General Instructions for using Utah Pit Lining and Cleanup Criteria Worksheet

The basis for potential resource impact assessment is UDOGM's *Environmental Handbook* , Environmental Regulations for the OIL & GAS EXPLORATION & PRODUCTION INDUSTRY, January 1996. The purpose of this worksheet is to enable electronic generation of the tables on pages 16 and 25 of the above referenced document. Further desriptions of resource terms, along with assesment methodologies, are presented in more detail in the *Environmental Handbook* , which should be reviewed for reference. Since the BLM does not have specific pit siting or closure requirements/criteria UDOGM's environmental impact analysis has been adopted for this cooperative effort.

1) The **Pit Lining Criteria** tab will be used to assess the potential environmental impact from constructing a reserve or production pit and determine what pit lining requirements will be necessary.

*The **Fields** of Depth from Surface to Groundwater, Distance to Surface Water, Distance to Nearest Municipal Water Well, and Distance to Other Water Well are '**Fillable**' fields and denoted with a light blue shading. Once a number is entered a **Ranking** score will be calculated for that resource factor. If the 'depth' or 'distance' values are not known type 'Unknown', which will not interfere with ranking calculation.*

*The **Fields** of Native Soil Type, Fluid Type, Drill Cuttings, Annual Precipitation,Potentially Affected Populations, and Presence of Onsite or Adjacent Utility Corridors/Conduits (buried) are '**Drop Down**' fields and denoted with a light yellow shading. There is an 'arrow' to the right of the box. Click on it and select the approriate description. For the 'Annual Precipitation' field use the 'Utah Average Annual Precitation' Map to estimate a precipitation value for your area. It should be noted that the 'Potentially Affected Populations' field for **Pit Lining Criteria** are not the same values as the 'Potentially Affected Populations' field for **Soil Cleanup Levels**, which is why it is not a fillable field.*

*The 10 'Ranking' scores (light geen shading) are added to get the '**Sum of Ranking Scores**', which determines whether the Level of Sensitivity is Level I, II, or III (line 19). The mitigations necessary to protect each Level of Sensitivity are listed and should be used in design criteria.*

2) The **Soil Cleanup Levels** tab will be used to assess the requirements that will be necessary for pit closure. The TPH and Chloride concentrations, associated with Level of Sensitivity, will be the primary controlling factors which determine whether the pits contents could be landfarmed or require burial by stabilization (removing free-standing liquids) or solidification (forming a cementitious monolith).

*are linked to the **Pit Lining Criteria** worksheet are automatically populated. The **Field**, Distance from Contamination to Groundwater is not linked, since the 'depths' and 'ranking scores' are not the same as in the Depth from Surface to Groundwater from the **Pit Lining Criteria** worksheet. The Distance from Contamination to Groundwater should be measured from the 'lowest vertical extent of contamination' to groundwater, which would be 25 feet if contamination were at a depth of 15 feet (base of pit) and depth to groundwater were 40 feet. The Depth from Surface to Groundwater for this same scenario would be 40 feet.*

and <3,000 mg/L Chlorides. For TPH levels ≥ 18,000 mg/kg or ppm and an EC > 15 mmho/cm (≈ 35,000 m/L TDS) or Chlorides > 10,000 mg/L the waste material must be solidified or transported to an approved landfill. However, within a Level II Sensitivity area (Ranking Score > = 50) volatile constituents, namely benzene, would dictate TPH cleanup levels. A benzene concentration would be entered and the resultant TPH cleanup level would be calculated and treatment technique selected.

Utah BLM-UDOGM Pit Lining Determination Assessment

Project Name:
Date:

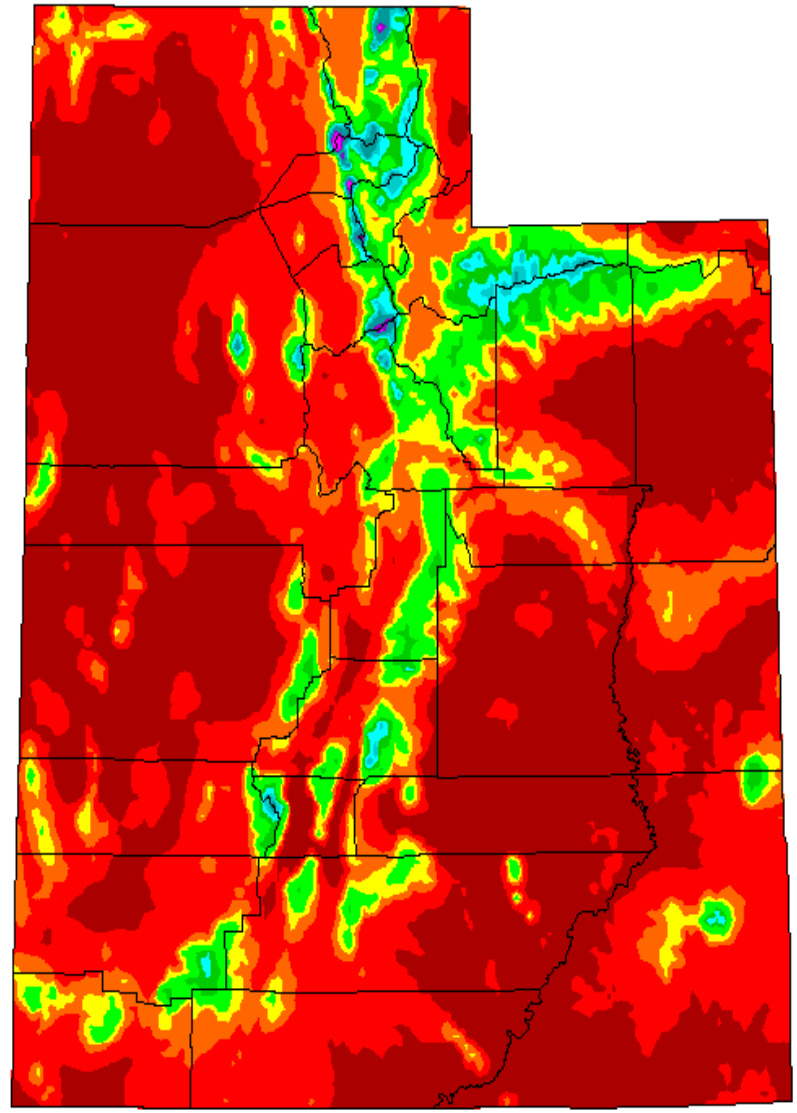
			Ranking
Depth from Surface to Groundwater:		feet	0
Distance to Surface Water:		feet	0
Distance to Nearest Municipal Water Well:		feet	0
Distance to Other Water Well:		feet	0
Native Soil Type:	Low Permeability	hydraulic cond.	0
Fluid Type:	Air/Mist	TDS in mg/L	0
Drill Cuttings:	Shale, Sandstone, Limestone, Dolomite	rock type	0
Annual Precipitation:	<10	inches	0
Potentially Affected Populations:	<10	people	0
Presence of Onsite or Adjacent Utility Corridors/Conduits:	Not Present	proximity	0
Sum of Ranking Scores:			**0**

Containment Requirement Based on Sensitivity Lev ***Level III Sensitivity***

Level I Sensitivity (Ranking ≥ 20) : Requires total containment by synthetic liner, concrete structure or other type of total containment structure or material.
Level II Sensitivity (Ranking 15-19) : Bentonite or other compatible lining is discetionary depending on the fluid to be contained and environmental sensitivity.
Level III Sensitivity (Ranking < 15) : No specific lining requirements.

Average Annual Precipitation

Utah



Legend (in inches)

- Under 10
- 10 to 15
- 15 to 20
- 20 to 25
- 25 to 30
- 30 to 35
- 35 to 40
- 40 to 45
- 45 to 50
- 50 to 55
- Above 55

Period: 1961-1990

This map is a plot of 1961-1990 annual average precipitation contours from NOAA Cooperative stations and (where appropriate) USDA-NRCS SNOTEL stations. Christopher Daly used the PRISM model to generate the gridded estimates from which this map was derived; the modeled grid was approximately 4x4 km latitude/longitude, and was resampled to 2x2 km using a Gaussian filter. Mapping was performed by Jenny Weisburg. Funding was provided by USDA-NRCS National Water and Climate Center.

12/7/97

Attachment 5 - Sheet 2 continued

Utah BLM-UDOGM Contaminated Soil Remediation Ranking Assessment

Project Name:
Date:

			Ranking
Distance from Contamination to Groundwater: (not linke		feet	0
Native Soil Type:	Low Permeability	hydraulic cond.	0
Annual Precipitation:	<10	inches	0
Distance to Nearest Municipal Water Well:		feet	0
Distance to Other Water Well:		feet	0
Distance to Surface Water:		feet	0
Potentially Affected Populations: (not linked)	<100	people	0
Presence of Onsite or Adjacent Utility Corridors/Conduits	Not Present	proximity	0
Sum of Ranking Scores:			**0**

Environmental Sensitivity and Cleanup Level: ***Level I Sensitivity***

Level I Sensitivity (Ranking < 50) Land Applied

TPH* Limit for Cleanup:	10,000 mg/kg or ppm
Saline Limit for Cleanup :	EC < 4 mmho/cm, ESP < 15%, SAR < 12, or Chlorides < 1,000 mg/L

