCARBON RECYCLING	EOR	CLASS II DISPOSAL	CLASS I DISPOSAL
Name	Northstar Production Facility	None	NS-10, NS-32 Class I Wells	NS-10, NS-32 Class I Wells
Location	Northstar		Northstar	Northstar
Operator	BP		BP	BP
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbons • Crude oil/water mixtures • Non-exempt lubricating oils, hydraulic fluids, transmission fluids, grease, diesel, other refined petroleum products 		<ul style="list-style-type: none"> • See next column 	<ul style="list-style-type: none"> • Non-hazardous or RCRA-exempt fluids and solids in pre-approved waste-stream categories
Restrictions	<ul style="list-style-type: none"> • <200 ppm organic chlorides • Minimal solids • No hazardous wastes 		<ul style="list-style-type: none"> • See next column 	<ul style="list-style-type: none"> • Wastes must be characterized by testing or generator knowledge • Requires approval from ADEC for storage of contaminated materials (snow, gravel, & drilling waste) • Non-Northstar waste requires review and pre-approval
Paperwork Required	<ul style="list-style-type: none"> • Material Receipt Log (Environmental) 		<ul style="list-style-type: none"> • See next column 	<ul style="list-style-type: none"> • North Slope Manifest
Facility Contact	<ul style="list-style-type: none"> • Environmental Technician 670-3508 		<ul style="list-style-type: none"> • See next column 	<ul style="list-style-type: none"> • Environmental Technician 670-3508
Compliance Contact	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810 		<ul style="list-style-type: none"> • See next column 	<ul style="list-style-type: none"> • Environmental Advisor (North) 659-6810
Notes	<ul style="list-style-type: none"> • Environmental Technician coordinates transfer to production facility 		<ul style="list-style-type: none"> • GPB G&I also authorized (see GPB Facility Guide G.8) 	<ul style="list-style-type: none"> • GPB Pad 3 (for fluids) and G&I also authorized (see GPB Facility Guide G.8)

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.7 NORTHSTAR FACILITY GUIDE (page 2 of 2)

	SOLID WASTE ¹			HAZARDOUS WASTE ²
Name	Spot Cleanup Bins	Landfill Dumpster	Northstar Camp Incinerator	Hazardous Waste Bay
Location	Northstar	Northstar	Northstar	Northstar
Operator	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> • Snow and gravel from spill cleanups • Contaminants must be non-hazardous, RCRA-exempt, or recyclable hydrocarbons 	<ul style="list-style-type: none"> • Cardboard • Clean wood debris 	<ul style="list-style-type: none"> • Non-hazardous burnable waste • Food waste • Household waste • Non-hazardous oily waste 	<ul style="list-style-type: none"> • Hazardous or potentially hazardous wastes from Northstar
Restrictions		<ul style="list-style-type: none"> • No food waste 	<ul style="list-style-type: none"> • No listed or characteristic hazardous waste • No aerosol cans, batteries, or light bulbs • Waste must be visually inspected before burning 	<ul style="list-style-type: none"> • Access restricted to authorized personnel • No deliveries without approval of Northstar Environmental
Paperwork Required	<ul style="list-style-type: none"> • Snow/Gravel Log (Environmental Technician) 	<ul style="list-style-type: none"> • N/A – visual inspection 	<ul style="list-style-type: none"> • N/A – visual inspection 	<ul style="list-style-type: none"> • Material Receipt Log (Environmental Technician)
Facility Contact	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508
Compliance Contact	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508 	<ul style="list-style-type: none"> • Environmental Technician 670-3508
Notes	<ul style="list-style-type: none"> • Segregate materials as instructed • Contaminated gravel storage cell may be available for larger volumes 	<ul style="list-style-type: none"> • Segregate materials as instructed 	<ul style="list-style-type: none"> • Segregate materials as instructed 	<ul style="list-style-type: none"> • Environmental Technician collects and stores in restricted access facility until shipped off site to authorized disposal facility.

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.8 GREATER PRUDHOE BAY FACILITY GUIDE (page 1 of 3)

	HYDROCARBON RECYCLING		EOR								
Name	GC2	Flow Station 1 (offload to slop oil tank)	Flow Stations 1, 2, 3; LPC; Gathering Centers 1, 2, 3 Also: designated injector wells available seasonally for pad and pit dewatering								
Location	WOA	EOA	GPB								
Operator	BP	BP	BP								
Materials Accepted	<ul style="list-style-type: none"> • Non-hazardous and exempt hydrocarbons from any BP asset • Crude oil/water mixtures • Non-exempt lubricating oils, hydraulic fluids, transmission fluids, diesel, Therminol, other refined petroleum products (subject to operational restrictions) • Other hydrocarbons eligible for Class II disposal 	<ul style="list-style-type: none"> • Fluids with $\geq 2\%$ hydrocarbons • Crude oil/water mixtures • Fuel/water mixtures • Non-exempt lubricating oils, hydraulic fluids, transmission fluids, diesel, other refined petroleum products 	<ul style="list-style-type: none"> • Seawater, produced water, fresh water, and other exempt and non-hazardous fluids that meet AOGCC EOR guidelines (Attachment C) • Fluids that are compatible with the reservoir and meet technical specs for dissolved O₂, suspended solids, etc. 								
Restrictions	<ul style="list-style-type: none"> • Must be delivered in bulk – no drums • <200 ppm organic chlorides – each source must be analyzed • No viscous/gelled emulsions • May not plug screens • No fluids with high solids content • No hazardous wastes • No chlorinated or nonchlorinated solvents • No acid/acid mixtures 	<ul style="list-style-type: none"> • Must be delivered in bulk – no drums • <200 ppm organic chlorides – each source must be analyzed • No viscous/gelled emulsions • May not plug screens • No fluids with high solids content • No hazardous wastes • No chlorinated or nonchlorinated solvents • No acid/acid mixtures 	<ul style="list-style-type: none"> • No hazardous waste • No fluids that would be chemically or physically incompatible 								
Paperwork Required	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest if trucked, none if hard-piped 								
Facility Contact	<ul style="list-style-type: none"> • GC2 Ops Team Lead 659-4916 • GC2 Control Room 659-4912 	<ul style="list-style-type: none"> • FS1 Control Room 659-5391 	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">FS1 659-5391</td> <td style="width: 50%;">GC1 659-4082</td> </tr> <tr> <td>FS2 659-5491</td> <td>GC2 659-4912</td> </tr> <tr> <td>FS3 659-5591</td> <td>GC3 659-4963</td> </tr> <tr> <td>LPC 659-8660</td> <td></td> </tr> </table>	FS1 659-5391	GC1 659-4082	FS2 659-5491	GC2 659-4912	FS3 659-5591	GC3 659-4963	LPC 659-8660	
FS1 659-5391	GC1 659-4082										
FS2 659-5491	GC2 659-4912										
FS3 659-5591	GC3 659-4963										
LPC 659-8660											
Compliance Contact	<ul style="list-style-type: none"> • GPB Environmental Advisor (West) 659-4789 	<ul style="list-style-type: none"> • GPB Environmental Advisor (East) 659-5999 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 • GPB Environmental Team Lead 659-5196 								
Notes	<ul style="list-style-type: none"> • Used oil from rigs is consolidated and sampled by Waste Technician 	<ul style="list-style-type: none"> • Used oil from rigs is consolidated and sampled by Waste Technician 	<ul style="list-style-type: none"> • Class I or Class II disposal may be an alternative 								

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.8 GREATER PRUDHOE BAY FACILITY GUIDE (page 2 of 3)

Name	CLASS II DISPOSAL		CLASS I DISPOSAL	
	GC1, GC2, GC3 H-3A (seasonal)	G&I Facility	G&I Facility	Pad 3 Waste Injection Facility (WIF)
Location	WOA	EOA DS 4	EOA DS 4	EOA DS 6
Operator	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> Class II-eligible fluids such as <ul style="list-style-type: none"> Returned seawater Well-cellar fluids Meltwater from reserve pits Class II-eligible vessel cleanouts 	<ul style="list-style-type: none"> See next column 	<ul style="list-style-type: none"> Non-hazardous and RCRA-exempt solids and fluids in pre-established waste-stream categories Solids accepted at DS 4 Material Transfer Station 	<ul style="list-style-type: none"> Non-hazardous and RCRA-exempt fluids in pre-established waste-stream categories
Restrictions	<ul style="list-style-type: none"> Minimal solids – may not plug screens Screen size <1/8" Restricted to GPB fluids only 	<ul style="list-style-type: none"> Check with facility for current restrictions 	<ul style="list-style-type: none"> No hazardous waste (e.g., non-exempt methanol or diesel) No oily solids may be offloaded directly at facility (worker exposure/equipment issue) <1% hydrocarbons or flammables (for liquids) 	<ul style="list-style-type: none"> No hazardous wastes (e.g., non-exempt methanol or diesel) Fluids with <15% solids by volume Screen size <1/4" pH ≤11
Paperwork Required	<ul style="list-style-type: none"> North Slope Manifest 	<ul style="list-style-type: none"> See next column 	<ul style="list-style-type: none"> North Slope Manifest Additional paperwork requirements for non-GPB and third-party users (see current procedure): <ul style="list-style-type: none"> Approved waste analysis & sampling plan Initial characterization data Indemnification form (one time) Lack-of-radioactivity certification (once) Fingerprint data (as required) Approval letter from BP (third parties) 	<ul style="list-style-type: none"> North Slope Manifest Additional paperwork requirements for non-GPB and third-party users (see current procedure): <ul style="list-style-type: none"> Approved waste analysis & sampling plan Initial characterization data Indemnification form (one time) Lack-of-radioactivity certification (once) Fingerprint data (as required) Approval letter from BP (third parties)
Facility Contact	<ul style="list-style-type: none"> GC1 Control Room 659-4082 GC2 Control Room 659-4912 GC3 Control Room 659-4963 	<ul style="list-style-type: none"> See next column 	<ul style="list-style-type: none"> G&I Control Room 659-8419 	<ul style="list-style-type: none"> Pad 3 Operator 659-5533
Compliance Contact	<ul style="list-style-type: none"> GPB Environmental Advisor (West) 659-4789 	<ul style="list-style-type: none"> See next column 	<ul style="list-style-type: none"> GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> GPB Environmental Advisor (Central) 659-5893
Notes	<ul style="list-style-type: none"> H-3A used seasonally for reserve pit dewatering (contact Environmental) 	<ul style="list-style-type: none"> See next column 	<ul style="list-style-type: none"> MSDS and/or lab data may be required Direct injection of fluids may be approved (contact Environmental) 	<ul style="list-style-type: none"> MSDS and/or lab data may be required

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.8 GREATER PRUDHOE BAY FACILITY GUIDE (page 3 of 3)

	RECYCLABLE SOLIDS	SOLID WASTE ¹				HAZARDOUS WASTE ²
	Solid Waste Sites	Pad 3 Waste Injection Facility West Pit	DS 4 Material Transfer Station	W Pad, CC2A	Santa Fe Pad Storage Bins	Hazardous Waste Process Facility (HWPF)
Location	WOA Cold Storage Pad EOA C-Pad	EOA DS 6	EOA DS 4	WOA	WOA Santa Fe Pad Module A3W2	WOA BOC Pad
Operator	BP	BP	BP	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> • Non-friable ACM • Recyclable wood • Burnable wood waste • Oily waste • Landfill waste • Food waste • Recyclable metal • Recyclable plastics, paper, cardboard, batteries • Recyclable electronics and office equipment 	<ul style="list-style-type: none"> • Gravel contaminated with exempt or non-hazardous residues (hydrocarbons, glycols) 	<ul style="list-style-type: none"> • E&P exempt and non-hazardous solids, oily and non-oily (if approved by Environmental and G&I Operator) 	<ul style="list-style-type: none"> • Exempt and non-hazardous drilling waste, snow, and gravel from GPB and Exploration (with prior approval) 	<ul style="list-style-type: none"> • Exempt and non-hazardous contaminated gravel and snow from spot cleanups 	<ul style="list-style-type: none"> • Hazardous or potentially hazardous waste from GPB facilities only (including drilling rigs operating in GPB)
Restrictions	<ul style="list-style-type: none"> • No hazardous waste • No liquids, gravel, or snow • Use designated dumpsters (follow <i>Dumpster Guidelines</i> in Attachment F) 	<ul style="list-style-type: none"> • No non-GPB solids • Pre-approval required for all E&P exempt solids because of space limitations • Minimize free liquids 	<ul style="list-style-type: none"> • Maintain 2' of freeboard above free liquids 	<ul style="list-style-type: none"> • No non-GPB solids 	<ul style="list-style-type: none"> • Access limited to authorized ACS Spill Technicians • 60-day storage limit 	<ul style="list-style-type: none"> • Access restricted to authorized personnel only • No deliveries without prior arrangement with Waste Coordinator
Paperwork Required	<ul style="list-style-type: none"> • Tracking Logs (maintained by Waste Site Technician) 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • North Slope Manifest, to G&I Control Room before offloading 	<ul style="list-style-type: none"> • North Slope Manifest 	<ul style="list-style-type: none"> • Accumulation Bin Log 	<ul style="list-style-type: none"> • Material Receipt Log
Facility Contact	<ul style="list-style-type: none"> • Waste Site Technician 659-4097 (West) 659-5195 (East) 	<ul style="list-style-type: none"> • Pad 3 Operator 659-5533 	<ul style="list-style-type: none"> • G&I Control Room 659-8419 	<ul style="list-style-type: none"> • Waste Coordinator 659-4810 	<ul style="list-style-type: none"> • ACS Lead Technician 659-4375 	<ul style="list-style-type: none"> • Waste Coordinator 659-4810
Compliance Contact	<ul style="list-style-type: none"> • GPB Environmental Advisor (West) 659-4789 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> • GPB Environmental Advisor (Central) 659-5893 	<ul style="list-style-type: none"> • Waste Coordinator 659-4810 	<ul style="list-style-type: none"> • GPB Environmental Advisor (West) 659-4789 	<ul style="list-style-type: none"> • Waste Coordinator 659-4810
Notes	<ul style="list-style-type: none"> • Follow current Solid Waste Site Procedures 					

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.9 GAS-TO-LIQUIDS FACILITY* (NIKISKI) GUIDE (page 1 of 1)

	RECYCLABLES	SOLID WASTE ¹		OILY WASTE	HAZARDOUS WASTE ²	
Name	Recyclable Accumulation Areas (RAAs)	Recyclable Metal Dumpsters	Kenai Landfill Dumpsters	Oily Waste Bin	Central Hazardous Waste Storage Unit	Accumulation Areas
Location	GTLTF	GTLTF	GTLTF	GTLTF	GTLTF	GTLTF
Operator	BP	BP	Kenai Borough	BP	BP	BP
Materials Accepted	<ul style="list-style-type: none"> Used oil that meets recycling specifications Reusable glycol Scrap metal 	<ul style="list-style-type: none"> Scrap metal that will be recycled 	<ul style="list-style-type: none"> Non-hazardous solid material that will be sent to Kenai landfill 	<ul style="list-style-type: none"> Non-hazardous oiled rags, sorbents, debris Oil/diesel filters, drained 	<ul style="list-style-type: none"> Hazardous waste Controlled waste Used oil Waste stored for disposal 	<ul style="list-style-type: none"> Hazardous waste, potentially hazardous waste Universal waste (batteries, unbroken light bulbs) Aerosol cans
Restrictions	<ul style="list-style-type: none"> No hazardous wastes 	<ul style="list-style-type: none"> No liquids (except water) No hazardous waste or hazardous material No trash or garbage 	<ul style="list-style-type: none"> No aerosol cans or light bulbs No free liquids No hazardous wastes Dumpster must be covered at all times 	<ul style="list-style-type: none"> No free liquid No hazardous wastes No snow or gravel No garbage 	<ul style="list-style-type: none"> Do not mix corrosive waste and flammable waste No incompatible wastes All containers must be properly labeled 	<ul style="list-style-type: none"> All materials from SAAs must be logged in upon transfer to storage area Follow approved procedures for crushing aerosol cans
Paperwork Required	<ul style="list-style-type: none"> Weekly Inspection Log 	<ul style="list-style-type: none"> Transfer receipt when emptied 	<ul style="list-style-type: none"> Disposal Receipts 	<ul style="list-style-type: none"> Disposal Records 	<ul style="list-style-type: none"> Weekly Inspection Log 	<ul style="list-style-type: none"> Weekly Inspection Log
Facility Contact	<ul style="list-style-type: none"> Main Number 776-5413 	<ul style="list-style-type: none"> Main Number 776-5413 	<ul style="list-style-type: none"> Main Number 776-5413 	<ul style="list-style-type: none"> Main Number 776-5413 	<ul style="list-style-type: none"> Main Number 776-5413 	<ul style="list-style-type: none"> Main Number 776-5413
Compliance Contact	<ul style="list-style-type: none"> BP Compliance Authority 564-5229 	<ul style="list-style-type: none"> BP Compliance Authority 564-5229 	<ul style="list-style-type: none"> BP Compliance Authority 564-5229 	<ul style="list-style-type: none"> BP Compliance Authority 564-5229 	<ul style="list-style-type: none"> BP Compliance Authority 564-5229 	<ul style="list-style-type: none"> BP Compliance Authority 564-5229
Notes						<ul style="list-style-type: none"> To be shipped to permitted disposal facility in Lower 48

* Facility currently in cold shutdown. Limited maintenance activities still occur.

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.10 LIQUEFIED NATURAL GAS PLANT (KENAI) FACILITY GUIDE (page 1 of 1)

	USED OIL RECYCLING	SOLID WASTE¹	HAZARDOUS WASTE²		
Name	Used Oil Collection Tanks	Peninsula Sanitation Dumpsters	Universal Waste Accumulation Area (UAA)	Central Drum Accumulation Area	Generator Accumulation Areas
Location	Lean-to outside Maintenance Shop	Various – Plant Grounds	Warehouse	Lower Yard Drum Dock	Equipment Shop, Roustabout Shop, others as needed
Operator	CPAI	Peninsula Sanitation	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> Approved used oils and hydrocarbons burned for energy recovery <ul style="list-style-type: none"> Crankcase & gear oil Used turbine oil from de-oilers Hydraulic fluid Lube oil 	<ul style="list-style-type: none"> Non-hazardous, non-exempt solids Domestic solid wastes <ul style="list-style-type: none"> Paper products Plastic, rubber, textiles, leather 	<ul style="list-style-type: none"> Universal wastes including batteries and fluorescent lamps 	<ul style="list-style-type: none"> Central staging area for all hazardous and non-hazardous waste that requires specialized handling (e.g., solid oily waste, used oil, tank bottoms) 	<ul style="list-style-type: none"> See Accumulation Area Guidelines
Restrictions	<ul style="list-style-type: none"> No hazardous wastes No mixtures of used oil with other products or wastes unless approved by Environmental (e.g., Stoddard solvent, glycol, gasoline) No dielectric oil with PCBs No chlorinated solvent mixtures Any used oil from oil changes on personal equipment must be placed directly in the Used Oil Burner day tank 	<ul style="list-style-type: none"> No hazardous wastes No hazardous chemicals No asbestos-containing material No PCB-containing material No solids containing oils or chemicals (rags, sorbent, gravel) 	<ul style="list-style-type: none"> Materials must be stored in proper containers with required labels and dates Contact Environmental for assistance 	<ul style="list-style-type: none"> Contact Operations prior to placing any waste in the drum accumulation area 	<ul style="list-style-type: none"> See Accumulation Area Guidelines
Paperwork Required			<ul style="list-style-type: none"> Cook Inlet Manifest required for transport to another CPAI facility 	<ul style="list-style-type: none"> LNG Monthly Accumulation Area Inspection Log 	<ul style="list-style-type: none"> LNG Monthly Accumulation Area Inspection Log
Facility Contact	<ul style="list-style-type: none"> Maintenance Supt. 776-2037 	<ul style="list-style-type: none"> Maintenance Supt. 776-2037 	<ul style="list-style-type: none"> Maintenance Supt. 776-2037 	<ul style="list-style-type: none"> Maintenance Supt. 776-2037 	<ul style="list-style-type: none"> Maintenance Supt. 776-2037
Compliance Contact	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092
Notes			<ul style="list-style-type: none"> Lead-acid batteries managed per 40 CFR 266.80 		<ul style="list-style-type: none"> LNG typically RCRA CESQG

Notes: 1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

G.11 TYONEK PLATFORM FACILITY GUIDE (page 1 of 1)

	CLASS II DISPOSAL	CLASS I DISPOSAL	SOLID WASTE ¹	STAGING (for movement off platform)	UNIVERSAL WASTE ²	HAZARDOUS WASTE ²
Name	A-12, B-01A (backup) Disposal Wells	NCIU A-13 Disposal Well	Kitchen Trash Dumpster (30-yd)	Drum Storage Areas	Recycling Accumulation Area	Satellite Accumulation Areas
Location	Tyonek Platform	Tyonek Platform	On Drill Deck near living quarters	Designated storage area on Production and Utility Decks	Production Deck	Mud Deck, AC Room, others as required
Operator	CPAI	CPAI	CPAI/KPB	CPAI	CPAI	CPAI
Materials Accepted	<ul style="list-style-type: none"> Class II-eligible fluids only A-12-specific, pre-approved non-hazardous fluids: <ul style="list-style-type: none"> Unused brine, Excess cement slurry Unused cement rinsate 	<ul style="list-style-type: none"> Non-hazardous fluids Class II-eligible fluids 	<ul style="list-style-type: none"> Non-hazardous solid waste: <ul style="list-style-type: none"> Domestic solid wastes Paper products Plastic, rubber, textiles 	<ul style="list-style-type: none"> Staging area for clearly identified waste pending transportation off site 	<ul style="list-style-type: none"> Materials suitable for recycling including lead-acid batteries and fluorescent light bulbs 	<ul style="list-style-type: none"> See Accumulation Area Guidelines
Restrictions	<ul style="list-style-type: none"> A-12: no solids Batch fluids (not hard-piped) by approval only 	<ul style="list-style-type: none"> No hazardous wastes 	<ul style="list-style-type: none"> No hazardous wastes No hazardous chemicals No asbestos-containing material No PCB-containing material No solids (rags, sorbent, gravel) containing oils or chemicals 	<ul style="list-style-type: none"> Contact Operations prior to placing any waste in the drum storage area Wastes must be clearly identified and properly containerized Special requirements for hazardous waste management – contact Environmental for assistance 	<ul style="list-style-type: none"> Materials must be stored in proper containers with required labeling Contact Environmental for assistance 	<ul style="list-style-type: none"> See Accumulation Area Guidelines
Paperwork Required	<ul style="list-style-type: none"> Batch Injection Log Daily Production Report 	<ul style="list-style-type: none"> Batch Injection Log 		<ul style="list-style-type: none"> Tyonek Platform Drum Manifest Cook Inlet Manifest required for transport to another CPAI facility Accumulation Area Monthly Report 	<ul style="list-style-type: none"> Cook Inlet Manifest required for transport to another CPAI facility 	
Facility Contact	<ul style="list-style-type: none"> Platform Supervisor 776-2073 	<ul style="list-style-type: none"> Platform Supervisor 776-2073 	<ul style="list-style-type: none"> Platform Supervisor 776-2073 	<ul style="list-style-type: none"> Platform Supervisor 776-2073 	<ul style="list-style-type: none"> Platform Supervisor 776-2073 	<ul style="list-style-type: none"> Platform Supervisor 776-2073
Compliance Contact	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092 	<ul style="list-style-type: none"> Environmental Coordinator 776-2092
Notes		<ul style="list-style-type: none"> Permit AK-11012-A 	<ul style="list-style-type: none"> DIO 17 & 33 			<ul style="list-style-type: none"> Tyonek typically RCRA CESQG

Notes: 1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

- Notes:**
1. See Attachment F (Dumpster Guidelines)
 2. See Attachment E (Accumulation Area Guidelines); accumulation area may also be used for non-hazardous waste to be shipped offsite

H. NORTH SLOPE AND COOK INLET MANIFESTS

Purpose

North Slope and Cook Inlet manifest forms are used to track all wastes from the point of generation to the final BP or CPAI disposal facility. They contain important information about the source, composition, volume, and final disposition of the material. This information is needed for billing purposes, permits, regulatory compliance, and corporate statistics. These manifests (or some form of documentation) also are required for many recycling activities, such as hydrocarbon recovery and EOR, and for beneficial reuse of certain materials. Some facilities require additional paperwork. Check the *Facility Guides* (Attachment G of this book) to find out what is needed for a specific facility, and contact your environmental representative if you have any questions.

Liability

Many people ask about the liability associated with signing a manifest. Please read Section 2 of this book regarding your individual responsibility for complying with environmental laws. You can significantly reduce or eliminate the risk of violating an environmental law by following these simple steps:

Generators:

- Attend the BP/CPAI Waste Management Certification Training Program.
- Fill out manifests accurately and completely, according to the instructions provided.
- Use the classifications and disposal/reuse options listed in this book.
- Don't leave a signed, incomplete manifest for someone else to fill out.
- Sign only if you are familiar with the material and the process that generated it.
- Check with the BP or CPAI environmental staff if you have any questions.

Transporters:

- Attend the BP/CPAI Waste Management Certification Training Program.
- Know what you are hauling — don't let someone else load your truck.
- Pick up only what is described on the manifest, and deliver it only to the facility indicated by the generator.
- Don't pick up any unmanifested waste.
- Contact the generator if you have any questions about the material or the paperwork.

Receivers:

- Attend the BP/CPAI Waste Management Certification Training Program.
- Verify that the generator and transporter are on the current certification list.
- Understand the restrictions and policies of the receiving facility.
- Contact the generator if anything on the manifest is unclear.
- Contact the BP or CPAI environmental staff if you have any questions.

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

How to Complete the North Slope and Cook Inlet Manifest Form

The manifest must be completed and signed by **certified generators, transporters, and receivers**. “Certification” means that an individual has completed the BP/CPAI Waste Management Certification Program and has been authorized by his/her supervisor to sign manifests. Contact the BP or CPAI environmental staff for training information and schedules. A list of currently certified generators, transporters, and receivers is posted on company Intranet sites.

Examples of the current North Slope and Cook Inlet manifests, along with step-by-step instructions, are shown on the next pages. North Slope manifest booklets come with an instruction sheet on the cover flap.

Important!

- Generators: fill in all the appropriate information before you sign the manifest.
- Don't leave an unfinished manifest for someone else to complete.
- Don't use abbreviations or slang in the “generating activity or process ” box.
- Be sure to have all the paperwork you need before sending a load to the receiving facility.
- Remember that mixed loads may require more than one manifest.
- Everyone: remember to sign and date your section of the form.
- Don't change a manifest without contacting the generator.
- Document all contacts (with generator, environmental, etc.) in the comments section of the form.

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Example of North Slope Manifest Form.

NORTH SLOPE MANIFEST

1. GENERATOR INFORMATION		Field/ Asset	Owner Company	Date	
Name (Print)		Rig/ Facility	Source/ Well No.	Time	<input type="checkbox"/> AM <input type="checkbox"/> PM
Contact Number		<input type="checkbox"/> Phone <input type="checkbox"/> Radio	<input type="checkbox"/> Pager <input type="checkbox"/> Harmony	Cost Code/Activity Code AFE/Approver ID	
2. GENERATING ACTIVITY OR PROCESS			3. VOLUME (Estimate)		
			<input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³		
4. DESCRIPTION (Composition must equal 100% - use whole numbers)					
Crude Oil	%	Glycol	%	Fresh Water	%
Produced Water	%	Acid	%	Seawater/Brine/KCl	%
Drilling Mud	%	Frac Sand	%	Source Water	%
Cuttings	%	Diesel/Water Gel	%	Reserve/Flare/Relief Pit Water	%
Cement/Contaminate	%	Scale/Corrosion Inhibitor	%	Snow	%
Diesel	%	Boiler Blowdown	%	Gravel/Sand	%
Methanol	%	Used Oil	%	Domestic Wastewater	%
OTHER: Describe below. Check approval method at right.		Approved by (Name/Date)		or	
				<input type="checkbox"/> Listed in Alaska Waste Disposal & Reuse Guide	
5. REUSE / RECYCLE / EOR: Will the material be reused/recycled as approved in the Alaska Waste Disposal and Reuse Guide?					
<input type="checkbox"/> YES Select method at right and go to PART 8		<input type="checkbox"/> Water recycle/EOR		<input type="checkbox"/> Other beneficial reuse/recycle (Describe):	
<input type="checkbox"/> NO Go to PART 6		<input type="checkbox"/> Hydrocarbon recycle			
6. CLASS II DISPOSAL: Was the waste brought to the surface or otherwise approved for Class II disposal?					
<input type="checkbox"/> YES Go to PART 7 if Class I facility will be used OR Part 8 if Class II facility will be used					
<input type="checkbox"/> NO Go to PART 7 or contact Environmental					
7. CLASS I DISPOSAL: Is the waste either non-hazardous or exempt from regulation as hazardous waste (40 CFR 261.4)?					
Refer to the Alaska Waste Disposal & Reuse Guide and other appropriate guidance.					
<input type="checkbox"/> YES Select classification at right and go to PART 8		<input type="checkbox"/> Non-exempt, Non-hazardous		GPB Waste Stream Code (see instructions)	
<input type="checkbox"/> NO Contact Environmental - no Class I disposal		<input type="checkbox"/> RCRA-exempt		Pad 3/G&I only	
8. DESTINATION (Name of Facility) If destination facility is not listed below, describe in OTHER box.					
ALPINE		<input type="checkbox"/> WD-02	<input type="checkbox"/> A1 Hydrocarbon Recycle	<input type="checkbox"/> Temporary Storage Cell	<input type="checkbox"/> CD2 Class II Storage Cell
		<input type="checkbox"/> CD1-01A	<input type="checkbox"/> Annular Injection	(describe in OTHER)	<input type="checkbox"/> CD2 Class I Storage Cell
KUPARUK		<input type="checkbox"/> CPF-1 Hydrocarbon Recycle	<input type="checkbox"/> CPF-1 Water Recycle	<input type="checkbox"/> CPF-1 Oily Waste Storage Cell	
		<input type="checkbox"/> DS 1R-18 Class II Well	<input type="checkbox"/> C/D Warehouse	<input type="checkbox"/> DS 1H Oily Waste Storage Cell	
GREATER PRUDHOE BAY		<input type="checkbox"/> Pad 3 Waste Facility		<input type="checkbox"/> Grind & Inject Facility	
MILNE POINT		<input type="checkbox"/> B-50 (Wellhead)		<input type="checkbox"/> ORT	
NORTHSTAR		<input type="checkbox"/> NS-10		<input type="checkbox"/> NS-32	
ENDICOTT		<input type="checkbox"/> Snowmelt Tank		<input type="checkbox"/> P-12/202	
OTHER (Include field and location)					
9. TEST DATA if required by receiving facility		<input type="checkbox"/> Attached	pH	Water	%
		<input type="checkbox"/> On file	Flash pt.	°F	Org. chlorides ppm
			Solids	%	Hydrocarbons %
10. GENERATOR			11. TRANSPORTER		
Name (Print)		Signature		Date	
Certification <i>This consignment, to the best of my knowledge and belief, is accurately described above and I have applied the provisions of the Alaska Waste Disposal and Reuse Guide in making decisions concerning the reuse or disposal of this material.</i>					
Name (Print)		Signature		Date	
Company:			Truck/Trailer No:		
12. RECEIVER			13. VOLUME		
Name (Print)		Signature		Date	
Offloaded at:			Volume		
			<input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³		

COMMENTS: If this is a mixed load, cross-reference other manifest numbers here:

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Example of instruction sheet from cover flap.

NORTH SLOPE MANIFEST INSTRUCTIONS

This form is valid ONLY if it is signed by "certified" Generators, Transporters, and Receivers who have completed the ConocoPhillips and BP Waste Management Certification Training Program.

Parts 1 through 10 are completed by the GENERATOR

- PART 1** **GENERATOR INFORMATION:** Fill in all sections legibly.
- PART 2** **GENERATING ACTIVITY OR PROCESS:** Clearly describe the activity or process that generated the material.
- PART 3** **VOLUME:** Estimate the quantity in barrels, gallons, or cubic yards.
- PART 4** **DESCRIPTION:** Estimate the percentage of all components, and be sure numbers add up to 100%. Use "trace" when percentage is significantly less than 1%. (These percentages are only estimates, and should not be used in calculations to determine RCRA compliance.)
- Do not use "Other" without providing a complete description. "Other" material must be listed in the *Alaska Waste Disposal & Reuse Guide (Waste Guide)* or specifically approved by BP or ConocoPhillips.
- PART 5** **REUSE/RECYCLE:** Check the latest edition of the *Waste Guide* for appropriate re-use and recycling options. If your particular activity is not listed, you must contact the BP or ConocoPhillips environmental staff for case-by-case approval. Note facility restrictions (*Waste Guide* Attachment G). If applicable, describe how and where material will be beneficially reused.
- PART 6** **CLASS II:** Waste must be specifically listed for Class II disposal in the *Waste Guide*, and/or must meet the Class II disposal criteria shown in Attachment B of the *Waste Guide*. Note: Class II waste may also be sent to a Class I disposal facility providing it meets the facility's operating requirements.
- PART 7** **CLASS I:** Waste must be listed as RCRA-exempt or non-hazardous in the *Waste Guide*. If not, it must be specifically approved by the BP or ConocoPhillips Environmental staff on the basis of testing or other information. You must check either RCRA-Exempt or Non-Exempt, Non-Hazardous in Part 7. The manifest must also include the appropriate Waste Stream Code for non-exempt, non-hazardous wastes that go to GPB Pad 3 (P) or Grind and Inject Facility (G). One waste stream code should be used per manifest.

GPB: Pad 3 and G&I Codes for Non-Exempt, Non-Hazardous Waste Streams

P/G-1 Sump Fluids	P/G-7 Off-Spec Product
P/G-2 Heat Exchanger Media	P/G-8 Contained Snow/Ponded Water
P/G-3 Photo Processor Waste	P/G-9 Tank Cleaning/Drum Rinsate
P/G-4 Non-Exempt Spill Cleanup	P/G-10 Fluid From Remediation
P/G-5 Hydrotest Fluids (Water/Glycol)	P/G-11 Domestic Waste Water
P/G-6 Equipment/Facility Wash Water	P/G-12 Other

- PART 8** **DESTINATION:** Check the appropriate box or write the name of the facility where this load will be managed. Be sure to check the *Waste Guide* (Attachment G) for site-specific restrictions and requirements.
- PART 9** **SCREENING OR TEST DATA:** Check with the facility in advance to find out if any special testing or screening is required. Provide results, or attach supporting data (lab results, MSDS, etc.) as instructed.
- PART 10** **GENERATOR CERTIFICATION:** Generators must read, sign, and date this section.
-
- PART 11** **TRANSPORTER SECTION:** By completing and signing this section, the Transporter certifies that he/she has picked up only the material described by the Generator and delivered it only to the designated facility.
-
- PART 12** **RECEIVER SECTION:** The Receiver must review the manifest for completeness, and verify that the Generator and Transporter are currently certified. Contact the Generator if there are any questions or discrepancies. Indicate the actual location where the material is offloaded, and the volume received. By signing this section, the Receiver acknowledges that the material, as described by the Generator, meets the criteria for acceptance at the facility.
-
- COMMENTS SECTION:** To be used as required by Generator, Transporter, and/or Receiver.
Cross-reference other manifest numbers here for "mixed loads".

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Example of Cook Inlet Manifest Form.

COOK INLET WASTE MANIFEST

1. GENERATOR INFORMATION		Field/ Asset	Owner Company	Date	
Name (Print)		Rig/ Facility	Source/ Well No.	Time	<input type="checkbox"/> AM <input type="checkbox"/> PM
Contact Number		<input type="checkbox"/> Phone <input type="checkbox"/> Pager <input type="checkbox"/> Radio <input type="checkbox"/> Harmony	Cost Code/Activity Code AFE/Approver ID		
2. GENERATING ACTIVITY OR PROCESS				3. VOLUME (Estimate) <input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³	
4. DESCRIPTION (Composition must equal 100% - use whole numbers)					
Crude Oil	%	Glycol	%	Fresh Water	%
Produced Water	%	Acid	%	Seawater/Brine/KCl	%
Drilling Mud	%	Frac Sand	%	Source Water	%
Cuttings	%	Diesel/Water Gel	%	Reserve/Flare/Relief Pit Water	%
Cement/Contaminate	%	Scale/Corrosion Inhibitor	%	Snow	%
Diesel	%	Boiler Blowdown	%	Gravel/Sand	%
Methanol	%	Used Oil	%	Domestic Wastewater	%
OTHER: Describe below. Check approval method at right.		Approved by (Name/Date)		or	
<input type="checkbox"/> % <input type="checkbox"/>				<input type="checkbox"/> Listed in <i>Alaska Waste Disposal & Reuse Guide</i>	
<input type="checkbox"/> % <input type="checkbox"/>				<input type="checkbox"/> <i>Reuse Guide</i>	
5. REUSE / RECYCLE / EOR: Will the material be reused/recycled as approved in the <i>Alaska Waste Disposal and Reuse Guide</i>?					
<input type="checkbox"/> YES Select method at right and go to PART 8		<input type="checkbox"/> Water recycle/EOR		<input type="checkbox"/> Other beneficial reuse/recycle (describe):	
<input type="checkbox"/> NO Go to PART 6		<input type="checkbox"/> Hydrocarbon recycle			
6. CLASS II DISPOSAL: Was the waste brought to the surface or otherwise approved for Class II disposal?					
<input type="checkbox"/> YES Go to PART 7 if Class I facility will be used OR Part 8 if Class II facility will be used					
<input type="checkbox"/> NO Go to PART 7 or contact Environmental					
7. CLASS I DISPOSAL: Is the waste either non-hazardous or exempt from regulation as hazardous waste (40 CFR 261.4)?					
Refer to the <i>Alaska Waste Disposal & Reuse Guide</i> and other appropriate guidance.					
<input type="checkbox"/> YES Select classification at right and go to PART 8		<input type="checkbox"/> Non-exempt, Non-hazardous		Waste Stream Code	
<input type="checkbox"/> NO Contact Environmental - no Class I disposal		<input type="checkbox"/> RCRA-exempt		(if applicable)	
8. DESTINATION (Name of Facility) If destination facility is not listed below, describe in OTHER box.					
TYONEK		<input type="checkbox"/> Class I A-13 <input type="checkbox"/> Class II B-01A		<input type="checkbox"/> Haz/Nonhaz Disposal/Recycling	
<input type="checkbox"/> KPB Landfill		<input type="checkbox"/> Class II A-12 CLEAR FLUIDS ONLY		<input type="checkbox"/> CWDF	
BELUGA		<input type="checkbox"/> Class I 232-09 <input type="checkbox"/> Class II BRWD-1		<input type="checkbox"/> Haz/Nonhazardous Disposal/Recycling	
<input type="checkbox"/> Beluga Landfill <input type="checkbox"/> Incinerator		<input type="checkbox"/> Recycler		<input type="checkbox"/> Haz/Nonhazardous Disposal/Recycling	
LNG PLANT		<input type="checkbox"/> KPB Landfill		<input type="checkbox"/> Haz/Nonhazardous Disposal/Recycling	
OTHER (Include field and location)					
9. TEST DATA if required by receiving facility		<input type="checkbox"/> Attached	pH	Water	%
<input type="checkbox"/> On file		Flash pt.	°F	Solids	%
				Org. chlorides	ppm
				Hydrocarbons	%
10. GENERATOR		Signature		Date	
Name (Print)					
Certification <i>This consignment, to the best of my knowledge and belief, is accurately described above and I have applied the provisions of the Alaska Waste Disposal and Reuse Guide in making decisions concerning the reuse or disposal of this material.</i>					
11. TRANSPORTER		Signature		Date	
Name (Print)					
Company:			Truck/Trailer No:		
12. RECEIVER		Signature		Date	
Name (Print)					
Offloaded at:			Volume <input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³		

COMMENTS: If this is a mixed load, cross-reference other manifest numbers here:

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Step-by-Step Instructions

1. Generator Information

- Print clearly
- Fill in each box with the appropriate information.

1. GENERATOR INFORMATION	Field/ Asset	Owner Company	Date
Name (Print)	Rig/ Facility	Source/ Well No.	Time <input type="checkbox"/> AM <input type="checkbox"/> PM
Contact Number	<input type="checkbox"/> Phone <input type="checkbox"/> Pager <input type="checkbox"/> Radio <input type="checkbox"/> Harmony	Cost Code/Activity Code AFE/Approver ID	

2. Generating Activity or Process

- Accurately describe the activity or process that generated the material.
- Be sure to indicate whether the material was returned from downhole.
- Don't use slang or abbreviations.

3. Volume

- Write down the estimated volume.
- Check the appropriate units (Bbl, Gal, Cu. yd.)

2. GENERATING ACTIVITY OR PROCESS	3. VOLUME (Estimate) <input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³
--	---

4. Description

- Estimate percentages of each constituent – must total 100%.
- Use whole numbers.
- Identify “trace” amounts (less than 1,000 ppm) with the letter “T” however, do not include these when adding the percentage of components (“T”=0%).
- If you check “Other”, describe the material clearly. It must be either listed in this Guide or approved by Environmental.
- Avoid estimating percentages (%) for spill cleanup materials; describe as “OTHER: Spill Cleanup Waste”.

4. DESCRIPTION (Composition must equal 100% - use whole numbers)			
Crude Oil	%	Glycol	%
Produced Water	%	Acid	%
Drilling Mud	%	Frac Sand	%
Cuttings	%	Diesel/Water Gel	%
Cement/Contaminate	%	Scale/Corrosion Inhibitor	%
Diesel	%	Boiler Blowdown	%
Methanol	%	Used Oil	%
		Fresh Water	%
		Seawater/Brine/KCl	%
		Source Water	%
		Reserve/Flare/Relief Pit Water	%
		Snow	%
		Gravel/Sand	%
		Domestic Wastewater	%
OTHER: Describe below. Check approval method at right.		Approved by (Name/Date)	
%	<input type="checkbox"/>	or <input type="checkbox"/> Listed in <i>Alaska Waste Disposal & Reuse Guide</i>	
%	<input type="checkbox"/>		

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

5. Reuse/Recycle

- Will the material be reused or recycled? This includes waterflood (EOR) and hydrocarbon recycling.
- If you check YES, then select one of the options on the right.
- If you select “Other Beneficial Reuse”, remember that the use must be pre-approved. Explain how, where, and when the material will be used.

5. REUSE / RECYCLE / EOR: Will the material be reused/recycled as approved in the Alaska Waste Disposal and Reuse Guide?		
<input type="checkbox"/> YES Select method at right and go to PART 8	<input type="checkbox"/> Water recycle/EOR	<input type="checkbox"/> Other beneficial reuse/recycle (Describe):
<input type="checkbox"/> NO Go to PART 6	<input type="checkbox"/> Hydrocarbon recycle	

6. Class II Disposal

- If you checked NO in step five, go to the *Disposal/Reuse Tables* in this Guide to see if the waste is approved for Class II disposal. If not, check with Environmental.
- If it is approved, then select the disposal facility (Step 8).
- Remember that Class II material can also go to a Class I well as RCRA E&P Exempt. If that is the case, then complete Step 7.

6. CLASS II DISPOSAL: Was the waste brought to the surface or otherwise approved for Class II disposal?	
<input type="checkbox"/> YES Go to PART 7 if Class I facility will be used OR Part 8 if Class II facility will be used	
<input type="checkbox"/> NO Go to PART 7 or contact Environmental	

7. Class I Disposal

- If you checked NO in Steps 5 and 6, you are probably going to use Class I disposal.
- You must check either RCRA Exempt or Non-Exempt, Non-Hazardous.
- If you check Non-Exempt, Non-Hazardous, and the material is going to GPB Pad 3 or G&I, you must also select one of the “Waste Stream Codes” listed on the instruction flap of the North Slope manifest book. Use only one code per manifest.

7. CLASS I DISPOSAL: Is the waste either non-hazardous or exempt from regulation as hazardous waste (40 CFR 261.4)?		
Refer to the <i>Alaska Waste Disposal & Reuse Guide</i> and other appropriate guidance.		
<input type="checkbox"/> YES Select classification at right and go to PART 8	<input type="checkbox"/> Non-exempt, Non-hazardous	GPB Waste Stream Code (see instructions)
<input type="checkbox"/> NO Contact Environmental - no Class I disposal	<input type="checkbox"/> RCRA-exempt	Pad 3/G&I only

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Step 8 – Destination (North Slope Manifest)

- Use check boxes to identify the receiving facility (or write it in if not listed). Check this Guide for facilities in your area.
- Check the *Facility Guides* for operating restrictions, test requirements, and contact numbers for each facility.

8. DESTINATION (Name of Facility)					
Alpine	<input type="checkbox"/> A1 Recycle	<input type="checkbox"/> CD1-01a	<input type="checkbox"/> CD1-19	<input type="checkbox"/> WD02/L2	<input type="checkbox"/> HWCAA
Kuparuk	<input type="checkbox"/> CPF-1 Hydrocarbon Recycle	<input type="checkbox"/> CPF-1 Water Recycle	<input type="checkbox"/> CPF-1 Oily Waste Storage Cell		
	<input type="checkbox"/> 1R-18 Class II Well	<input type="checkbox"/> C/D Warehouse	<input type="checkbox"/> 1-H Oily Waste Storage Cell		
Greater Prudhoe Bay	<input type="checkbox"/> Pad 3 Waste Facility	<input type="checkbox"/> Grind & Inject Facility			
Milne Point	<input type="checkbox"/> B-50 (Wellhead)	<input type="checkbox"/> ORT			
Northstar	<input type="checkbox"/> NS-10	<input type="checkbox"/> NS-32			
Endicott	<input type="checkbox"/> Snowmelt Tank	<input type="checkbox"/> P-12/202			
OTHER (Include Field and Location)					

Step 9 – Screening or Test Data

Check with Environmental or the receiving facility to find out if you need any test data. You may need:

- pH for some EOR wells
- Percent hydrocarbons for recycling
- Organic chlorides for used oil recycling
- “Fingerprint” data for Class I disposal. (Not required for routine waste streams from BP or CPAI facilities, but may be required if you are a third-party user.)