Level I Sensitivity (Ranking < 50) Burial - Stabilization

TPH* Limit for Remediation:	> 10,000 and < 18,000 mg/kg or ppm
Saline Limit for Remediation :	EC > 4 and < 15 mmho/cm, or Chlorides > 1,000 and < 10,000 mg/L

Level I Sensitivity (Ranking < 50) Burial - Solidification

TPH* Limit for Remediation:	≥ 18,000 mg/kg or ppm
Saline Limit for Remediation :	EC > 15 mmho/cm (≈ 35,000 m/L TDS) or Chlorides > 10,000 mg/L

Level II Sensitivity (Ranking ≥ 50)

		Benzene** (ppm)
TPH Limit for Soil Cleanup (ppm):	17730	28.2
Saline Limit for Cleanup:	EC < 4 mmho/cm, ESP < 15%, SAR < 12, or Chlorides < 1,000 mg/L	28.2 mg/kg Benzene is Non-Residential Tier 2 Cleanup Threshold

Testing Methods
* (TPH) EPA 8015C
** (BTEX) EPA 8021B or 8260B

Pits whose contents have been determined to be below the Tier 2 risk-based screening levels (RBSLs) from the pre-treatment analytical results will not require post-treatment sampling, e.g. a TPH of < 18,000 mg/kg or ppm. This assessment will utilize the following formula for sites where both types of TPH are detected, the sum of the ratios of each hydrocarbon type must be calculated as follows:

$$\frac{X}{\text{GRO Tier 2 Value}} + \frac{Y}{\text{DRO Tier 2 Value}} = N$$

Where:
X = Detected GRO Concentration
Y = Detected DRO Concentration
N = Sum

Using the GRO and DRO Tier 2 Risk-Based Summary Table below any N value less than 1.0 would be acceptable for stabilization, whereas any N value greater than 1.0 would be considered an excessive risk and would require corrective action as determined by the AO (Level II Sensitivity).

Tier 2 Values

	Residential			Non-Residential		
	Soil	Soil to GW	Groundwater	Soil	Soil to GW	Groundwater
TPH Type	(mg/kg)	(mg/kg)	(mg/L)	(mg/kg)	(mg/kg)	(mg/L)
Benzene	15.9	0.168	0.005	28.2	0.168	0.005
GRO	220	39	0.500	450	150	0.500
DRO	2,000	3,000	0.500	20,000	15,000	0.720

See Appendix A at back of Attachment 4 for complete list of Tier 2 analyte risk-based cleanup standards
It is assumed that the majority of pit closures fall in the Non-Residential category