9. TEST DATA <i>if required by receiving facility</i>	<input type="checkbox"/> Attached	pH	Water	%	Org. chlorides	ppm
	<input type="checkbox"/> On file	Flash pt.	°F	Solids	%	Hydrocarbons

Step 10 – Generator signature

Print your name, then sign and date the form.

10. GENERATOR		
Name (Print)	Signature	Date
Certification <i>This consignment, to the best of my knowledge and belief, is accurately described above and I have applied the provisions of the Alaska Waste Disposal and Reuse Guide in making decisions concerning the reuse or disposal of this material.</i>		

Step 11 – Transporter

- If you have any questions about the load or the paperwork, talk to the generator before you leave the site.
- Print the company name, your name, and your truck number.
- Sign and date the form.

11. TRANSPORTER		
Name (Print)	Signature	Date
Company:	Truck/Trailer No:	

H. NORTH SLOPE AND COOK INLET MANIFESTS (CONT.)

Step 12 – Receiver

- Is the manifest complete?
- Are the generator and transporter currently certified? Check the list on the BP or CPAI web site.
- Does the material meet your facility's acceptance criteria?
- If there are any discrepancies or questions, contact the generator first. Call Environmental if necessary.
- Write in the location where the material is offloaded.
- Record the volume.
- Sign and date the form.

12. RECEIVER		
Name (Print)	Signature	Date
Offloaded at:	Volume	<input type="checkbox"/> bbl <input type="checkbox"/> gal <input type="checkbox"/> yd ³

Step 13 – Comments

- This section can be used by anyone (generators, transporters, receivers) to provide additional information or details and to document any communications about the load.
- Cross-reference other manifest numbers here for "mixed loads".

COMMENTS: If this is a mixed load, cross-reference other manifest numbers here:



Appendix B

NORSOK Standard

Environmental care

This NORSOK standard is developed with broad petroleum industry participation by interested parties in the Norwegian petroleum industry and is owned by the Norwegian petroleum industry represented by The Norwegian Oil Industry Association (OLF) and Federation of Norwegian Industry. Please note that whilst every effort has been made to ensure the accuracy of this NORSOK standard, neither OLF nor Federation of Norwegian Industry or any of their members will assume liability for any use thereof. Standards Norway is responsible for the administration and publication of this NORSOK standard.

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are, as far as possible, intended to replace oil company specifications and serve as references in the authorities' regulations.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standard will be withdrawn.

The NORSOK standards are developed according to the consensus principle generally applicable for most standards work and according to established procedures defined in NORSOK A-001.

The NORSOK standards are prepared and published with support by The Norwegian Oil Industry Association (OLF) and Federation of Norwegian Industry.

NORSOK standards are administered and published by Standards Norway.

Introduction

The third edition of this NORSOK standard is a complete revision of the previous edition, focusing on the following elements:

- to describe the decision process at the various stages of design development and the environmental issues related to these;
- to identify the main criteria for the decisions to be made;
- to identify analytical tools and methods that can be used to arrive at specific requirements for the individual contracts;
- to provide a format for documenting the output of these decision processes which can be used in different contract forms for the execution phase of a project.

The rationale for this structure, which differs considerably from other NORSOK standards, is that there are few pre-accepted solutions that are applicable to all projects with respect to environmental issues. Previous editions of this NORSOK standard have also included many options to explore and solutions to consider. Many of these considerations have to be done in an early stage of the project development, and are usually performed by the operating company internally and/or by a FEED contractor prior to project execution. Many of the statements in this NORSOK standard are difficult to handle contractually, and it is therefore necessary to supplement this NORSOK standard with specific requirements in the execution contracts.

The intention with the third edition is that this NORSOK standard is considered to be a guideline for use internally in the operating companies and possibly in FEED contracts. It will have to be supplemented by other contract documents, such as the design basis and/or other specifications during execution. The functional requirements in this NORSOK standard are listed in tabular form in 5.2 to 9.3, and the blank column to the right may be used to fill in brief statements regarding the conclusions of studies, analyses and decisions with references to other contract documents when relevant. Thus this NORSOK standard constitutes a template for creating an operator's document for documenting and tracing the environmental decisions that are made during the project cycle.

The objective of this NORSOK standard is to achieve implementation of technology that minimizes adverse impacts on the environment. The most cost effective technical and/or operational solutions should be sought, based on the principle of BAT and life cycle cost analyses.

This NORSOK standard includes criteria and methods for establishing limitations for emissions to air, discharges to sea, for selection and handling of chemicals and for waste management. Furthermore, some options regarding technologies that may be applied to achieve the environmental objectives are listed. Project specific requirements will be the result of analyses and evaluations for the actual project, and these results can be entered into an open column adjacent to the functional requirement/objective in this NORSOK standard with a reference to more detailed contract documents, when relevant.

Guidelines for drilling rigs are presented, which may be used in drilling contracts, are presented in Annex C. This is also in the form of optional requirements, where the operating company has to select the relevant level of protection according to the sensitivity of the drilling site and other criteria.`

This NORSOK standard is published without marking of changes, compared to Rev 2, as the modifications are comprehensive.

1 Scope

This NORSOK standard is a guideline that applies to field development, design, construction, installation, modification and decommissioning of installations for offshore drilling, production and transportation of petroleum.

The principles of this NORSOK standard are applicable to new developments as well as modifications and tie-in projects. However, the relevance and applicability of the different requirements will have to be reviewed in context with the scope of the project.

This NORSOK standard covers offshore activities in areas of "normal" environmental sensitivity. More stringent requirements apply to certain licence areas, and the conditions of the exploitation licence shall be observed.

2 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements and guidelines of the standards referenced below.

2.1 Normative references

Council Directive 96/61/EC,	Integrated Pollution Prevention and Control
IMO International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Annex 1	
IMO MEPC.107(49),	Revised guidelines and specifications for pollution prevention equipment for machinery space bilges of ships
IMO Regulations	
IMO Requirements,	International Oil Pollution Prevention (IOPP)
ISO 14001:2004,	Environmental management systems
The Framework Regulations,	Regulations relating to health, environment and safety in the petroleum activities
The Activity Regulations	

2.2 Informative references

IMO Guidelines and Standards for The Removal of Offshore Installations and Structures on The Continental Shelf, Assembly Resolution A672, 1989	
OLF Handbook in Environmental Impact Assessment for Offshore Decommissioning and Disposal (2001)	
OLF Guideline on waste management	
OSPAR Decision 98/3,	Disposal of Disused Offshore Installations.
UKOOA Drill Cuttings Initiative, Final Report, Feb. 2002	
White Paper No 21 (2004 – 2005),	St.meld. nr. 21 (2004-2005) Regjeringens miljøvernpolitikk og rikets miljøtilstand (The governments environmental policy and the state of environment in Norway)

NOTE Many useful environmental reports are to found on web-sites of

OLF: <http://www.olf.no/miljo/miljorapporter/> ,
 NPD: <http://www.npd.no/Norsk/Emner/Ytre+miljo/Miljo/coverpage.htm>
 SFT: <http://www.sft.no/publikasjoner/> .

Since these pages are continuously being updated, no specific reports are listed.

3 Terms, definitions and abbreviations

For the purposes of this NORSOK standard, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

shall

verbal form used to indicate requirements strictly to be followed in order to conform to this NORSOK standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.2

should

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.1.3

may

verbal form used to indicate a course of action permissible within the limits of this NORSOK standard

3.1.4

can

verbal form used for statements of possibility and capability, whether material, physical or casual

3.2 Abbreviations

BAT	best available techniques
BOP	blow out preventer
BTEX	benzene, toluene, ethylbenzene and xylene (light aromatic oil components)
DREAM	dose related risk effect assessment model
EIA	environmental impact assessment
EIF	environmental impact factor
FEED	front end engineering and design
FPSO	floating, production, storage and off-loading
HSE	health, safety and environment
IMO	International Maritime Organization
NMVOC	non methane volatile organic compound
NORM	naturally occurring radioactive material
NPD	Norwegian Petroleum Directorate (Oljedirektoratet)
NPV	net present value
OLF	Oljeindustriens landsforening (Norwegian Oil Industry Association)
OSPAR	Oslo and Paris Convention
PDO	plan for field development and operation
SFT	Statens forurensningstilsyn (The Norwegian Pollution Control Authority)
VOC	volatile organic compound

4 Guiding principles

4.1 General

This NORSOK standard assumes that an environmental management system satisfying the principles in ISO 14001 or equal has been established and is maintained.

Governing documents, in the form of acts, regulations, standards, recognized practices and company requirements shall be identified, listed, and applied in the design process.

It should be noted that some of the technologies mentioned in this NORSOK standard as possibilities to be explored, may not be commercial or proven at the time of issue of this NORSOK standard. The responsible for design has to evaluate the maturity of these technologies for application when relevant.

Operational and/or accidental discharges to sea and emissions to air shall be eliminated or minimized through design, choice of chemicals and materials as well as operation and maintenance philosophies.

4.2 Framework conditions

The application of BAT is a bearing principle of the environmental regulations. BAT is further defined in the Council Directive 96/61/EC, Article 2 and Annex IV. The criteria that are part of determination of BAT according to the directive are summarized in the figure in Annex A of this NORSOK standard. However, the functional requirements stated in these regulations and the directive has to be adopted by the operating company into explicit requirements at concept and system level.

The use of this NORSOK standard may help operators and contractors in systematically addressing and documenting the environmental issues and hence obtaining the approvals and permits.

4.3 Decision process

4.3.1 Setting of objectives and goals

The operating companies will usually have environmental policies, strategies and objectives on different levels of the organisation. The company should define project specific objectives and goals based on these general statements in an early project phase.

4.3.2 Option identification and analyses

At the different stages of the design development, from concept evaluation through detailed design, option analyses should be performed where the expected environmental performance is compared between the various alternatives and against regulatory requirements, criteria defined in this NORSOK standard and the specific objectives and goals defined by company.

An example of such a decision process at the concept level follows as shown in Figure 1.

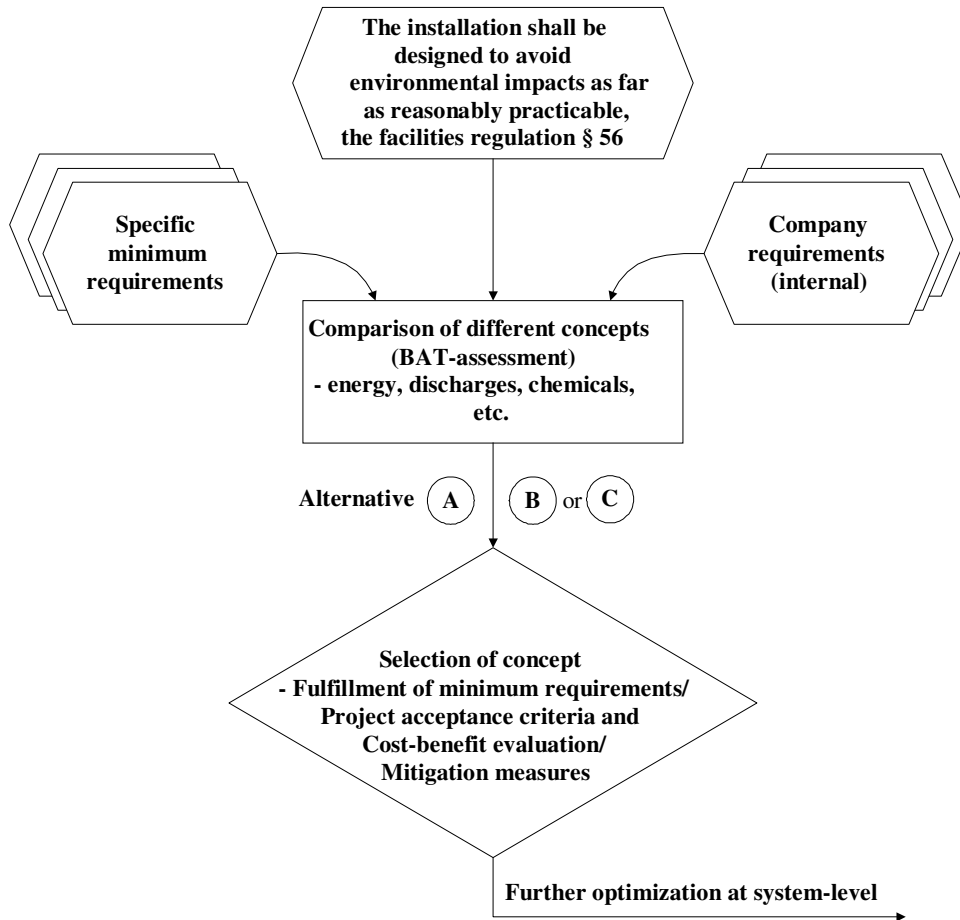


Figure 1 – Example: Integration of environmental aspects in concept selection process

In the decisions, a balance has to be found between environmental objectives and other project objectives related to e.g. cost, schedule, safety, technical performance and working environment. Also, when there are conflicting environmental objectives (e.g. reduction of discharges to sea at the expense of increased energy demand and air emissions), a balance has to be found between such objectives.

Finding the right balance is consistent with the The Framework Regulations and the Council Directive 96/61/EC, Article 2 and Annex IV. See Annex A which illustrates the factors that determine BAT.

4.3.3 Environmental budget

An environmental budget shall be established in order to compare and optimize alternative concepts, technical solutions and designs, or alternative decommissioning and disposal options. The budget shall include life cycle aspects such as expected energy demand and use of chemicals, and estimates for emissions to air and discharges to sea. When chemicals enter the product stream, downstream environmental consequences shall be considered. Annex B outlines the content of an environmental budget. The budget should be updated at appropriate stages in the project.

When a contractor is making an environmental budget during the execution phase, the boundaries of the system has to be clearly defined.

4.3.4 Cost-benefit evaluation

When specific minimum requirements are not established or when there is a need to consider measures beyond such minimum requirements, cost-benefit evaluations should be used to establish the proper level of environmental protection measures. The cost/benefit evaluations should include life cycle aspects. The operating company should establish methods and criteria for such evaluations. The recommended methods and criteria are shown in Annex D.

4.4 Project phases

4.4.1 General

Most operating companies have formally defined project phases and associated decision gate processes when passing from one phase to the next. Evaluation of environmental aspects of each option should be an integral part of each decision gate process. Figure 2 shows a generic project phase flow sheet and the associated decisions related to environment for each phase.

It is important to identify the key environmental aspects for each project phase and especially evaluate all possible concepts that could be relevant as early as possible in order to avoid later costly modifications. It is recommended to perform environmental design reviews at appropriate stages of the project development, e.g. in connection with concept selection, pre-engineering/FEED and during detail engineering. The main aspects to be looked at are listed below.

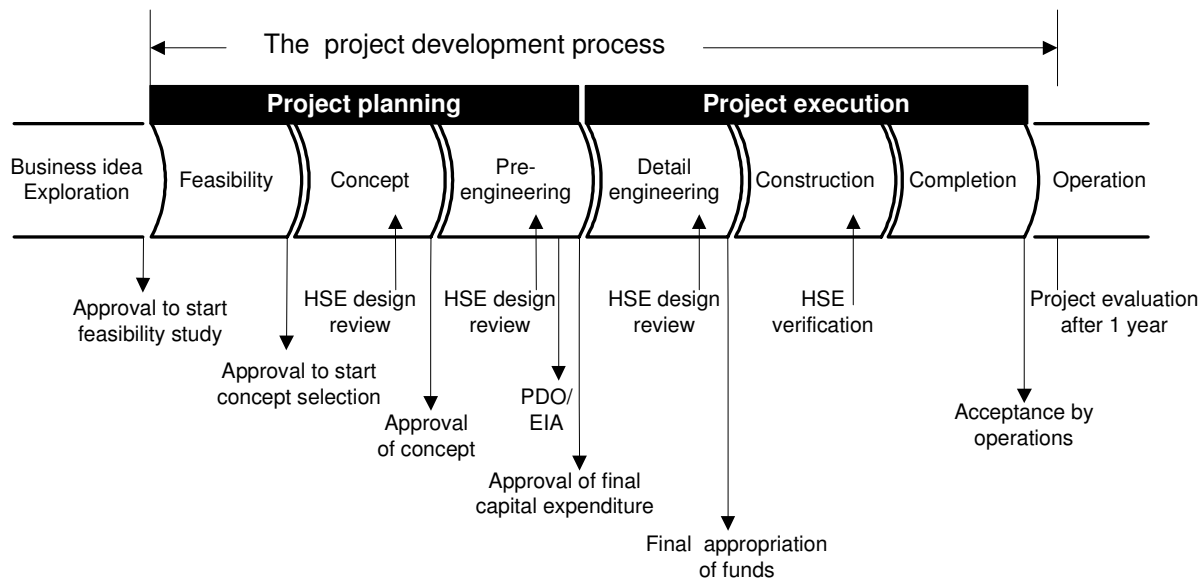


Figure 2 – The project development process

4.4.2 Concept selection

The selection of project concept shall include environmental considerations. The following are examples of main conceptual decisions that will have different impacts on the air emissions and discharges to sea:

- stand-alone development or subsea tie-in to existing platform(s);
- platform or subsea-to-land solution;
- integration with existing platform(s) or infrastructure, e.g. wellhead platform, partial processing, full processing;
- power from land or from other platforms;
- transport solution for oil (pipeline transport or offshore loading);
- transport solution for gas (compression demand, processing requirements);
- reservoir drainage strategy (water and/or gas injection, increased oil recovery, definition of plateau rate);
- possibilities for well stream energy conservation or utilization;
- platform concepts, e.g. floating or fixed, with and without drilling facilities;
- possibilities for injection of produced water, either as a part of pressure maintenance strategy or as a disposal option;
- possibilities for injection of cuttings and excess mud;
- design for easy decommissioning and removal.

The EIA shall document the evaluations and choices made in this phase, and the approval of the PDO/EIA will be an important confirmation of the decisions.

4.4.3 Pre-engineering or FEED

In the pre-engineering or FEED phase the chosen concept is elaborated further to a level of detail and confidence that is required for deciding on execution. The environmental aspects to be looked at this stage are typically related to

- main process design and energy balance,
- power supply configuration,
- flaring philosophy and flare system design,
- identification of main chemicals for e.g. hydrate control, corrosion control, emulsion breaking etc.,
- well program including types of drilling fluids to be used for each section,
- well testing and well clean-up strategy,
- sand control,
- basic design of produced water treatment or injection system,
- basic design of drain systems (segregation etc.),
- basic design of systems for injection or disposal of drilling wastes,
- VOC recovery systems (for offshore loading of oil),
- material quality selection (in order to minimize the use of corrosion inhibitors and other chemicals).

All conditions of the PDO approval and plan for installation and operation approval will have to be considered and implemented.

4.4.4 Detail design

In the detail design phase, the design is further detailed until fabrication drawings can be issued. In this phase the key issue is to avoid changes to the basis already established, and from an environmental point of view confirm that changes do not reduce the environmental performance level. Furthermore, some decisions with environmental significance are usually made, such as

- complete evaluation, selection and documentation of chemicals, including budgets for use and discharge (basis for discharge permit application),
- selection and design of sampling points,
- detailed design of wastewater treatment systems and drain systems,
- detailed spill prevention issues,
- design of waste handling systems.

5 Emissions to air

5.1 General

Emissions to air include CO₂, NO_x, methane, NMVOC, and SO_x. Field development concepts and technology that minimizes these emissions at the source shall be preferred. Focus shall be given to reduce atmospheric emissions by process design and through energy optimisation.

5.2 Energy management

Functional requirement	Conclusions/references
<p>Good energy management is a key factor in achieving as low emissions as practical. A power and heat requirement analysis shall be performed comprising the process and utility systems over the lifetime of the production facility. The objective is to minimize emissions of CO₂ and NO_x by</p> <ul style="list-style-type: none"> • reducing energy requirements, • increasing the efficiency of energy generation and utilization. 	
<p>The following are examples of measures that should be considered for minimizing energy demand when relevant:</p> <ul style="list-style-type: none"> • well design to minimize water cut and minimize pressure loss; • subsea or downhole separation; • subsea compression or pumping; • maximize operating pressure in first stage separator; • partly separate process trains for high and low pressure wells; • use of turbo-expanders to utilize well pressure; • correct sizing of power demanding equipment to achieve maximum efficiency; • use of variable speed drives on larger equipment with variable loads; • direct turbine drive on large compressors; • optimal sizing of long export pipelines for oil and gas to reduce pressure loss; • waste heat recovery/process integration to minimize the need for fired heaters or electrical heaters; • energy use monitoring and control systems to allow optimum operation and tuning; • multiphase pumping compared to gas-lift; • use of flow improvers for oil export pipelines. 	
<p>In order to increase the efficiency of energy production, the following measures should be considered:</p> <ul style="list-style-type: none"> • gas turbine cycle enhancement, e.g. steam bottoming cycle; • integrated or shared power generation with other installations, as well as the possibility of power supply from shore; • selection of optimum number, size and make of turbines according to power demand profile. 	

5.3 NOx control on turbines

Functional requirement	Conclusions/references
<p>New gas turbines should be of low-NOx type to achieve an emission level of 25 ppmv (dry offgas, 15 % O₂) or better. Steam or water injection to achieve a similar level may be considered when this technology is proven for offshore application.</p> <p>The reasons for not achieving a low NOx emission level shall be clearly documented.</p>	

5.4 NOx control on engines

Functional requirement	Conclusions/references
<p>For larger engines (> 1 MW) that will normally be in operation (not stand-by or emergency use), NOx-reducing measures should be considered, such as</p> <ul style="list-style-type: none"> • selection of engine make with a low NOx emission rate, • use of gas fuel when possible, • use of water emulsion in the diesel, • selective catalytic reduction or similar. 	

5.5 Flaring

Functional requirement	Conclusions/references
<p>The process system shall be designed to minimize flaring. This should include, but not be limited to, consideration of the following measures:</p> <ul style="list-style-type: none"> • recycling of gas from high pressure relief systems during normal operation; • recycling of low pressure relief systems during normal operation (subject to cost-benefit evaluation); • process design that minimizes risk of tripping of compressors etc.; • control and condition monitoring systems to reduce the number of trips; • planning of start-up activities to reduce flaring. 	