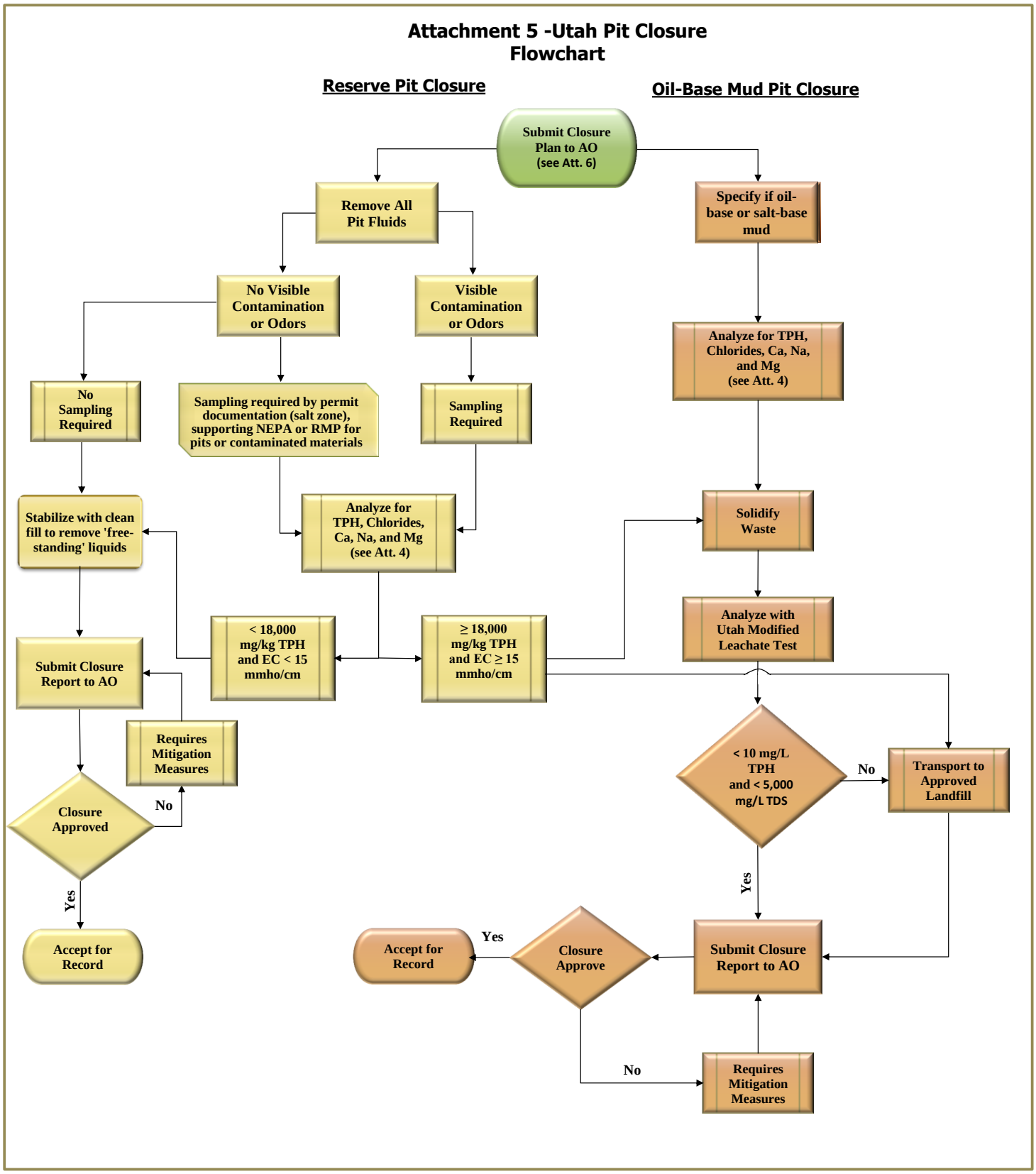
Utah BLM-UDOGM Sample Ranking Assessment

1.) Sampling required by permit documentation, supporting NEPA or RMP for pits or contaminated materials.	No, proceed to 2	Yes, sampling required
2.) Level II Sensitivity site	No, proceed to 3	Yes, sampling required
3.) Drilling system includes the use of oil or salt based drilling mud's or other mediums.	No, proceed to 4	Yes, sampling required
4.) Drilling program penetrated salt diapir or chloride laden zones such as the Paradox Formation, Arapien Shale, Preuss Formation etc….	No, proceed to 5	Yes, sampling required
5.) Contamination by chlorides, hydrocarbons, heavy metals, NORM or RCRA materials suspected based on visual observations or discussion with operator	No, proceed to 6	Yes, sampling strongly recommended
6.) Classify soils and underlying formations	Relatively impermeable clays or clay loams underlain by shale's-sampling not required	Permeable sand or loam soils underlain by sandstones-sampling is discretionary, recommended in precipitation zones over 16"

7.) Stabilized pit contents may require a Cappilary Barrier or a Bentonite Cap to prevent upward migration of waste consituents, especially salts.

Recommended Sampling Procedures

At least one composite sample should be taken for every 50' x 50' area (5' deep), larger pits should be divided into cells.
5-10 samples should be collected in a random S pattern for each cell.
Smaller pits can be sample from each corner and one from the center.
Samples should be collected from pit contents from surface to the bottom of pit.


Attachment 5 -Utah Pit Closure Flowchart
Reserve Pit Closure
Oil-Base Mud Pit Closure
Submit Closure Plan to AO (see Att. 6)
Remove All Pit Fluids
Specify if oil-base or salt-base mud
No Visible Contamination or Odors
Visible Contamination or Odors
Analyze for TPH, Chlorides, Ca, Na, and Mg (see Att. 4)
No Sampling Required
Sampling required by permit documentation (salt zone), supporting NEPA or RMP for pits or contaminated materials
Sampling Required
Stabilize with clean fill to remove 'free-standing' liquids
Analyze for TPH, Chlorides, Ca, Na, and Mg (see Att. 4)
Solidify Waste
< 18,000 mg/kg TPH and EC < 15 mmho/cm
≥ 18,000 mg/kg TPH and EC ≥ 15 mmho/cm
Analyze with Utah Modified Leachate Test
Submit Closure Report to AO
Requires Mitigation Measures
< 10 mg/L TPH and < 5,000 mg/L TDS
No
Transport to Approved Landfill
Closure Approved
No
Yes
Yes
Accept for Record
Yes
Accept for Record
Closure Approve
Submit Closure Report to AO
No
Requires Mitigation Measures