5.6 Oil storage and loading

Functional requirement	Conclusions/references
<p>FPSO, floating storage units ,shuttle tankers, offshore and onshore loading systems shall be designed to minimize emissions of methane and NMVOC. The following measures should be considered, but not be limited to</p> <ul style="list-style-type: none"> • sequential loading/unloading of oil, • optimized geometry of tanks with respect to evaporation of hydrocarbons, • loading/discharge rate with respect to evaporation, • use of hydrocarbon gas as blanket gas in floating storage tanks, with recovery, • installation of a VOC recovery plant to return NMVOC to crude oil, 	

Functional requirement	Conclusions/references
<ul style="list-style-type: none"> • installation of a VOC recovery plant to condense NMVOC and use condensed liquid as fuel, • incineration of VOC during loading operations. <p>The process system should be designed to optimize the Reid vapour pressure and true vapour pressure and temperature of the oil, in order to minimize emissions of methane and NMVOC.</p>	

5.7 Fugitive emissions and cold vents

Fugitive emissions and cold vents include all emissions of hydrocarbons (CH₄ and NMVOC) other than combustion processes. The main sources on these emissions are principally linked to

- leakages at valves and flanges,
- emissions from the atmospheric vent system,
- emissions from miscellaneous decentralized systems, i.e. extinguished flare.

Functional requirement	Conclusions/references
<p>The process system should be designed to minimize emissions to air of hydrocarbon gas from different sections of the system. The gas should be either contained or routed back to the process system, if the pressure level and safety considerations allow this.</p> <p>This applies, but is not limited to</p> <ul style="list-style-type: none"> • gas from seal oil traps, • gas from sampling points, • purge gas and leak gas, • gas from start up of the fuel gas system, • gas from compressor seals, • gas from produced water. 	
<p>Emissions of hydrocarbon gas to the air, including glycol and BTEX, from stripping processes shall be minimized, e.g. by use of</p> <ul style="list-style-type: none"> • systems that do not require stripping gas (e.g. trace water extraction process), • systems using low glycol concentrations, • glycol recycle systems, • systems that recover hydrocarbon stripping gas, • systems based on vacuum deaeration systems using inert gas. 	
<p>Cold venting should be avoided. Exceptions should be documented from a technical, economic and environmental point of view.</p>	
<p>Hydrocarbon gas used as a blanket gas shall be recovered.</p>	
<p>Selection of valves, flanges and packings should be based on due considerations in order to reduce gas leakages and fugitive emissions to air.</p>	

5.8 Well testing

Functional requirement	Conclusions/references
<p>Burning of well fluids and well clean-up residues from testing and restart of wells shall, as far as possible, be avoided. If unavoidable, this shall be documented from a technical, economic and environmental point of view. Incomplete burning shall be avoided. When testing or restarting wells on or with connection to a fixed installation, the well fluid should be routed to the production facilities.</p>	
<p>For testing on a mobile rig, at least the following options should be evaluated:</p> <ul style="list-style-type: none"> • injection of the well fluid at location or at a nearby field, when test separators are designed to handle well stream from testing for this option; • use of facilities with possibility to collect the oil produced during testing; • gas produced during testing may be flared if there is no other cost effective alternative; • downhole testing and separation. 	

5.9 Emission control and monitoring

Functional requirement	Conclusions/references
<p>Relevant process parameters should be recorded and processed in order to allow on-line (or nearly online) reporting and trending of emission data for CO₂, NO_x, VOC and methane., The information should be available for the operators in order to allow optimisation of the operation.</p>	
<p>CO₂ emissions shall be calculated based on the fuel gas composition, the amount of fuel utilized for power generation (gas and diesel) and the amount of gas being flared, which are measured according to authority requirements.</p>	
<p>NO_x emissions may be calculated based on different methods with increasing degree of accuracy:</p> <ul style="list-style-type: none"> • generic emission factors for turbines, engines and flares (independent of load); • emission factors that are specific for the equipment and the average load they operate at; • online calculation of emissions based on calibrated emission factors at different operating loads for the specific equipment. 	
<p>Non-methane volatile organic compounds and methane are usually calculated by use of emission factors for the different source categories. Significant point sources should be measured.</p>	

6 Discharges to sea

6.1 General

Discharges to sea include discharges from drilling and well operations, produced water, drainage water, displacement water, cooling water, sanitary water as well as discharges from testing, cleaning and commissioning of pipelines,.

The overall goal is the zero discharge concept as specified by the authorities in several White Papers (among them White Paper No 21 (2004-2005)). The goal is that there should be no discharges of the most hazardous substances, based on the substances' intrinsic properties and the authorities' lists of substances for priority action, and that there should be no discharges, or there should be a minimization of the discharges, of less hazardous substances, if the discharges may lead to adverse effects on the environment.

6.2 Produced water

The main objective is to minimize the environmental risk related to discharge of produced water.

Functional requirement	Conclusions/references
<p>The expected composition of produced water shall be identified, and natural components and added chemicals known to contribute to the environmental risk shall be assessed in terms of concentration and load.</p> <p>The environmental risk should be calculated by the use of the DREAM model or similar tools. The result of the modelling should be used for selection of fitted technologies, including, but not limited to, the following options:</p> <ul style="list-style-type: none"> • minimize water production by well management and/or downhole or subsea separation of water; • injection of the produced water by <ul style="list-style-type: none"> – subsea separation, – injection to reservoir to maintain pressure, – injection to disposal well. • maximize regularity of injection system when relevant; • treatment and discharge to sea. 	
<p>The concentration of dispersed oil in produced water shall be as low as practically possible and not exceed the regulatory requirement or company requirement.</p>	
<p>When treatment and discharge to sea is selected, the water treatment systems shall be designed and optimized to maintain the treatment efficiency regarding natural solutes, added chemicals and dispersed oil during load variations (e.g. high flow, low flow, during separator jetting), and to operate with a minimum of chemical addition.</p> <p>The following measures should be considered to optimize the treatment process:</p> <ul style="list-style-type: none"> • minimize pressure drop and turbulence that create stable oil/water emulsions; • use of treatment systems that reduce the content of oil, BTEX, polycyclic aromatic hydrocarbons, and other components that contribute to the environmental risk. Such systems may include different combinations of some of the techniques listed below: <ul style="list-style-type: none"> – electrostatic oil/water separation; 	

Functional requirement	Conclusions/references
<ul style="list-style-type: none"> – emulsion breaking and foam control; – flocculation; – hydrocyclones; – stripping; – extraction; – membrane filtration. 	
<p>The need for back-up systems for critical components in treatment systems, should be considered in order to maintain continuous operation during maintenance activities and keep discharges within limits specified in discharge permits, rules, regulations and company environmental targets.</p>	

6.3 Drain system

Drain systems are classified according to the following applied terminology:

- open drain;
 - non-hazardous open drain;
 - hazardous open drain.
- closed drain.

Functional requirement	Conclusions/references
<p>The open drain system is separated in two subsystems, one for hazardous (classified) areas and one for non-hazardous (non-classified) areas.</p> <p>The open drain system operate at atmospheric pressure and shall handle rainwater, fire water, wash-down water including spillage of liquids and solids from deck areas, equipment drip trays and bounded areas. Hydrocarbon liquid spill shall be recovered and only water meeting regulatory requirements may be dumped to sea. The hazardous and non-hazardous areas shall have dedicated collection systems kept apart from each other. However, the subsystems may have a common oily water treatment plant.</p> <p>Drains from non-polluted areas should be routed directly to sea.</p>	
<p>On a combined drilling and production facility there shall be no connection between the drilling and production open drain systems.</p>	
<p>Systems containing hydrocarbons or chemicals shall be designed to minimize spills. There shall be drains or drip-trays under all sampling points and all injection points. The measures listed in Table C.5 shall be considered to minimize risk of spills.</p>	
<p>Injection of contaminated drainage should be considered, especially drainage from the drilling area, which may be injected together with contaminated cuttings.</p>	
<p>The closed drain system shall collect hydrocarbon liquid drains from platform equipment and piping, and safely dispose and degas the liquid. The system shall operate at the same pressure as the flare header connected to the closed drain flash drum.</p>	
<p>Drain water discharges are subject to regulatory requirements for oil in water content.</p>	

6.4 Displacement water

For platforms with offshore loading and storage of oil in e.g. gravity base structures, seawater is used as displacement water in the oil storage. The displacement water may be discharged without treatment.

Functional requirement	Conclusions/references
Control systems shall be in place to ensure that there is sufficient distance between the oil/water contact and the discharge point at all times. A risk evaluation of this system shall be carried out.	
The need for separate treatment of the emulsion/slop phase near the water/oil contact should be evaluated.	

6.5 Discharges from drilling and well operations

Functional requirement	Conclusions/references
<p>Drilling- and well operations shall be planned with solutions that reduce discharges to sea to a zero harmful discharge level. The following represent examples of technologies that will minimize discharges of drilling waste to sea, and which should be evaluated for implementation:</p> <ul style="list-style-type: none"> • slim hole drilling; • branched drilling; • batch drilling; • riser-less mud return system; • toe driven conductor; • injection of drill cuttings and used drilling mud; • injection of cementing chemicals (excess mix-water); • injection of completion chemicals; • injection of slop- and drainage water; • reuse of drilling mud; • alternative weighting materials; • heavy salt solutions; • heavy metal free pipe dope. 	
<p>The drilling fluid selection should be made following an environmental risk evaluation combined with an operational technical evaluation. Environmental risk management tools should be used where appropriate. Evaluations of alternative technologies shall be documented.</p> <p>The following drilling fluid systems should be evaluated in combination with relevant cuttings disposal options:</p> <ul style="list-style-type: none"> • use of water based fluid and discharge of cuttings to sea; • use of non-aqueous based fluid and injection of cuttings; • use of non-aqueous based drilling fluid and treatment of cuttings at an approved onshore treatment plant. • use of non-aqueous based drilling fluid and treatment on-board to ultralow hydrocarbon content, discharge to sea. 	
<p>The need for back-up systems for critical components in treatment/injection systems should be considered in order to maintain continuous operation and keep discharges within limits specified in discharge permits, rules, regulations and company environmental targets.</p>	
<p>Mud and cuttings handling systems shall be designed to minimize risk of spills. The measures listed in Table C.1 shall be</p>	

Functional requirement	Conclusions/references
considered.	
Discharges from cementing shall be minimized. The list of possible measures listed in Table C.3 shall be considered.	
Discharges from well clean-up and testing shall be minimized. Reference is made to 5.8 and to C.8.	

6.6 Risk of acute discharge/pollution

Functional requirement	Conclusions/references
Process, utility and drilling systems shall be designed to reduce the risk of spills. Hazard and operability study (HAZOP) or similar techniques shall be used to identify risks and risk reducing measures.	
The measures listed in tTable C.5 and Table C.7 shall be considered.	

6.7 Produced sand

Functional requirement	Conclusions/references
Production process design should include sand handling measures. Well design should aim at minimized sand production. The disposal options for produced sand to be considered include <ul style="list-style-type: none"> • injection into a subsea geological structure, • cleaning and discharge to sea, • shipment ashore for treatment and disposal. When discharged, the produced sand shall be treated to oil content less than the regulatory limit.	

6.8 Handling of chemicals

Functional requirement	Conclusions/references
The chemical storage system shall be designed to minimize risk of spills (e.g. breakage of sacks) and facilitate collection of spills. Spills of hazardous chemicals that cannot be recycled shall be collected for transportation to shore as hazardous waste.	
The transfer system between transport and storage tanks should be a closed system, which allows complete draining of transport tanks. Only unique couplings should be used on transfer systems in order to reduce risk of unintentional transfer to a wrong tank.	
A separate drain to a chemical spill tank should be provided from the chemical injection package/system. It should be possible to switch from the hazardous drain system to this system during filling and maintenance operations.	

6.9 Sanitary waste water and food waste

Functional requirement	Conclusions/references
Sanitary waste water may be discharged to sea. Food waste shall be macerated before discharged to sea.	

6.10 Cooling water

Functional requirement	Conclusions/references
The intake of cooling water (depth) should be optimized with respect to minimizing the need for use of chemicals to prevent marine fouling, i.e. growth of algae, mussels, etc. The use of copper-chlorination, which minimizes the doses of copper and free chlorine, should be considered.	

6.11 Discharge points

Functional requirement	Conclusions/references
<p>All water discharge points shall be located and designed in order to minimize environmental effects.</p> <p>In order to design for an optimal discharge depth and location, an evaluation regarding dispersion of oil and chemicals, effects on marine species in different marine layers, as well as conflicts with seawater intakes (i.e. cooling water, fresh water production), should be performed.</p>	

6.12 Sampling and monitoring of effluents

Functional requirement	Conclusions/references
<p>Effluent streams shall be monitored as follows:</p> <ul style="list-style-type: none"> • produced water streams shall be metered and sampled downstream the water treatment plant; • sampling points shall be installed easily accessible up - and downstream of the treatment units, and in the effluent lines, as well as between treatment stages; • access for sampling and visual control of holding tanks for drainage water shall be provided. <p>Automatic samplers, analyzers and online monitoring should be considered when possible.</p>	

6.13 Subsea systems

Functional requirement	Conclusions/references
Subsea systems shall be designed in order to minimize operational discharges and leaks to the environment.	
<p>Hydraulic valve control systems, including BOP, may be based on closed loop systems with return line to the platform/FPSO, or open systems with discharge to the sea.</p> <p>Environmental aspects should be considered in the selection of system as follows:</p> <ul style="list-style-type: none"> • an assessment of the risk of leakage from the closed system during installation, testing, commissioning and operation should be made based on the design and operational experience with similar systems; • a screening of available hydraulic fluids should be performed in order to investigate if hydraulic fluid(s) containing environmentally acceptable components is available and have the required properties; • the risk of harmful effects from the discharge from an open system should be evaluated based on the properties of the fluids and quantities expected to be discharged. 	

6.14 Pipelines

Functional requirement	Conclusions/references
<p>Inhibited water in connection with laying, cleaning, pressure-testing and start-up of pipelines may be discharged to sea subject to a discharge permit.</p> <p>The use of chemicals shall be minimized. The following options should be considered:</p> <ul style="list-style-type: none"> • the sequence and duration of pipe laying, testing and start-up of the pipelines should be planned in order to minimize the duration between filling and discharge and hence reduce the need for chemicals; • the use of dye for pressure testing should be minimized, i.e. added at local level. 	
Material selection shall be evaluated in order to minimize the use of chemicals in the operation phase.	

6.15 Tanks

Functional requirement	Conclusions/references
Drainage tanks and slop tanks shall be designed with sufficient capacity for foreseeable operating conditions.	
Systems to prevent overfilling shall be installed.	

7 Waste

7.1 General

Waste includes cuttings from drilling, wastes from production, drilling and utility areas, consumer waste and scrap metal, hazardous waste and NORM.

7.2 Waste management

Waste shall be minimized through the design and the choice of materials and chemicals in a cost effective manner.

Functional requirement	Conclusions/references
A waste management plan shall be developed to define categories of waste and plans for treatment, disposal, or shipment to shore. The objective should be to minimize the generation of waste and maximize the degree of reprocessing, reuse or recirculation, see OLF Guideline on waste management.	
The layout shall include space for waste containers for segregated collection of waste locally and centrally, and facilitate transport of the containers. Wastes, which cannot be reused at the installation, shall be collected for temporary storage and shipped ashore for reprocessing or destruction in accordance with authority requirements. The system design shall ensure safe handling without the risk of pollution.	
Reclaimed lube oil and other waste oils should preferably be disposed of by mixing into the crude stream. If this is not possible, then injection may be feasible.	
NORM shall be collected in special containers and handled according to regulations and in agreement with the authorities.	

8 Spill prevention and barrier philosophy

These issues are extensively covered in the regulations relating to health, safety and environment in the petroleum activities. Compliance with these regulations should be ensured through e.g. hazard and operability studies and design reviews.

Annex C contains lists of optional requirements to ensure spill prevention, which could be used as a check list for design reviews.

9 Decommissioning

9.1 General

When a field or installation faces the end of its production period, an alternative use shall be found or it shall be decommissioned according to relevant legislation. Both an EIA and a cessation plan shall be worked out well in advance of the end of the production period as required by the authorities, see Figure 3. The handling of oil contaminated cutting piles shall also be considered in this process.

As a general rule, all installations shall be designed so that all parts above the seabed can be entirely removed. Removal costs and potential for reuse shall be evaluated as part of the field development plan.

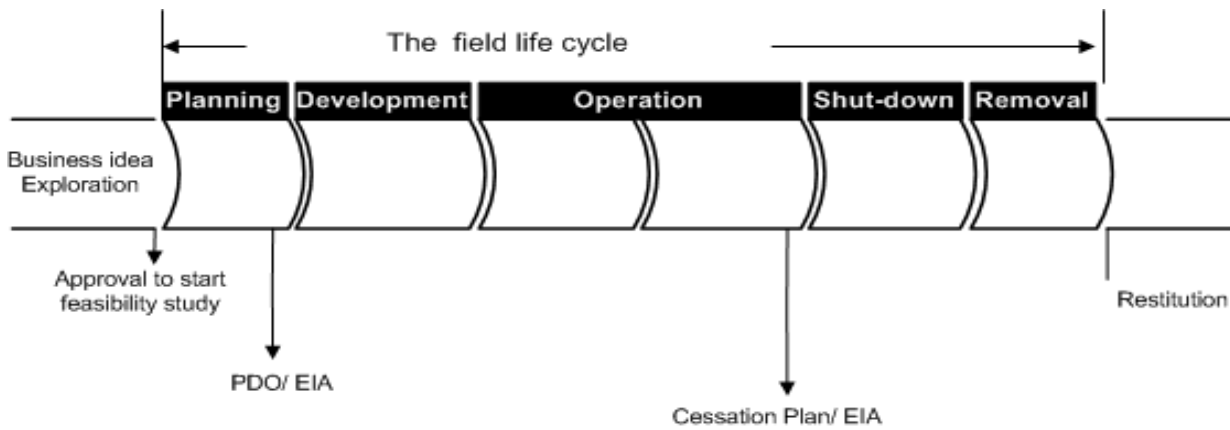


Figure 3 – The field life cycle

9.2 Cleaning operations and waste management

Functional requirement	Conclusions/references
An inventory should be made to map the amounts and characteristics of chemicals, wastes and hazardous materials in the installation and on this basis plan cleaning activities and disposal of the wastes present and created in this process.	
Tanks, pipelines or other equipment containing chemicals shall be emptied. Surplus chemicals (e.g. drilling and production chemicals) should be reused at another location or returned to vendor. Chemicals, which cannot be reused or returned to vendor, shall be taken ashore.	
Tanks, pipelines or other equipment containing oily waste should be cleaned as thoroughly as possible to remove oily waste, e.g. lube oils, hydraulic oils, oily sludge and sediments, wax deposits, etc.. Oily waste shall be taken ashore as hazardous waste.	
All components containing halons, chlorofluoro carbons/hydro chlorofluoro carbons or polychlorinated biphenyls shall be removed and taken ashore for disposal as hazardous waste.	
NORM shall be removed either offshore or onshore. NORM shall be handled and disposed according to authority requirements. Other equipment containing radioactive sources shall be handled safely according to authority requirements.	
Asbestos material requires encapsulation prior to removal. Asbestos material shall be handled and disposed according to authority requirements.	
Batteries shall be removed and taken ashore for disposal as hazardous waste.	
The degree of cleanliness shall be documented before removal and disposal.	

9.3 Options for disposal of offshore installations

Functional requirement	Conclusions/references
All disposal options should be evaluated, e.g. re-use in petroleum activity in place, other use in place, disposal in place, partly removal or complete removal for re-use or disposal. Some disposal options will be determined based on the water depth and the weight of the structure, see "OSPAR Decision 98/3" and "IMO Guidelines and Standards for The Removal of Offshore Installations and Structures on the Continental Shelf, Assembly Resolution A672, 1989".	
An environmental budget should be applied as a part of the overall criteria in selecting the final disposal option. Parameters to be included in the environmental budget are presented in the "OLF Handbook in Environmental Impact Assessment for Offshore Decommissioning and Disposal (2001)". In general, disposal options with a maximum degree of reuse should be aimed at.	

9.4 Oil contaminated drill cuttings on the seabed

The "UKOOA Drill Cuttings Initiative, Final Report, Feb. 2002" concludes that in general, to leave the piles undisturbed or cover the drill cuttings piles for protection are considered to have the lowest environmental impact and should therefore be aimed at. Covering may be required if the piles continue to be a source of new contamination in the area.

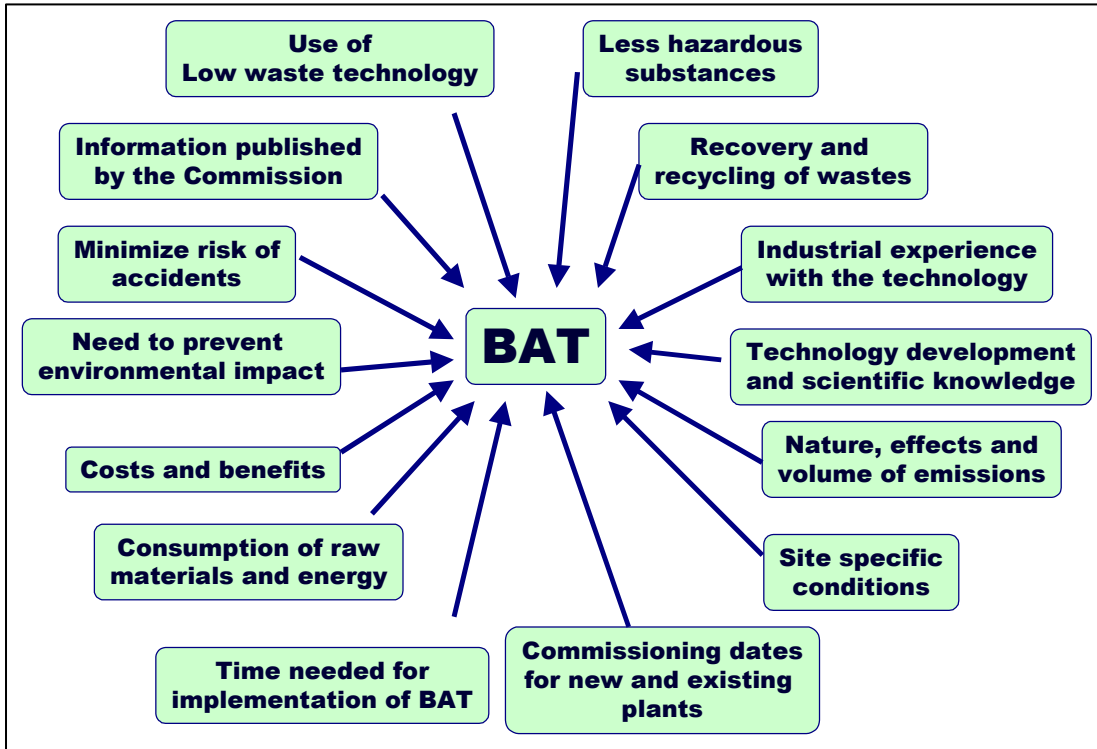
Other options that have been studied, and which were considered less attractive either due to environmental impact, costs, in-effectiveness or combinations of these criteria, are listed below:

- bioremediation;
- retrieval technology;
- removal and injection in a well;
- respreading on the sea floor;
- treatment/disposal offshore or onshore.

However, a case-by-case environmental assessment of each pile should be performed to define the preferred solution. This should include the effect of removing the installation on the cuttings pile.

Annex A (Informative) Best available technique (BAT) determining factors

Factors that are relevant in the determination of BAT are shown in the table below, see Council Directive 96/61/EC, Article 2 and Annex IV.



Annex B (Informative) Environmental budget

The objective of an environmental budget is to obtain emission and discharge data in order to enable implementation of the best possible technical solutions and practices regarding the environment.

Environmental budgets quantitatively describe the expected energy demand, use of chemicals, emissions to air, discharges to sea and waste generation. It may be reasonable to handle different phases of the project in separate due to individual characteristics, i.e. drilling, commissioning and start-up, production phase, de-commissioning.

The structure of an environmental budget is characterised by a dynamic set-up, which means that the data will change according to the calculation basis, i.e. production profile. Thus, the output of analysis based on present information may be changed due to design development and new knowledge.

An example of the "Contents" of an "Environmental Budget Report" concerning the operational phase is shown below (the setup has to be adjusted to reflect the specific development project):

1. Summary and conclusions
2. Introduction
 - 2.1 Objectives and scope of work
 - 2.2 General description of the project
 - 2.3 Environmental philosophy and requirements
3. Emissions to air
 - 3.1 Sources of emissions to air
 - 3.1.1 Emissions to air due to combustion processes
 - CO₂
 - NO_x
 - CH₄
 - NMVOC
 - 3.1.2 Direct emissions of hydrocarbons
 - CH₄
 - NMVOC
4. Discharges to sea
 - 4.1 General
 - 4.2 Sources to discharges to sea
 - 4.3 Produced water profile, including injection profile, when relevant
 - 4.4 Produced water composition and calculation of EIF
 - 4.5 Production chemicals budget (including mass balance for use and discharge)
 - 4.6 Drainage water
 - 4.7 Produced sand
 - 4.8 Food waste and sanitary water
 - 4.9 Cooling water
5. Other consumption of chemicals
(e.g. chemicals to be injected or transported by oil/gas/condensate to shore)
6. Waste
7. References
8. Appendices

Annex C (Informative) Environmental requirements for drilling rigs

C.1 Introduction

This annex provides lists of possible environmental requirements and recommendations related to drilling rigs in a tabular form. Depending on the location of the operation, the characteristics of the operation and other factors, not all of these requirements will be necessary to comply with in every case. The intention is that the operating company in the tender documents shall identify those requirements and measures that are compulsory by filling in the second columns of the tables, and that the rig operator may fill in the status of the rig in the third column as a part of the bid. Where compulsory requirements are not met, the rig operator shall describe how this deficiency may be compensated by other measures.

C.2 Policy

Planning and execution of drilling operations on the XX Field shall be based on the principle of zero harmful discharges to sea. Where possible, equipment with low NO_x emission characteristics will be favoured, but no specific guidelines will be established for discharge to air.

Selection of rig shall include evaluation of environmental considerations with respect to technical arrangements to prevent spill and discharge to the sea.

The functional requirement is that zero harmful discharges and no un-intentional spill or discharge to sea shall occur. Certain functional and specific requirements are described in C.3 to C.11 in order to secure fulfilment of the philosophy and secure a green drilling unit. Other measures than those described in C.3 to C.11 can be accepted so long as the environmental policy is complied with. These measures shall be described in detail for company approval.

C.3 Rig size

The capacity of the rig to collect and store waste products is a function of its size and design. The rig should be of sufficient size to ensure that bulk and loading capacity are suitable for use of the various liquid systems and simultaneous storage of waste products for cleaning/back loading. Evaluation of a potential rig shall include environmental safety, disposal handling and storage capacity, e.g. in tanks, pits and deck size.

C.4 Use of chemicals

All chemicals shall be selected and used in accordance with governmental and company requirements.

Chemicals shall be selected with consideration to the environment and suitability for the purpose. Chemicals that are most environmentally friendly and at the same time fit for technical and climatic conditions shall be chosen. The climatic conditions have to be carefully considered to prevent situations, which may jeopardize operations or lead to situations that might represent safety or environmental risks.

C.5 Mud and cuttings handling system

The options listed in Table C.1 should be considered according to the types of drilling fluids to be used (water based or oil based), as well as the sensitivity of the drilling location.

Table C.1

Mud and cuttings handling system	Required (Y/N)	Status
Two physical barriers are required to prevent discharge or spill from loading/unloading lines, pits and tanks		
The rig contractor shall develop criteria for "clean tank" and permission to open a drain to sea.		
It shall be possible to back-load mud to the supply boat.		
It shall be possible to transfer slop from mud pits to closed drain/holding tank.		
The rig shall have equipment and capacity to collect, handle and store high solids mud for backloading.		
The shaker system shall be operated to effectively reduce the mud content on cuttings.		
The pits shall be fitted with minimum one dump valve (double secured) and be connected to the closed drain system.		
Double barriers to prevent discharge shall be installed on the mud tank and the drain connected to this tank. It shall be possible to clean the tank and the mud pipelines with spill/cleaning water routed directly to the closed drain system.		
All valves on the mud system, tanks included, shall be easily accessible.		
All pit drains and all outlets from the drilling fluid system to the environment shall be secured by double valves.		
Back loading to boat from tanks for barite and cement shall be possible.		
There shall be two barriers between drain collecting line and each mud pit.		
There shall be double barrier between collecting lines and mud pits. If e.g. pumping dirty water through the collecting line to one mud pit, there should be a double barrier between this line and the inlet to each mud pit.		
Diesel line into the mud pit room shall have double barriers.		

C.6 Cuttings disposal**Table C.2**

Cuttings disposal	Required (Y/N)	Status
Cuttings with oil based muds shall be slurrified and injected.		
Cuttings with oil based muds shall be transported to shore for treatment and disposal.		
Cuttings with water based muds shall be slurrified and reinjected.		
Cuttings with water based muds shall be transported to shore for treatment and disposal.		
Cuttings with water based fluids may be discharged (subject to environmental assessment).		

C.7 Cementing

Table C.3

Requirements to cementing system	Required (Y/N)	Status
Two physical barriers are required in the loading/unloading lines and tanks to prevent discharge or spill.		
Rig procedures shall detail operation of the tank and criteria for «clean tank» status.		
Back loading from day tank for barite and cement tank shall be possible.		
It shall be possible, in an emergency situation, to route drain from cement unit either to drain system or direct to sea (option to direct overboard).		
It shall be possible to collect wash water, which contains cements after cleaning the cement unit and lines, into a transport tank.		
The closed drain system shall have the capacity to (e.g. pump capacity) to handle all cleaning water from the cement room.		
The dump line from the tank for cement mixing water shall have minimum one dump valve, padlocked and be connected to the closed drain system.		
The pits shall have minimum one dump valve with double valve and be connected to the closed drain system.		
The rig shall have liquid additive system for mixing cement chemicals.		
Double valves shall secure each pit drain and all other outlets from the drilling fluid system to the environment.		

C.8 Well testing and clean-up

(Alternative 1)

The wells are planned to be cleaned up and/or tested through test equipment on the drilling rig immediately after completion. The hydrocarbon well stream will be flared over the burner boom(s). Non-combustible fluid back flowed (e.g. brine) will be collected to a holding tank and cleaned to discharge standard or backloaded to land. Hydrocarbon contaminants (e.g. diesel, condensate) will go to the closed drain system.

Equipment shall be designed to ensure full burning and procedures shall be developed to govern contingency situations where problems are experienced.

Procedures shall be developed and implemented to prevent overflow of drain tanks due to use of rig cooling water during the test operations. Preventive measures such as cleaning of deck areas prior to testing shall be considered, to be able to route the test water directly to sea. This will minimize the possibility of unintentional discharge of oily water.

(Alternative 2)

The wells are planned to be cleaned up and/or tested through test equipment on the production platform.

(Alternative 3)

Well testing shall be performed by transferring the well fluids to a dedicated vessel.

Table C.4

Requirements to well testing system	Required (Y/N)	Status
Equipment shall be designed to ensure full burning and procedures shall be developed to control situations where problems are experienced.		
Procedures shall be developed and implemented to prevent overflow of drain tanks due to use of rig cooling water during the test operations.		

C.9 Drain system

The drain system should be designed to prevent any unintentional discharge to sea. Table C.5 gives the technical and organisational requirements for the drilling unit in order to secure a tight and "green rig". All drains shall be designed to be easily maintained open even at design minimum air temperature. Wherever a drain can be separately routed to closed drain system or to sea, it is very important that the valve can be operated at this temperature. In drain systems with a minor basin (0,5 m³ to 1,0 m³) and level-activated pump, it shall be ensured that the liquid in such basins does not freeze.

All decks shall be kept as dry as possible and ice-free. Water and ice on deck can cause increased risk for personnel injury and unintended spill to sea.

Table C.5

Requirements to drain system regarding external environment	Required (Y/N)	Status
Company shall at any time, upon request, be provided with an updated drawing of the drains/bilge system. Copy of updated drawings of the system shall be kept on the drilling unit.		
The requirement for two physical barriers to prevent discharge or spill is applicable for unloading lines and tanks.		
Moon pool area and other areas where spills can occur directly to sea, shall be fitted with a closed boundary. The height of the boundary shall be sufficient to prevent the fluid from spilling over the edge due to rig movement.		
All decks on the rig shall be closed and provided with a sufficient number of drains, which may be routed to tank or to sea. Valves for altering the routing position shall be installed at easily reachable locations.		
The drains from all areas where chemical/or oil spills may occur shall be connected to a closed drain system. The drain system shall have double barriers to sea.		
It shall be separated lines from hazardous drain and none hazardous drain and they shall be routed to separate storage tanks. The drain from none stabilized oil (e.g. from test area) shall not go into the line for stabilized oil in water. Closed drain system collecting to separate storage tank. Special precautions shall be taken to maintain zone integrity.		
The drain connected to closed drain system should have sufficient capacity to handle the amount of water entering the drain system. Regarding winterisation the closed drain system should also be usable at - XX °C.		
Valves connected to the closed drain system shall be designed so that the open/closed position can easily be observed and reached. The valves shall also be equipped in such a way that the valve can easily be opened/ in cold freezing weather - XX °C. Heating/insulation system should be		

evaluated.		
The deck areas should be designed in such a way that they are easily kept dry and free from ice. The use of de-icer shall be minimized.		
Drain from cellar deck shall be connected to a closed drain system.		
Drain from test unit shall be connected to a closed drain system.		
Drain from riser deck shall be connected to a closed drain system.		
Drain from pipe rack area shall be connected to a closed drain system.		
Drain from cement room shall be connected to a closed drain system.		
Drain from mud pit room shall be connected to a closed drain system.		
Drain from mud pump room shall be connected to a closed drain system.		
Drain from mud laboratory room shall be connected to a closed drain system and a open drain system.		
Drain from shaker room shall be connected to a closed drain system.		
Drain from sack store shall be connected to a closed drain system.		
Drain from BOP control room shall be connected to a closed drain system.		
Drains on the area below trip tank shall be connected to a closed drain system.		
The drains on area were chemicals or oil spill may occur (e.g. main deck) shall be connected to a closed drain system.		
Drain from cuttings collection area to closed drain system		
Drain from thrusters and engine rooms shall be connected to a closed drain system.		
Sufficient drainage shall be provided in all areas to prevent accumulation of ice.		
Emergency valves for drains in e.g. pump room, mud pit room, deck areas etc., shall be padlocked, and work permit required.		
All allowable outlets from the rig to the sea (e.g. bulk, cooling water, drain etc.) shall be routed to avoid spillage over supply vessel and personnel working on vessels.		

C.10 Oily water/bilge water discharge

When in position and preparing for and performing drilling and well operations, water discharged to sea shall as a minimum satisfy the discharge requirements stated in The Activity Regulations. During transit, the IMO Regulations apply.

Table C.6

Oily water/bilge water cleaning/sent to shore	Required (Y/N)	Status
The bilge water cleaning system shall be designed to clean emulsified oil in water.		
The rig shall have tank capacity to collect and process oily water for discharge or backloading to shore.		

Bilge water separator capacity in ...(m^3/h) (only for cleaning oily water containing no emulsion).		
At least one ballast pump shall be connected to the bilge system or other alternative backup system.		
One dedicated pump (in each pontoon) is connected to the emergency switchboard.		
Company shall at any time, on request, be provided with an updated drawing of the drains/bilge system. Copy of updated drawings of the system shall be kept on the drilling unit.		
Calibration procedure should be checked and it should be verified that calibration of the online meter is included in the maintenance system.		
The company should forward data of control analyses performed onshore to verify the online meter measurement or other measurement performed on the rig.		
Oil-contaminated water shall be cleaned to meet regulatory limits before it is discharged to sea.		
All drilling rigs shall have a certificate related to oil discharge during transit that documents compliance with IMO requirements. Reference is made to IMO MEPC. 107(49) and IMO International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Annex 1.		

C.11 Acute discharge and barriers

Table C.7

Requirements to physical barriers regarding external environment	Required (Y/N)	Status
Two physical barriers are required in the loading/unloading lines and pits.		
The helicopter fuel tank should be designed such that fluid spill from sample point does not go to sea.		
All mud, fuel and diesel hoses should be fitted with an Avery Hardall ¹ valve, or other type of valve that has similar function.		
Hose supports are to be arranged to ensure proper storage and to avoid buckling of the loading hoses		
The transfer hoses should be equipped with sufficient floaters to keep the hose floating.		
The high pressure hoses should meet the requirement regarding pressure, strength and climate conditions down to – XX °C.		
The loading/unloading line for fuel, diesel, mud, base oil, cement and other chemicals shall be fitted with two valves.		
NOTE The valve on the hose connected to the loading station is not included.		
For slip joint shall activation of top/bottom seals be possible by two independent systems.		
Slip joint shall be designed to prevent all leakage of riser fluids		
The valves on loading station shall be designed so that the open/closed position can easily be observed. The valves shall also be equipped so that they easily can be opened/closed also in cold weather – XX °C. Provision of heating/insulation system should be evaluated.		

¹ Avery Hardall is an example of a suitable product available commercially. This information is given for the convenience of users of this NORSOK standard and does not constitute an endorsement by this NORSOK standard of this product.

Requirements to physical barriers regarding external environment	Required (Y/N)	Status
Valves connected to the closed drain system shall be designed so that the open/closed position can easily be observed. The valves shall also be equipped in such a way that the valve can easily be opened/in cold freezing weather – XX °C. Provision of heating/insulation system should be evaluated. The valves shall be padlocked and work permit required.		
The deck areas should be designed in a way that they are easily kept dry and free from ice. The use of de-icer shall be minimized.		
Valves in non-heated piping systems shall be designed such that internal ice plugging and ice build-up does not occur, e.g. loading station valves.		
BOP hydraulic fluid system should be contained in a closed system, e.g. no return to sea.		
BOP control unit should be designed in such a way that discharge of BOP control fluid to sea is minimized. Environmentally friendly BOP fluid shall be used.		
The discharge from boilers and other rig equipment which has been treated with chemicals, shall not be discharged to sea.		
Back loading from day tank for barite and cement tank shall be possible.		
Spill collectors/drip pans should be arranged at chemical pods, machinery and equipment where leakage of chemicals, oil, fuel or mud might occur. Spill is to be routed to closed drain.		
Each mud pit drain and all other outlets from the drilling fluid system and dirty drain system to the environment shall be secured by double valves.		
Trip tank and system return/overflow line are to be capable of handling maximum flow to avoid mud spill from trip tank.		

Annex D (Informative) Summary of analytical tools

D.1 Dose related risk and effects assessment model (DREAM)

The DREAM was developed in the period 1998 to 2001 as a result of co-operation between SINTEF and the oil industry.

DREAM accounts for releases of complex mixtures of chemicals such as those associated with produced water.

The dynamic model allows calculation of environmental risk throughout the entire recipient. This calculation is based on the ratio between the predicted environmental concentration and the predicted no effect concentration of each component in the effluent as a function of dilution. Simplified, the EIF is a measure of the volume of receiving water where predicted environmental concentration is greater than predicted no effect concentration.

Furthermore, the model is fitted to identify the contribution of each component in a complex effluent to the total EIF, hence allowing to focus on the most effective measures to reduce the EIF. Note that EIF is mainly a tool for relative ranking of environmental impact/risk of various reduction measures, and not a tool for quantifying actual environmental impact/risk.

Reference:

http://ewe1.sintef.no/static/ch/environment/dream/Dream_web_input.pdf

D.2 Cost-benefit evaluation - Methods and criteria

Costs should be established according to the level of detail available at the time of the evaluation, and as necessary be further elaborated in order to reach a level of accuracy needed for decision. If the alternative solutions have an effect on production profiles (e.g. deferred or enhanced production), the effect of this should be incorporated in the evaluation.

The benefits of reduced emissions may be quantified either in terms of tonnes per year for emissions or in terms of some measure of the environmental effect. The former parameter is most relevant in relation to air emissions, where the effects are global or regional, and where the marginal environmental effect of a unit of emission is constant for a given platform. For discharges to sea, where the potential effects are mostly local, the most appropriate measure of the benefit would be the EIF which integrates the effects of all components in the discharge.

In order to compare the cost-benefit ratio of a measure with similar figures from analyses done by the authorities, the same approach as used by the authorities should be taken. In simple cases, when a measure only has an effect on one environmental parameter, the cost-benefit (C/B) ratio can be established as the net annual additional cost divided by the annual reduction in emissions (or EIF):

$$C/B = (A_I + O_A + M_A - S) / R_E \quad (D.1)$$

where

A_I is the annuity of additional investment costs over the lifetime of the project

O_A is the additional annual operating costs

M_A is the annual additional maintenance costs

S is the annual savings

R_E is the annual reduction in emissions

For comparison with cost-benefit studies of similar measures performed by the authorities, a discount rate of 7 % should be used.

For emissions that are subject to taxation (i.e. CO₂), the tax should be excluded from the calculation. However, when the cost-benefit (C/B) ratio is below the equivalent tax level, the measure would be expected to be economically feasible. An alternative method in this case would be to calculate the NPV of costs and savings over the lifetime of the measure, including the tax, and then choose the alternative with the best NPV. Depending on company policy, other discount rates than 7 % may then be chosen.

In cases with cross-media effects, i.e. when a measure affects more than one environmental parameter (e.g. if CO₂ increases as a consequence of low-NO_x technology or injection of produced water), a possible method is to assign a certain economic unit value (i.e. a virtual tax) on each of the environmental parameters that are affected, and see which alternative gives the best present value:

$$\text{NPV (7\%)} = \text{NPV}_I + \text{NPV}_{\text{O\&M}} - \text{NPV}_S + \text{NPV}(\sum P_i \cdot C_i) \quad (\text{D.2})$$

where

NPV_I is the present value of investments

NPV_{O&M} is the present value of operating and maintenance costs

NPV_S is the net present value of sales incomes

P_i is the emission per year of parameter *i*

C_i is the assigned economic value per unit emitted of this parameter (or EIF unit)

The last element of the equation will therefore represent the discounted environmental costs of the project alternative.

There are currently no official guidelines for establishing economical values on environmental parameters, but some guidance can be found in cost-benefit analyses performed by authorities (e.g. Norwegian Petroleum Directorate report on low-NO_x technology) and by the operating companies, e.g. zero discharge reports.



Appendix C

RWMTool



Functional Requirements



Regional Waste Management Tool Functional Requirements Specification

Version 1.2

Revision History

Date	Version	Description	Author
2013-10-07	1.0	Initial version	G. Moffatt
2013-10-09	1.1	Updated w/ A. Rashid	G. Moffatt
2013-10-21	1.2	Updated w/ T. Paget, C. Avey, T. Chambers, <i>et al.</i>	G. Moffatt
	1.3		

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APPENDIX B Sample Report	Error! Bookmark not defined.

Functional Requirements Specification

1. Introduction

This document provides a detailed listing of all functional requirements for the Regional Waste Management Tool (RWMTTool) project. The intent of this document is to define the requirements baseline that is used throughout the AMEC Information Management Methodology (AIM²) project management process to guarantee that the solution delivered matches the original scope of work requested.

2. Scope

The Regional Waste Management Tool is comprised of a web application, an underlying database, and the web service(s) that provide the interface between application and database.

Outside of the scope of this project are the maintenance, or management of any existing, client-owned resources, including servers, services, and data that may be consumed by the RWMTTool.

3. Overview

The goal for the application is to provide a decision support tool that summarizes the types and quantities of waste generated from hypothetical scenarios related to oil and gas exploration, drilling, production, and decommissioning.

The typical workflow involves the following:

1. The user defines a scenario by adding projects (exploration sites, production wells, etc.), and/or project groups (digitized areas containing non-location-specific projects) to the map, specifying for each certain properties related to the intensity of the operation (dates of operation, number and depth of wells, manpower, etc.).
2. Once projects in the scenario have been defined, the user can choose to view or print a report showing the projected types and quantities of waste from the projects within the scenario. Only user-added projects will be used to calculate the generated waste.
3. If signed in with a registered account, the user can save the scenario, and can open it later to view it or modify it.

4. Requirements Details

This section of the document defines all software requirements to a level of detail sufficient to enable designers to design a system to satisfy those requirements and testers to test that the system satisfies these requirements.

This section lists two types of requirements: functional and operational (non-functional). A functional requirement defines how the system will perform a function whereas an operational requirement defines how the system behaves or how you evaluate the functions.

For example:

Functional requirement would be: The search tool will perform full text scans of all PDF files.

Operational requirement would be: All full text scan searches will return results within 2 seconds.

4.1 Functional Requirements

The functional requirements are divided into the following categories:

- A) Security – Requirements related to authentication and user roles.
- B) Mapping (general) – Requirements related to general mapping functionality, map layers, etc.
- C) Scenarios – Requirements related to creating, saving, and opening scenarios, as well as adding, editing, and deleting projects within a scenario.
- D) Reporting – Requirements related to the tool’s output.
- E) Documentation – Requirements related to online help and other documentation.

4.1.1 Security

FR-ID	Requirement	Description
FR-A01	Register	Users can register a new account on the system. No approval or verification is needed. A single username may be shared by a number of individual users.
FR-A02	Sign in	Users with an account can sign into the system.
FR-A03	Edit account	Authenticated users can edit their account details (e.g. change their registered e-mail address).
FR-A04	Sign out	Authenticated users can sign out of the system.
FR-A05	Recover password	Users can recover their lost/forgotten password.
FR-A06	Roles	Three roles are defined for this application: <ul style="list-style-type: none"> • Public – an unauthenticated user can create scenarios and view reports. • User – an authenticated user can create, save, and delete scenarios, and view reports. • Administrator – an authenticated administrator can create, save, and delete scenarios, view reports, and manage users.
FR-A07	List users	An administrator can view a list of users registered with the system.
FR-A08	Edit user	An administrator can edit the properties of any user, including their role.
FR-A09	Delete user	An administrator can delete a user.

4.1.2 Mapping (general)

FR-ID	Requirement	Description
FR-B01	Map functions	<p>The RWMTTool will display a map on-screen, with the following basic functionality:</p> <ul style="list-style-type: none"> • Zoom • Pan • Return to default extent • Go-to previous extent • Go-to next extent • Display feature information (e.g. project metadata) • Measure distance between features on the map • Print* • Go-to coordinates (in decimal degrees) <p>* Requires an ArcGIS Server 10.1 or greater instance.</p>
FR-B02	Map layers	The map will display the map layers listed in Appendix 1, and will provide the ability to switch layers on/off.
FR-B03	Layers in nested folders	Map layers will be presented in nested directories (with logical layer names) that are easy to access and select.
FR-B04	Map projection	Maps will be presented in the Canada Lambert Conformal Conic projection.

4.1.3 Scenarios

FR-ID	Requirement	Description
FR-C01	New scenario	Users can create a new scenario, which deletes all projects from the map. If the active scenario contains projects, the user will be prompted to save the active scenario (requires sign-in), or discard the active scenario.
FR-C02	Add project	<p>Users can add a project to the active scenario.</p> <ul style="list-style-type: none"> • The project is a single point. • The user will be prompted to enter project details.
FR-C03	Add project group with polygon	Users can add a project group to the active scenario by drawing a polygon.

FR-ID	Requirement	Description
		<ul style="list-style-type: none"> The user will be prompted to add projects to the project group. Projects in the project group do not have a specific location, but do include other project details (number of wells, duration, manpower, etc.)
FR-C04	Add project group with circle	<p>Users can add a project group to the active scenario by drawing a circle.</p> <ul style="list-style-type: none"> The user will be prompted to add projects to the project group. Projects in the project group do not have a specific location, but do include other project details (number of wells, duration, manpower, etc.)
FR-C05	Add project group with selected area	<p>Users can add a project group to the active scenario by selecting a polygon feature in another layer.</p> <ul style="list-style-type: none"> The user will be prompted to add projects to the project group. Projects in the project group do not have a specific location, but do include other project details (number of wells, duration, manpower, etc.) The layers for which features can be selected for project groups include: <ul style="list-style-type: none"> Exploration licenses Production licenses
FR-C06	Select projects and project groups	<p>Users can select a set of projects and project groups on the map by clicking or dragging a rectangle around them. Once selected, the user can delete selected projects and project groups (FR-C11), or report on selected projects and project groups (FR-D03).</p>
FR-C07	Edit project	<p>Users can edit the properties of a project.</p>
FR-C08	Edit project group	<p>Users can edit the properties of projects within a project group.</p>
FR-C09	Delete project	<p>Users can delete a project.</p>
FR-C10	Delete project group	<p>Users can delete a project group.</p>
FR-C11	Delete selected projects and project groups	<p>Users can delete a set of selected projects and project groups.</p>

FR-ID	Requirement	Description
FR-C12	Save scenario	Users can save the active scenario (requires sign-in). The scenario must be given a unique name.
FR-C13	Open scenario	Users can open a saved scenario (requires sign-in). If the active scenario contains projects, the user will be prompted to save the active scenario, or discard the active scenario.
FR-C14	Delete scenario	Users can delete a saved scenario (requires sign-in).

4.1.4 Reporting

FR-ID	Requirement	Description
FR-D01	Generate report	Users can generate a report showing the waste generated from projects and project groups.
FR-D02	Report on all projects and project groups	Users can generate a report showing the waste generated from all projects and project groups in the active scenario.
FR-D03	Report on selected projects and project groups	Users can generate a report showing the waste generated from selected projects and project groups in the active scenario
FR-D04	List best practices	The report will optionally list the best practices and regulations from other jurisdictions associated with each waste stream.
FR-D05	Show proximity to transportation infrastructure	The report will show the proximity of each project to transportation infrastructure.
FR-D06	Show proximity to disposal facilities	The report will show the proximity of each project and project group to existing waste management infrastructure.
FR-D07	Show proximity to protected areas	The report will indicate whether each project or project group is within or overlaps a protected area.
FR-D08	Show calculated waste	The report will show the calculated quantity of each waste stream for each project and project group.
FR-D09	Show cumulative waste over time	The report will show the cumulative waste produced over time.
FR-D10	Display report on-screen	The generated report will be displayed on-screen.
FR-D11	Print report	Users can print the report.
FR-D12	Printed report includes	The printed report will include a map* showing:

FR-ID	Requirement	Description
	map	<ul style="list-style-type: none"> the selected projects and project groups transportation infrastructure waste management infrastructure <p>* Requires an ArcGIS Server 10.1 or greater instance.</p>

4.1.5 Documentation

FR-ID	Requirement	Description
FR-E01	Online help	The RWMTool will include online help, describing how to use the system.

4.2 Operational Requirements

OR-ID	Operational Requirements
OR-A01	The RWMTool will be hosted by GNWT.
OR-A02	GNWT will provide all reference geospatial datasets.
OR-A03	The RWMTool will support Internet Explorer 8. Additional browsers may work, but will not be tested or used in development.
OR-A04	The tool will not adhere to Treasury Board Secretariat (TBS) guidelines for Common Look-and-Feel (CLF), accessibility, or language. The tool will be English-only.

APPENDIX A Map Layers

The RWMTool will include a number of map layers used as geographic context (which we will term “base layers”), and in the calculation of report results (which we will term “operational layers”).

Base layers will be provided by GNWT in the form of a web map service. These are arbitrary, and can be updated as needed by GNWT.

The specific sources for operational layers will need to be determined by GNWT, but will include:

- Licenses (exploration and operational)
- Transportation infrastructure
- Waste disposal infrastructure
- Protected areas



Application Architecture



Regional Waste Management Tool Application Architecture

Version 1.1

Revision History

Date	Version	Description	Author
2013-06-04	1.0	Initial draft	Moffatt
2014-03-06	1.1	As-built	Moffatt
	1.2		
	1.3		

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Application Architecture

1. Introduction

The Regional Waste Management Tool (RWMTTool) was developed by AMEC in 2013-2014 for the Government of Northwest Territories. The objective of the application was to provide a useful, scenario-driven tool that would give decision-makers and other stakeholders the ability to plan and understand the quantity and temporal distribution of waste generated from oil and gas activities in coming years.

To fulfill that objective, AMEC produced a list of waste types typically produced in oil & gas operations, along with “waste factors” and “waste functions” that would calculate the amount of waste generated using parameters like the number and depth of wells in a project, the number of people on-site, the duration of the project, etc.

Those waste types and functions then became the foundation for the RWMTTool web application, a map-based web site where users can create hypothetical scenarios of future oil & gas operations, and view reports on the amounts of waste generated through those scenarios.

This document describes the as-built application architecture for the Regional Waste Management Tool (RWMTTool).

2. Scope

Within this document, the reader will find a Description of the technology stack and system architecture for the RWMTTool.

3. Technologies

A diagram of the technology stack can be found in Figure 1 on the following page.

On the client side, the application was developed using JavaScript. The map interface was based on the ArcGIS API for JavaScript, and incorporated some Dojo for creating and interacting with the map.

The jQuery JavaScript library was used for the majority of form interaction and validation, as well as for AJAX requests to the server. Additional jQuery plug-ins were used including Flot (for graphing), jqGrid (for tables), jsTree, and Mustache (for templating).

The application pages were served through Views, and AJAX requests for data were made to a REST endpoint in a C#.NET MVC 4 application. Data were retrieved from the database, or written into the database, using Entity Framework.

The underlying database was created in SQL Server 2008 R2. The database contains only tables; no stored procedures or functions were used.

The entire application is served via Internet Information Services in a Windows environment.

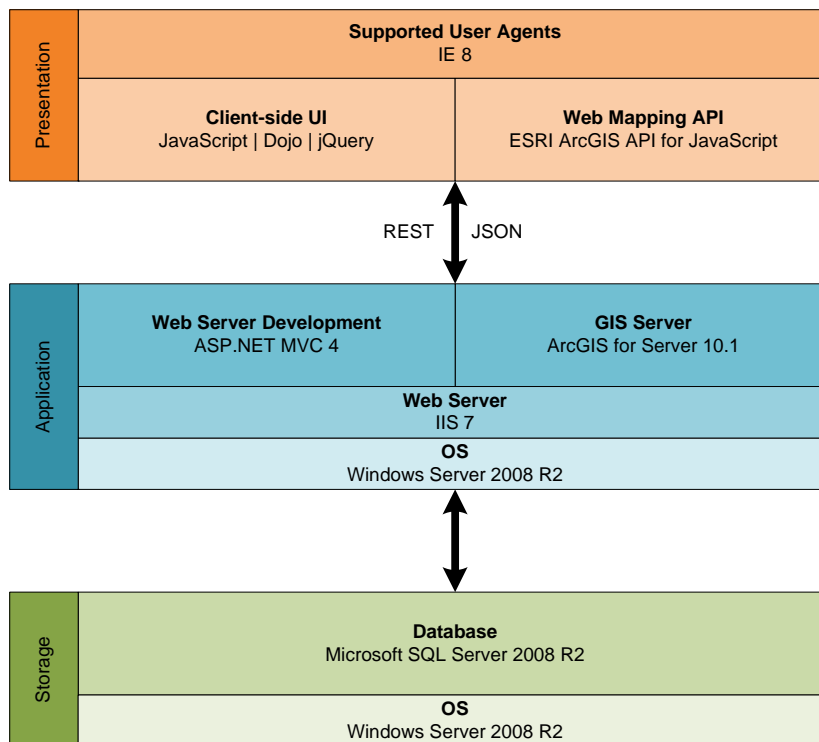


Figure 1. Technology stack for the Regional Waste Management Tool

4. Application Flow

The user navigates to the RWMTTool web site, and an MVC View provides the application presentation, along with a set of JavaScript files. The ArcGIS API for JavaScript provides the map frame, while the base map and other map layers are requested from the Government of NWT ArcGIS Server instance. Printing the map requires the GNWT ArcGIS Server PrintingTools service.

As the user begins to create a scenario by adding projects to the map, the page makes AJAX/REST requests for look-up tables like waste types and factors, project types, regions, etc., but the user-entered scenario data remains client-side. When the user views a report, the waste calculations are also performed client-side. By keeping the scenario data and waste calculations client-side, an unauthenticated user can develop scenarios and view reports without needing an account.

If the user chooses to save their scenario, they must create an account and sign in to the application. Once signed in, they may save the scenario, and at that point the system posts the scenario data to the server to be stored in the database.

Likewise, if authenticated, the user can open a saved scenario from the database. Opening a saved scenario populates the scenario data client-side, and all changes to the scenario from that point forward, as well as all waste calculations, are conducted on the client side. Only when the scenario is again saved is the scenario data transferred to the server.



Information Architecture



Regional Waste Management Tool Information Architecture

Version 1.1

Revision History

Date	Version	Description	Author
2013-06-04	1.0	Initial draft	Moffatt
2014-03-06	1.1	As-built	Moffatt
	1.2		
	1.3		

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Information Architecture

1. Introduction

The Regional Waste Management Tool (RWMTTool) was developed by AMEC in 2013-2014 for the Government of Northwest Territories. The objective of the application was to provide a useful, scenario-driven tool that would give decision-makers and other stakeholders the ability to plan and understand the quantity and temporal distribution of waste generated from oil and gas activities in coming years.

To fulfill that objective, AMEC produced a list of waste types typically produced in oil & gas operations, along with “waste factors” and “waste functions” that would calculate the amount of waste generated using parameters like the number and depth of wells in a project, the number of people on-site, the duration of the project, etc.

Those waste types and functions then became the foundation for the RWMTTool web application, a map-based web site where users can create hypothetical scenarios of future oil & gas operations, and view reports on the amounts of waste generated through those scenarios.

This document describes the as-built information architecture that underlies the Regional Waste Management Tool (RWMTTool).

2. Scope

Within this document, the reader will find a listing of each entity (or table) in the database, along with a description of the attributes (or fields) within each. Also described are the waste functions, and the means by which particular waste functions and parameters are applied for the various waste types.

3. Physical Data Model

The physical data model includes the following entities:

- Project
- ProjectGroup
- ProjectType
- ProjectWaste
- Region
- Scenario
- User
- WasteClass
- WasteManagementCategory
- WasteType
- .NET Membership Entities

3.1 Entity: Project

A project is a defined activity at a single site. The activity may include multiple wells, but those wells are treated as one activity, with the well depth, manpower, and time frame associated with the activity. Produced waste is calculated at the project level.

Attribute	Type	Nullable	Description
ProjectID	int	No	Unique identifier for the project
ProjectName	varchar(50)	No	Name of the project
Applicant	varchar(50)	Yes	Name of the applicant
RegionID	smallint	Yes	Region (from Region)
ProjectTypeID	smallint	Yes	Project type (from ProjectType)
LocationDescription	varchar(50)	Yes	Description of the project area/location
Latitude	float	Yes	Latitude (GCS WGS84)
Longitude	float	Yes	Longitude (GCS WGS84)
WellDepth	smallint	Yes	Projected depth of wells (m)
WellCount	smallint	Yes	Number of wells in the drilling project
Manpower	smallint	Yes	Projected manpower (individuals)
StartDate	date	No	Project start date
CompletionDate	date	No	Project completion date
ScenarioID	int	No	Scenario to which the project belongs (from Scenario)
ProjectGroupID	int	Yes	Group to which the project belongs (from ProjectGroup)

3.2 Entity: ProjectGroup

A project group is an area containing zero or more projects. It is analogous to an exploration or production license.

Attribute	Type	Nullable	Description
ProjectGroupID	int	No	Unique identifier for the project group
ProjectGroupName	varchar(50)	No	Name of the project group
ProjectGroupGraphicData	varchar(4000)	No	Coordinate pairs defining the

			vertices of the shape (GCS WGS84)
LicenseIssueDate	date	Yes	License issue date
LicenseExpiryDate	date	Yes	License expiry date

3.3 Entity: ProjectType

A lookup table of project types.

Attribute	Type	Nullable	Description
ProjectTypeID	smallint	No	Unique identifier for the project type
ProjectTypeDescription	varchar(50)	No	Description of the project type

3.4 Entity: ProjectWaste

A table storing the selected waste types by project. Also stores the calculated waste generation quantity.

Attribute	Type	Nullable	Description
ProjectWasteTypeID	int	No	Unique identifier for the project waste record
ProjectID	int	No	Project (from Project)
WasteTypeID	smallint	No	Waste type (from WasteType)
GenerationQuantity	float	Yes	Quantity of waste generated (various units)

3.5 Entity: Region

A lookup table of regions.

Attribute	Type	Nullable	Description
RegionID	smallint	No	Unique identifier for the region
RegionDescription	varchar(50)	No	Description of the region

3.6 Entity: Scenario

A table of scenarios belonging to users.

Attribute	Type	Nullable	Description
ScenarioID	int	No	Unique identifier for the scenario
ScenarioName	varchar(50)	No	Name of the scenario
UserID	int	No	User owning the scenario (from User)

3.7 Entity: User

A table of users registered on the web site.

Attribute	Type	Nullable	Description
UserID	int	No	Unique identifier for the user
UserName	varchar(50)	No	Name of the user
Email	varchar(50)	No	Email address of the user
IsActive	bit	No	Flag indicating whether the user is active
IsLockedOut	bit	No	Flag indicating whether the user is locked out

3.8 Entity: WasteClass

A lookup table of waste classes. Waste types are grouped into waste classes.

Attribute	Type	Nullable	Description
WasteClassID	smallint	No	Unique identifier for the waste class
WasteClassDescription	nvarchar(50)	No	Description of the waste class

3.9 Entity: WasteManagementCategory

This entity contains a summary of best management practices in several jurisdictions (Alaska, Norway, and Canada/Newfoundland) for a variety of waste management categories.

Attribute	Type	Nullable	Description
WasteManagementCategoryID	int	No	Unique identifier for the waste management category
WasteManagementCategoryDescription	varchar(100)	No	Description of the waste

				management category
Alaska	varchar(1000)	Yes		Summary of BMPs in Alaska
Norway	varchar(1000)	Yes		Summary of BMPs in Norway
Canada/Newfoundland	varchar(1000)	Yes		Summary of BMPs in Canada/Newfoundland

3.10 Entity: WasteType

A lookup of waste types. The waste types are used to calculate waste quantity (using the waste factors and waste function references).

Attribute	Type	Nullable	Description
WasteTypeID	smallint	No	Unique identifier for the waste type
WasteTypeDescription	varchar(100)	Yes	Description of the waste type
WasteClassID	smallint	Yes	Associated waste class (from WasteClass)
UnitRate	varchar(50)	Yes	Units of measure for the rate of waste generation
Unit	varchar(50)	Yes	Units of measure for the quantity of waste generated
WasteFactor	float	Yes	Factor by which waste is generated
WasteFunction	varchar(50)	Yes	Name of database function used to calculate waste generated

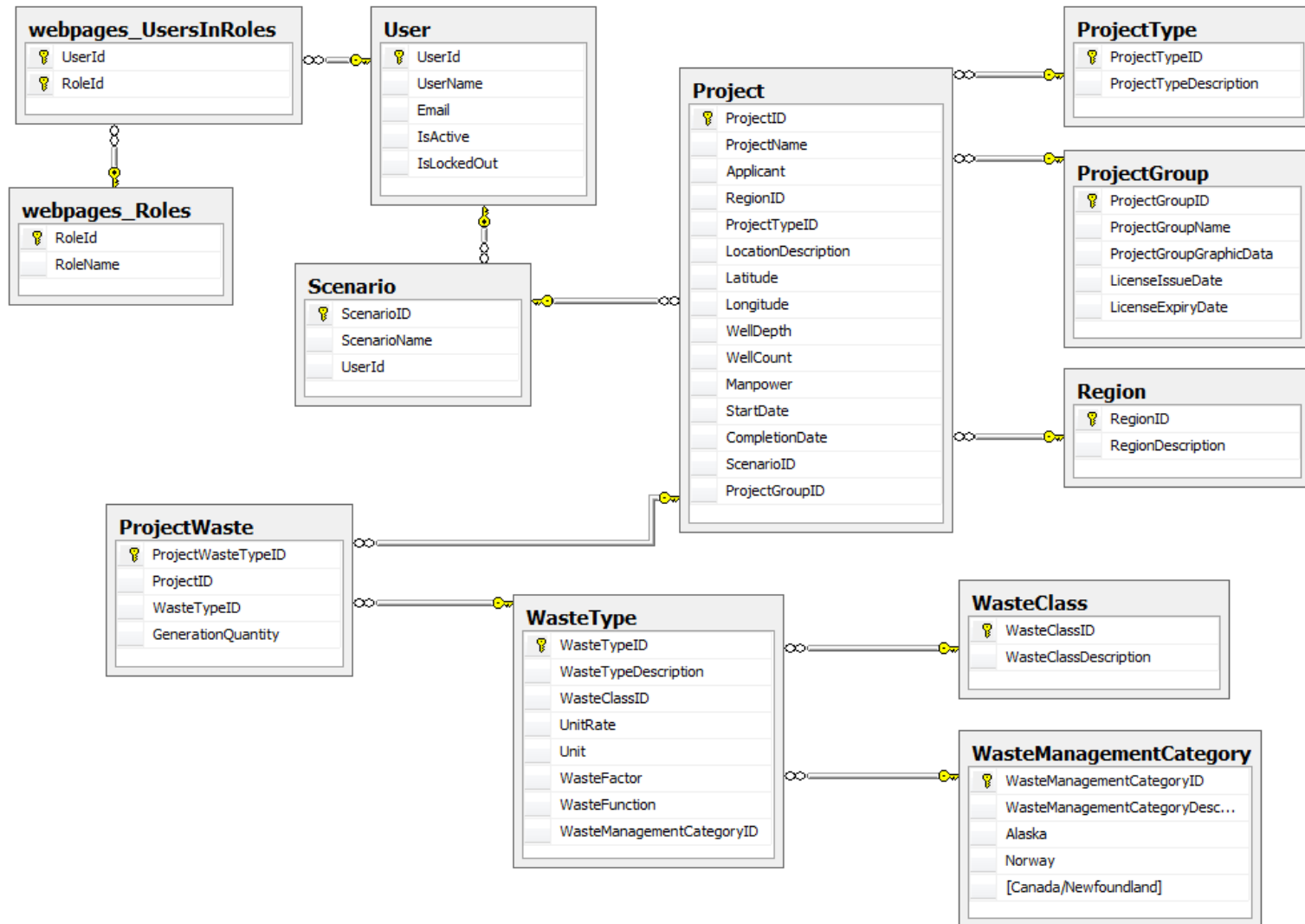
3.11 Entities: .NET Membership

The data model also includes a set of standard .NET Membership entities. These are primarily used to handle encrypted user passwords and roles.

- webpages_Membership
- webpages_OAuthMembership
- webpages_Roles
- webpages_UsersInRoles



4. Data Model Diagram



5. Functions

In an early Excel prototype, each “generation quantity” result cell contained a formula for calculating the quantity of waste generated. The formula would refer to the waste factor for the waste type, and also to other properties elsewhere in the spreadsheet (like number of wells, number of project days, number of people, etc.).

In the RWMTTool implementation, we have generalized the individual formulae into (initially) four discrete functions. Each function requires a waste factor and a ProjectID. The functions are characterized by the properties needed to calculate the waste quantity:

- *WF (waste factor)* – in this function, the calculated waste quantity is simply the waste factor. There are no other parameters in the calculation, and the ProjectID is not used. It is used for waste streams where the unit rate is quantity per project.
- *WFxDays (waste factor x days)* – the calculated waste quantity is the waste factor multiplied by the duration of the project (in days). It is used for waste streams where the unit rate is quantity per day.
- *WFxPeoplesDays (waste factor x people x days)* – the calculated waste quantity is the waste factor multiplied by the manpower, multiplied by the duration of the project (in days). It is used for waste streams where the unit rate is quantity per person per day.
- *WFxWells (waste factor x wells)* – the calculated waste quantity is the waste factor multiplied by the number of wells. It is used for waste streams where the unit rate is quantity per well.

Additional functions can be developed to handle other unit rates, including references to other calculated values. These functions are contained within the application code, but the reference between the waste type and its waste function is found in the WasteType table.

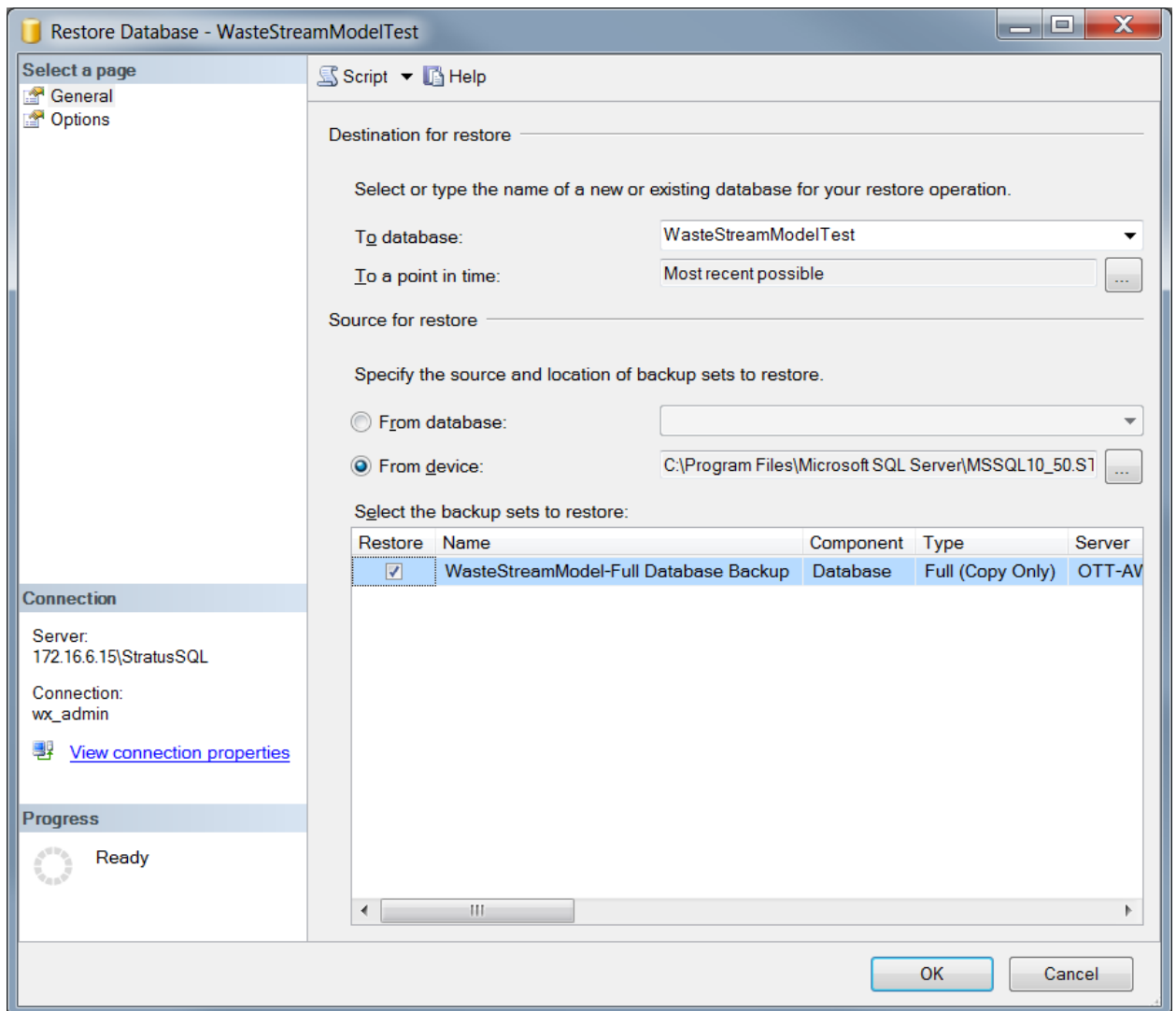


Deployment Instructions

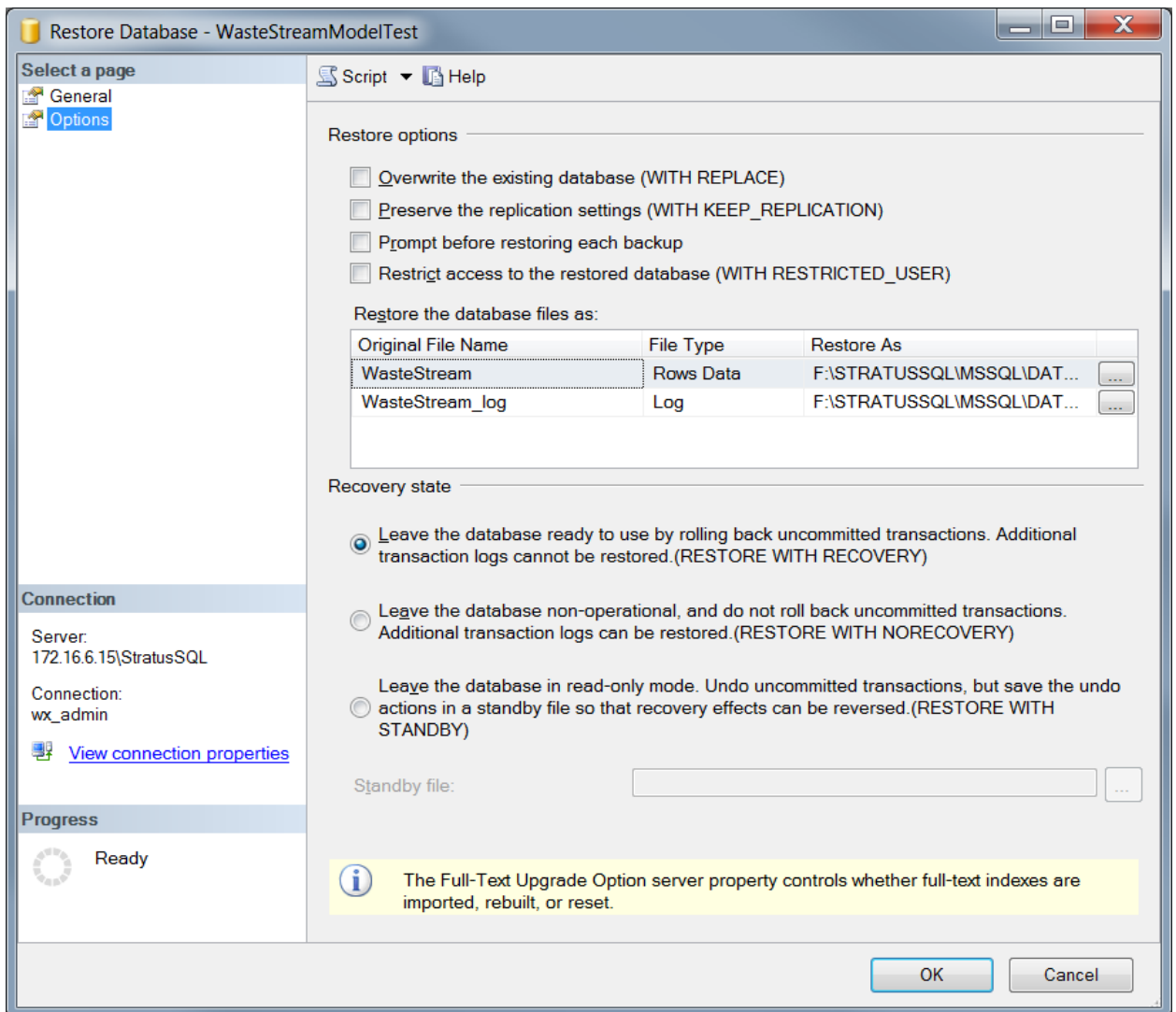
Regional Waste Management Tool - Deployment Instructions

1. Restoring the database to SQL server:

- a. Open SQL Server Management Studio and connect to the database server which the RWM-Tool database will be restored to.
- b. In the Object Explorer, right click Databases and select Restore Database.
- c. Under “Destination for restore”, enter “WasteStreamModel” in the “To database” field.
- d. Under “Source for restore”, select “From device”. Select the browse button to navigate to the location of the database backup file and select the file.
- e. The backup should now be listed in the “Select the backup sets to restore” grid. Check the box under “Restore” in the grid.

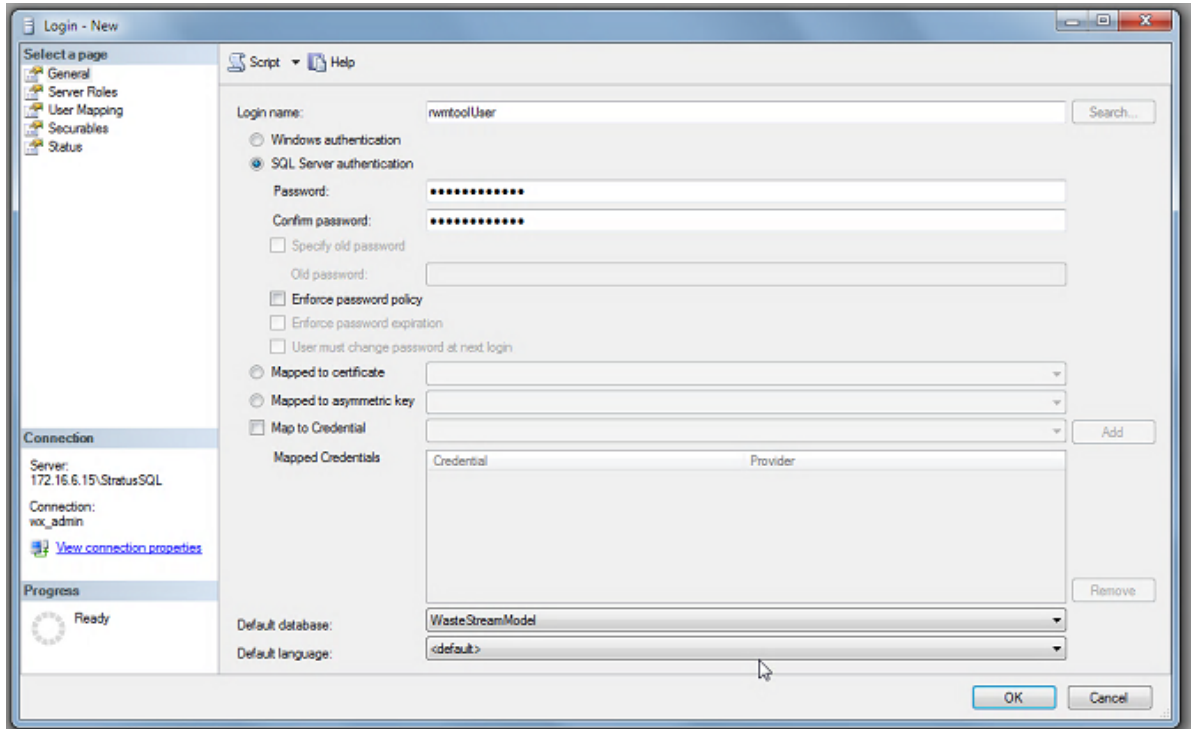


- f. Click Options in the “Select a page” pane. Leave all the default options as is. Click OK.



- g. Refresh the Object Explorer pane. The WasteStreamModel database should be listed under the Databases node.
- h. Expand the nodes WasteStreamModel -> Security -> Users. The user rwmtoolUser should be listed.
- i. Optional check: Right click rwmtoolUser and select Properties. In the dialog that appears, select Securables in the “Select a page” pane. Next click the Search button, select “All objects of the type” option and click OK. Check off Databases and Tables in the list, and click OK. In the Securables grid, ensure the database has “Create table” permissions and that the tables have Delete, Insert, Select and Update permissions set.
- i. In the Object Explorer pane, expand the Security node under the root. Right click the Logins node and select “New Login”.

- j. In the dialog that appears, enter “rwmtoolUser” (or alternatively, another login name of your choice) in the “Login name” field. Select the SQL Server authentication option and enter a password of your choosing in the Password and Confirm password fields.
- k. De-select the Enforce password policy option if it is checked off.
- l. In the “Default database” dropdown, select the WasteStreamModel database. Leave all other options with default settings. Click OK.



- m. Now map the created login to the rwmtoolUser: Click the New Query button in SQL Server Management Studio. Copy the following script into the query editor window and click Execute:

```
USE WasteStreamModel
```

```
GO
```

```
EXEC sp_change_users_login 'Update_One', 'rwmtoolUser',  
'rwmtoolUser'
```

```
GO
```

- n. Optional at this time: Add a record for the application’s admin user in the WasteStreamModel database’s User table. Click the New Query button in SQL Server Management Studio. Copy the following scripts into the query editor window, replace

adminUserName and adminEmailAddress with the name and email of the individual who will act as application administrator, and click Execute:

```
INSERT INTO [WasteStreamModel].[dbo].[User]
(UserName,
Email)
VALUES
('adminUserName',
'adminEmailAddress@email.com'
)

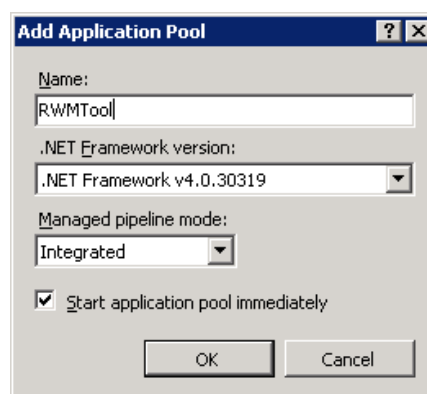
INSERT INTO [WasteStreamModel].[dbo].[webpages_UsersInRoles]
(UserId, RoleId)
VALUES
((SELECT UserId FROM [WasteStreamModel].[dbo].[User] WHERE UserName =
'adminUserName'),
1)
```

2. Copy the application code and proxy files:

- a. Create a new folder for the application, naming it e.g., RWMTTool, in the directory for web applications on your web server (e.g. C:\inetpub\wwwroot).
- b. Copy the application files from the zip folder over to the newly created folder.
- c. Create a new folder for the proxy files in the web application directory, naming it RWMTToolProxy, and copy the files proxy.ashx and proxy.config into the new folder.

3. Create the application and setup the proxy in IIS:

- a. Open up IIS Manager, right click the Application Pools node in the Connections pane and select Add application pool. Enter the application folder name (e.g. RWMTTool) in the Name field it, and for the .NET target version select .NET framework v4.0. Click OK.



- b. Expand Sites, right click the Default Web Site node (or application name if listed under Default Web Site node) and select Add Application. Type in the application name RWMTTool in the Alias field and change the "Application pool" entry to the one you created in step a. In the "Physical path" field, enter the path to the application folder in

the server's web application directory (e.g. C:\inetpub\wwwroot\RWMTool). Click OK. You should now see an RWMTool entry under the Default Web Site node.

- c. Repeat step b for the proxy, specifying the application name as RWMToolProxy, and the application pool as RWMTool.

4. Update the web.config file:

- a. In the <connectionStrings> section:
 - i. Modify the connectionString attributes in the WasteStreamModel and WasteStreamModelEntities entries to point to the new database server. Change the id and password to the new values.
- b. The <appSettings> section:
 - i. If desired, modify the NRCan.WasteManagement.SystemEmailFromAddress and NRCan.WasteManagement.SystemEmailFromName from the defaults. These will appear in the From field in password reset confirmation emails sent by the application.
 - ii. Modify the value of the NRCan.WasteManagement.AdminEmail entry to the email address of the individual who will act as the application's administrator and have the admin role.
 - iii. Comment out the NRCan.WasteManagement.PortalURL entry under the comment heading STAGE and uncomment the one under the heading PROD, replacing the value of this entry with the URL path to the application setup on the web server.
 - iv. If needed, modify the value of the RWMToolProxyPath entry to the absolute path of the file proxy.ashx.
- c. At the bottom of the web.config file, modify the network entry under the smtp section so that the host and port number attributes are correct for your environment.

5. Testing and clean up:

- a. Open up an internet browser and navigate to the URL for the application setup in IIS. Click some of the tools or links and try registering an account.
- b. Delete the database backup file and any temporary files copied over.

6. Technical Dependencies:

Note that the RWMTool has the dependencies specified below on the North West Territories (NWT) Centre for Geomatics' Web Map Services (WMSs). The URLs for the WMSs are stored in the application's web.config file and may be modified if needed.

- a. The print map tool is implemented using the ArcGIS javascript (JS) API's PrintTask, which makes use of the Centre for Geomatics ArcGIS server print utility's Export Web

Map Task. Also, the proxy.config file in RWMToolProxy folder contains a serverUrl entry referencing the print utility (<http://apps.geomatics.gov.nt.ca/arcgis/rest/services/Utilities/PrintingTools/GP/Server>). If the print utility is unavailable, the application displays a message to the user stating so.

- b. The map component is has as its base layer the NWT Relief Basemap (http://apps.geomatics.gov.nt.ca/arcgis/rest/services/GNWT_Basemaps/GNWT_Relief_Basemap/MapServer). If the basemap service is down, the application displays a message stating that there was an error loading the map.
- c. There are three NWT WMS-based operational layers that the user can add to the map via the Map Layers panel, namely, the Economy layer (http://apps.geomatics.gov.nt.ca/ArcGIS/rest/services/GNWT/Economy_LCC/MapServer), the Transportation layer (http://apps.geomatics.gov.nt.ca/ArcGIS/rest/services/GNWT/Transportation_LCC/MapServer) and the Environment and Conservation layer (http://apps.geomatics.gov.nt.ca/ArcGIS/rest/services/GNWT/Environment_LCC/MapServer).
- d. The application depends on the geometry service (<http://apps.geomatics.gov.nt.ca/arcgis/rest/services/Utilities/Geometry/GeometryServer>) to project coordinates between latitude/longitude and northing/easting.

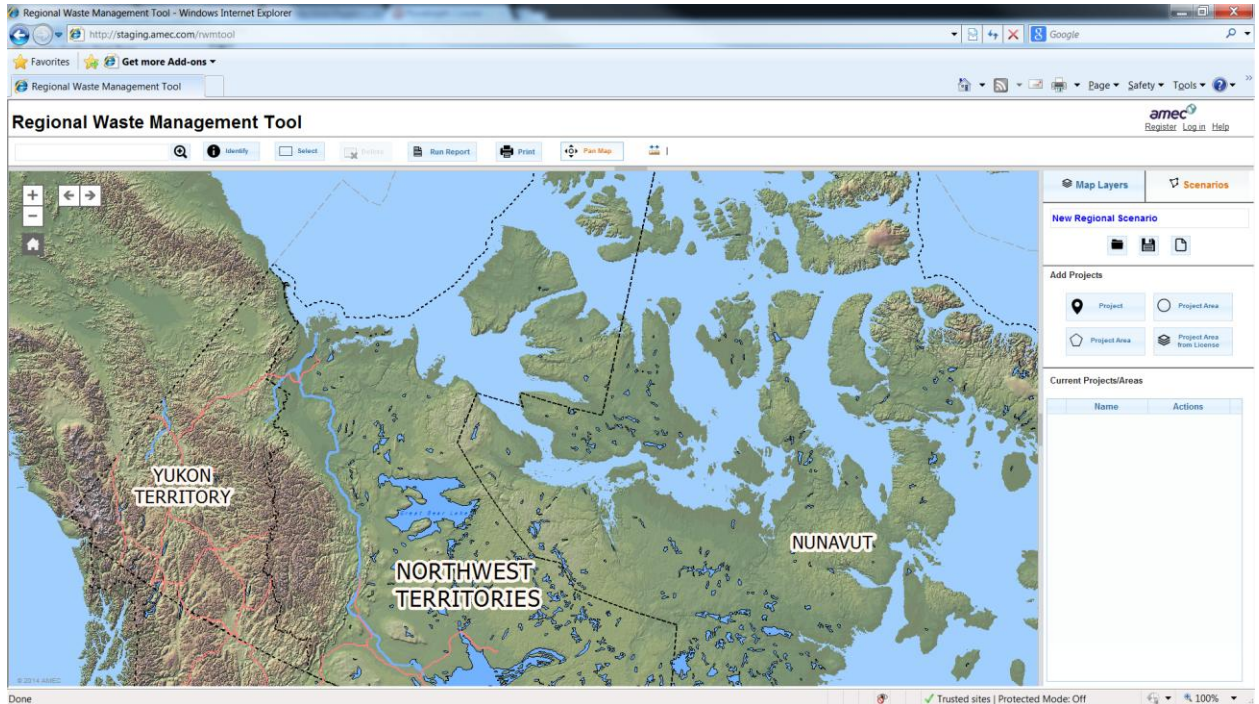


Online Help

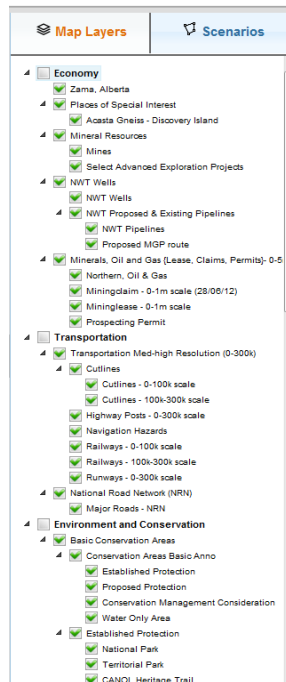
Regional Waste Management Tool Functionality

Introduction

1. There are a number of tools in the top panel above the map, and more tools under the “Scenarios” tab in the sidebar. The active tool has orange text.



2. Choose the Map Layers tab in the sidebar to select different context layers to add to the map.

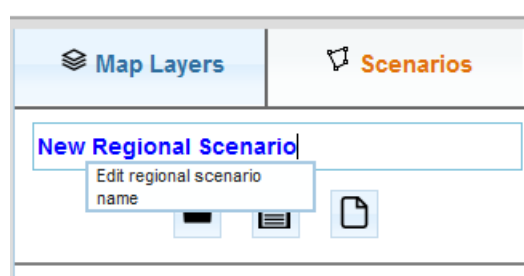


3. Pan, roll your mouse wheel, or click the +/- buttons to zoom to your area of interest. Click the home button to return to the home extent of the map, and the left/right arrow buttons to go to the previous or next extent.

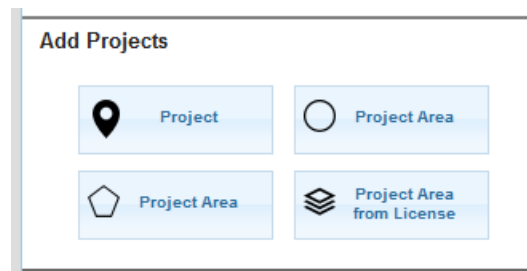


Creating a Scenario

1. The active scenario, by default, is called “New Regional Scenario” – you can change this by clicking the title and entering a new name.



2. Add projects to your scenario with the four “Project/Project Area” buttons.
 - a. Use the “Project” tool to add a single, location-specific project to your scenario.
 - b. Use the two “Project Area” tools to draw project areas on the map – these will contain non-location-specific projects. The project area is similar to a license area.
 - c. Use the “Project Area from License” tool to create a project area using an existing license. Draw a box around one or more licenses to create new project areas or click on a license to create a single new project area.



- For project areas, you'll set some basic properties for the area (name, and license issue/expiry dates). Then you'll add projects into the project area.

The screenshot displays the 'Regional Waste Management Tool' web application in a browser window. The main interface features a map of the Yukon and Northwest Territories. A 'Manage Project Area' dialog box is open, allowing users to input the following information:

- Project Area Name
- License Issue Date
- License Expiry Date
- An 'Add New Project' button

Below the input fields is a table for managing projects:

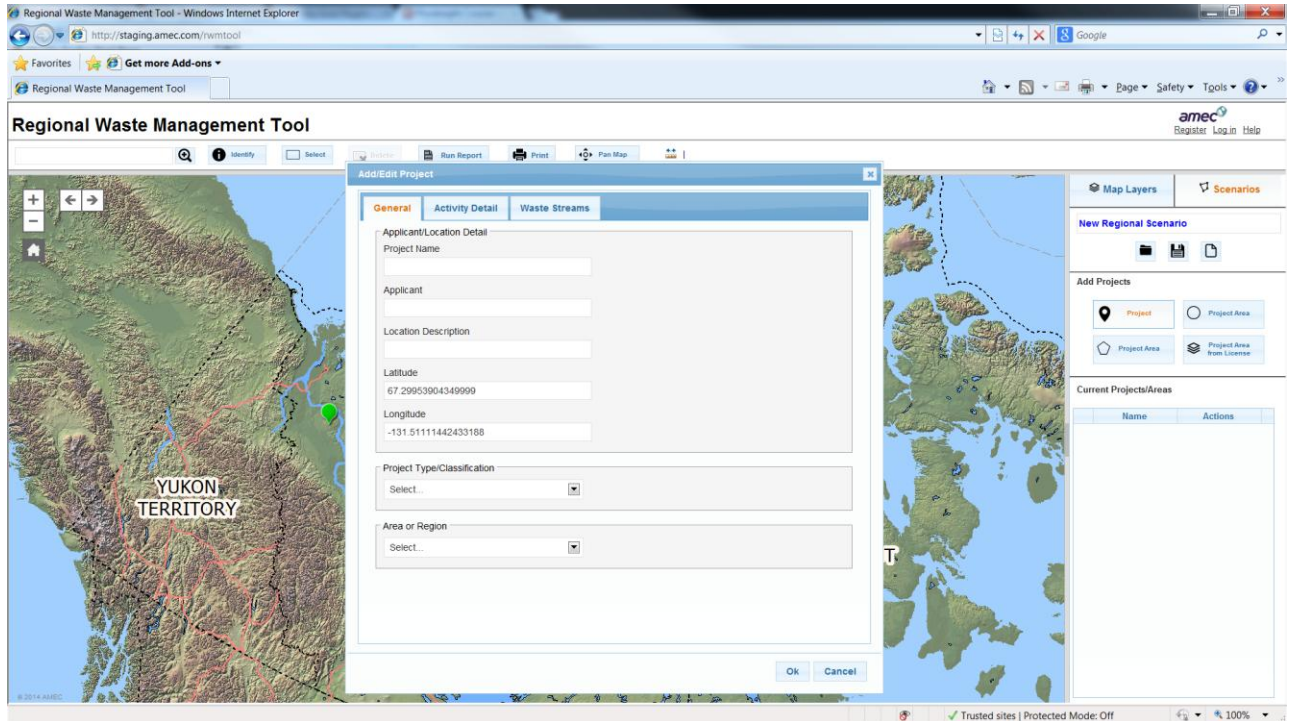
Project Name	Actions

The right-hand side of the application includes a 'Map Layers' and 'Scenarios' section, a 'New Regional Scenario' button, and an 'Add Projects' section with buttons for 'Project', 'Project Area', and 'Project Area from License'. At the bottom, there is a 'Current Projects/Areas' section with a table:

Name	Actions

The browser's status bar at the bottom shows 'Done', 'Trusted sites | Protected Mode: Off', and a zoom level of 100%.

4. The projects (on their own, or within an area) have their own properties found in three tabs:
 - a. General
 - b. Activity Detail
 - c. Waste Streams







5. Complete your scenario by adding projects and filling out the project properties.

Editing a Scenario

1. You can edit a project or project area in a scenario by right clicking the mouse on the project or area graphic on the map to bring up a context menu with the "Edit" option. The menu also contains a "Delete" option to delete the project or area from the scenario.



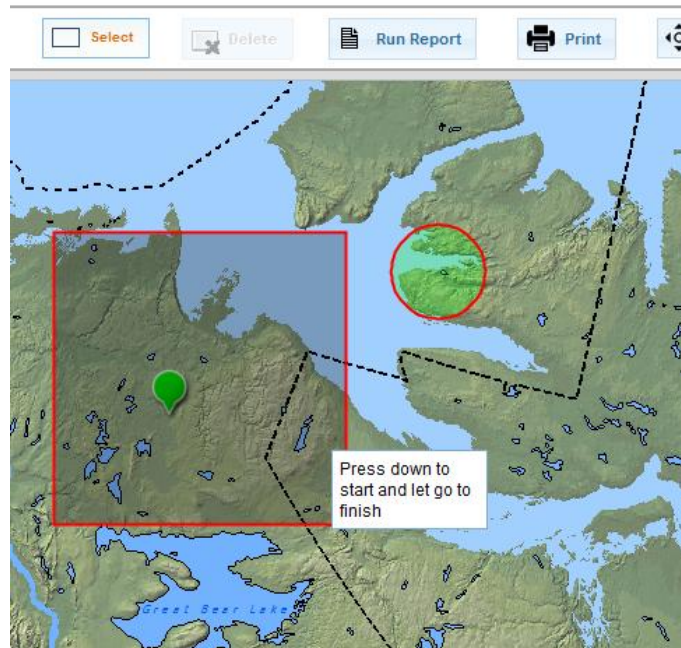
- Projects and project areas can also be edited or deleted from a scenario via the “Current Projects/Areas” table in the sidebar.

Current Projects/Areas		
	Name	Actions
1	Test Project	 
2	Test Project Area	 

- A third method of deleting projects and/or project areas is by using the “Select” tool to select the desired projects/areas, then clicking the “Delete” tool.

Reporting

1. Once you've created your scenario by adding projects, you can report on the waste generated by those projects.
2. Click on the "Run Report" button, or, optionally, use the "Select" tool to pick a subset of projects and project areas to report on.



3. On the Project Data tab, you'll get a table showing the properties of the projects you've entered.

Scenario 1614 - Waste Streams Report

Project Data | Waste Summary | Waste Charts | Best Practices

Projects Summary

Project Name	Start Date	Completion Date	Well Count	Well Depth	Manpower	Waste Types
projectOne_pg1614	2013/12/13	2014/01/01	5	6	20	Deck Drainage - Drilling, Drill cuttings, Drilling Fluids - NAF (drilling), Drilling Fluids - WBM (drilling)
p_testOne_1614	2013/12/03	2013/12/21	4	4	10	Absorbents, Deck Drainage - Drilling, Drill cuttings, Drilling Fluids - NAF (drilling)

Print

Close

4. On the Waste Summary tab, you'll see a table showing the calculated waste quantities for each project and waste type, plus the total waste generated for each waste type.

Scenario 1614 - Waste Streams Report

Project Data **Waste Summary** Waste Charts Best Practices

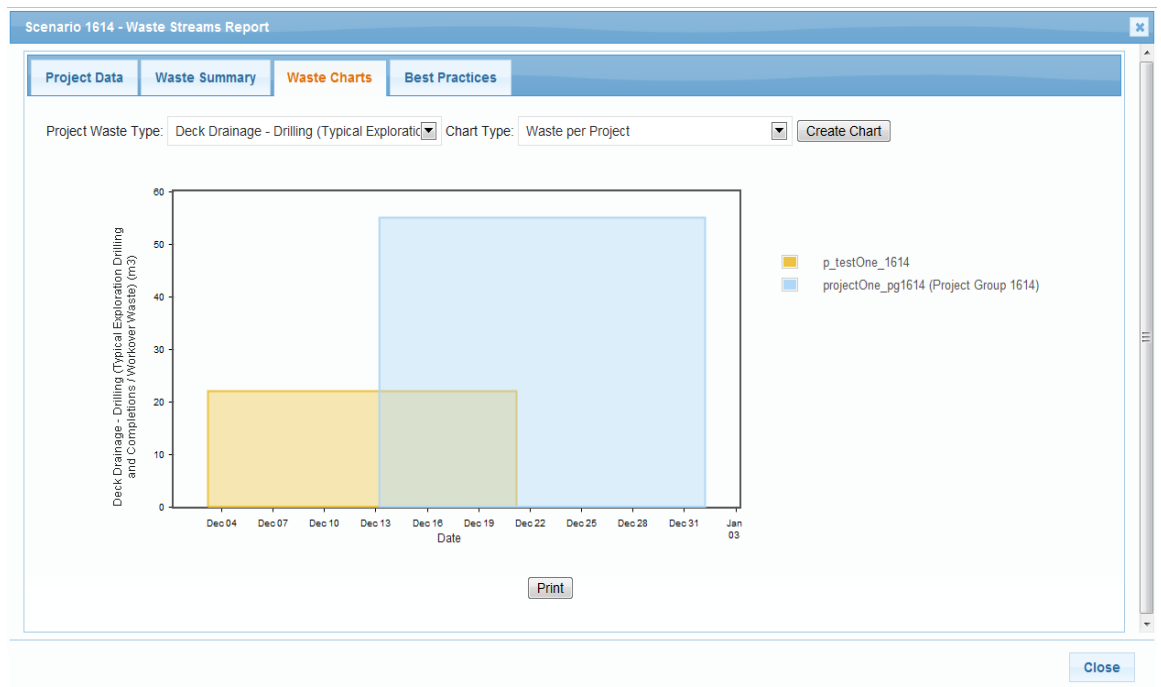
Project Waste Summary

Waste Type	projectOne_pg1614	p_testOne_1614	Totals
Absorbents (kg) - Typical Exploration Drilling and Completions / Workover Waste	0	3.2	3.2
Deck Drainage - Drilling (m3) - Typical Exploration Drilling and Completions / Workover Waste	55	22	77
Drill cuttings (m3) - Typical Exploration Drilling and Completions / Workover Waste	100	40	140
Drilling Fluids - NAF (drilling) (m3) - Typical Exploration Drilling and Completions / Workover Waste	1200	480	1680
Drilling Fluids - WBM (drilling) (m3) - Typical Exploration Drilling and Completions / Workover Waste	480	0	480

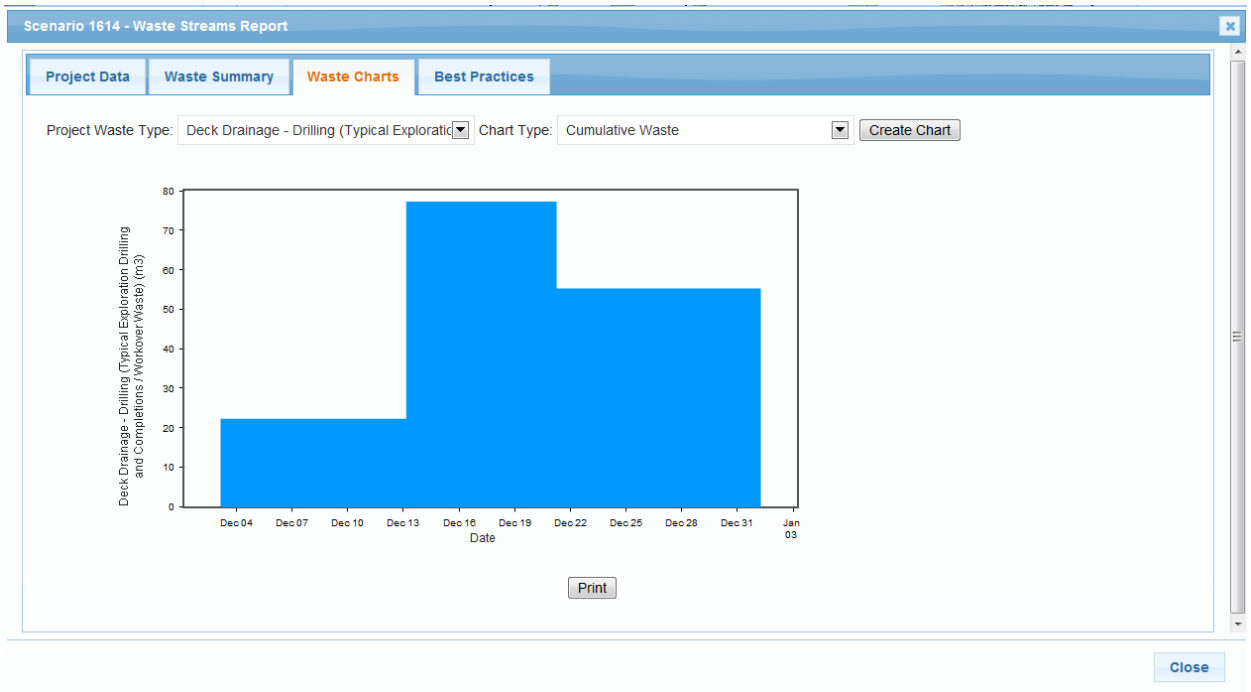
Print

Close

5. The Waste Charts allows you to graph the waste generated for a particular waste type in two ways:
 - a. "Waste per project" shows overlapping quantities per project (not totals).



b. "Cumulative waste" shows totals across all projects by time.



6. The Best Practices tab displays all of the relevant best practices for the selected waste types.

The screenshot shows the 'Best Practices' tab in the 'Scenario 1614 - Waste Streams Report' application. It displays a table with the following data:

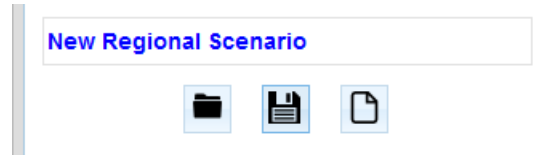
Waste Management Category	Alaska	Norway	Canada/Newfoundland
Drill cuttings	Annular or deepwell injection	Annular or deepwell injection	Treatment and offshore disposal or injected by disposal well
Drilling fluids	Recovery and reuse and/or deepwell injection	Recovery and reuse and/or deepwell injection	Tested and offshore disposal

A 'Print' button is located below the table, and a 'Close' button is at the bottom right of the window.

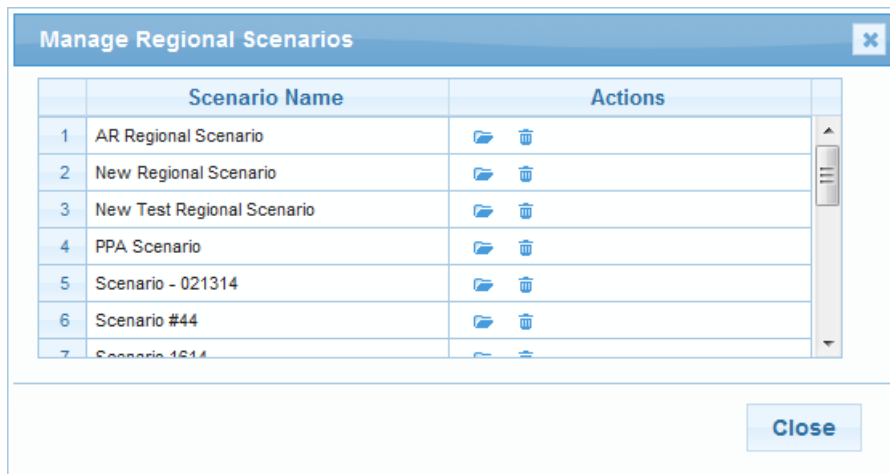
7. You can print each page of the report individually (since you might want to create and print out a number of different waste charts).

Saving, Loading and Deleting Scenarios

1. To save your scenario, click the button with the floppy disk icon below the regional scenario title field.

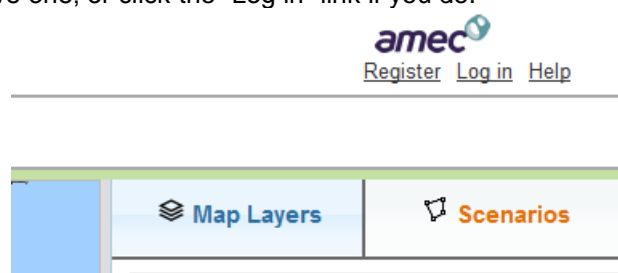


2. Create a new regional scenario by clicking the button with the new document icon.
3. To view a list of saved regional scenarios, click the button below the scenario title field with the folder icon. This will bring up the "Manage Regional Scenarios" dialog from which you can load or delete a saved regional scenario.

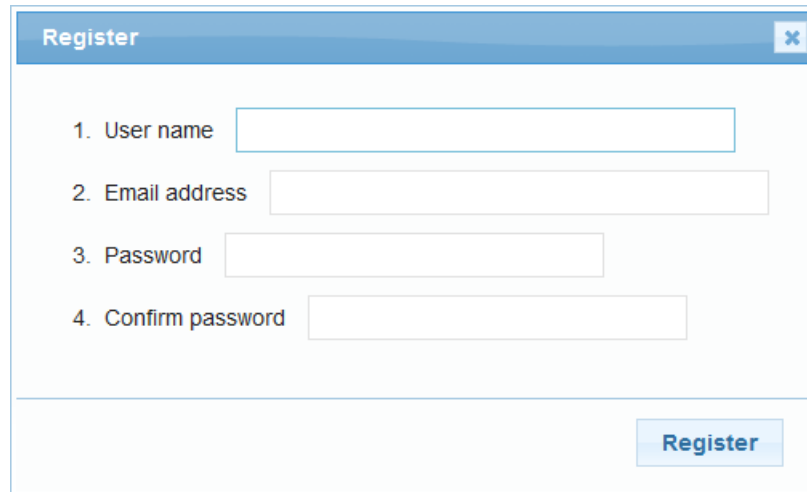


Security

1. To save your scenario, you'll need an account. Click the "Register" link in the top right-hand corner if you don't have one, or click the "Log in" link if you do.

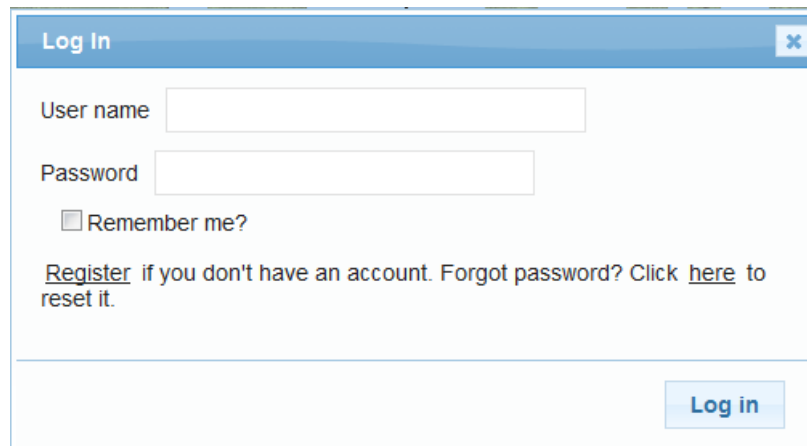


- To register, you will need to enter a user name, your email address, and create a password.



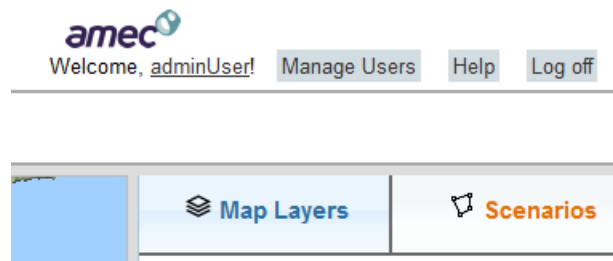
The image shows a 'Register' form with a blue header bar containing the title 'Register' and a close button. Below the header, there are four numbered input fields: '1. User name', '2. Email address', '3. Password', and '4. Confirm password'. Each field is a simple text box. At the bottom right of the form is a blue button labeled 'Register'.

- To login, enter your user name and password. If you forgot your password, there is a link to reset it.



The image shows a 'Log In' form with a blue header bar containing the title 'Log In' and a close button. Below the header, there are two input fields: 'User name' and 'Password'. Below these fields is a checkbox labeled 'Remember me?'. At the bottom of the form, there is a line of text: '[Register](#) if you don't have an account. Forgot password? Click [here](#) to reset it.' At the bottom right of the form is a blue button labeled 'Log in'.

- If you are the administrator, a "Manage Users" link will appear in the top right-hand corner once you are logged in.



- Clicking the "Manage Users" link will bring up a table of all registered users, from which the administrator can click a user name to edit the user's account details, unlock user accounts, and delete user accounts.

Manage User Accounts						
User Name	Email Address	Role	Creation Date	Is Active?	Is Locked?	Delete Account
testUser	atteeka.rashid@amec.com		11/12/2013 7:36:28 PM	True	False	Delete
atteeka	atteeka.rashid@amec.com	Administrator	11/29/2013 2:09:29 PM	True	False	Delete
LockedOutUser	atteeka.rashid@amec.com		11/29/2013 6:51:52 PM	True	True	Delete
DemoeyUser	greg.moffatt@amec.com	RWMTToolUser	12/13/2013 3:14:21 PM	True	False	Delete
demoUser	atteeka.rashid@amec.com	RWMTToolUser	12/13/2013 6:43:05 PM	False	False	Delete
testReq	atteeka.rashid@amec.com	RWMTToolUser	1/3/2014 2:57:43 PM	True	False	Delete
testReq#3	atteeka.rashid@amec.com	RWMTToolUser	1/3/2014 2:59:24 PM	True	False	Delete
greg_moffatt	greg.moffatt@amec.com	RWMTToolUser	1/16/2014 3:37:34 PM	True	False	Delete
testReq#5	atteeka.rashid@amec.com	RWMTToolUser	1/30/2014 2:53:39 PM	True	False	Delete
newUser	atteeka.rashid@amec.com	RWMTToolUser	2/13/2014 4:25:09 PM	True	False	Delete

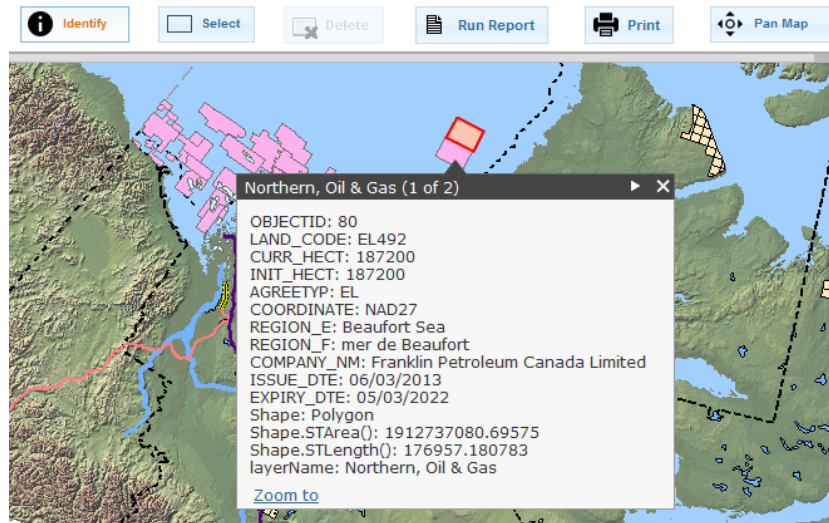
[Close](#)

Additional Tools

1. To zoom to a specific location on the map, enter the latitude and longitude in the text field in the left of the tool panel above the map, then click the button with the zoom-in icon.



2. To view metadata for a feature in a layer displayed on the map, click the “Identify” tool and click the feature. This will bring up an information dialog providing metadata on that feature.



3. Click the “Print” button to print a landscape document containing an image of the map.
4. Click the button with the ruler icon to enable a measurement tool that allows measuring distance between points on the map: click on the map to begin drawing a line and double click to complete the line. The distance will be displayed beside the measurement tool in miles by default. Click the text “Miles” to display a dropdown of other unit types.

