

10.0 SCHEDULE TWO - Phase 1 Environmental Site Assessment

☐ Phase 1 ESA not required and NOT submitted with this application

As of June 1, 2011 all Phase 1 ESA information must be entered on the Schedule Two form.
Please check off the appropriate boxes indicating which documents are attached.

- ☒ List of available aerial photographs from Air Photo Distribution
- ☒ Aerial or satellite photographs
- ☒ Site Visit Photos
- ☒ Construction and Operation Sketches
- ☒ AER Professional Declaration Form* – This must be signed for work completed after January 1, 2008.

* This form must be signed for work completed after January 1, 2008. The AER will refuse any reclamation certificate applications that do not strictly adhere ESRD's professional declaration requirements, outlined in Fact Sheet (R&R/10-01).

10.0 PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

10.1 Previously Refused Applications and Cancelled Certificates

Has this site been previously refused or certified and the certificate cancelled?	No
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10.2 Drilling Information

Add	Well name or UWI	Spud Date:	Final Drill Date:	Well Depth: (metres)
Delete	BIRCHCLIFF (2-19) DOE 16-18-81-12	01-Nov-2006	09-Nov-2006	1,700

10.2.1 Re-entry of a Well or Site Re-drilled

Is this site a re-entry?	No
Is the site re-drilled?	No

10.2.2 Drilling Waste Disposal Information

Add Mud	Drilling Mud Type	Volume (m ³)	Disposal Method
Delete	Gel chemical	132	Landspray-while-drilling
Delete	Gel chemical	28	Landspray-while-drilling
Delete	Gel chemical	160	Mix-bury-cover
Add Row	Sump Type	Sump location, if remote	Disposal Location(s)
Delete	None		NW-30-081-12W6, NW-19-081-12W6

Drilling Waste Compliance Option(s) used and attached to Schedule 3.

- ☒ Option 1
☐ Option 2
☐ Option 3

Has this site been used for drilling waste disposal more than once?	No
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Provide details and location(s):

10.3 Production, Storage, and Environmental Information

10.3.1 Current and/or Historical Information

Describe all historical and/or current infrastructure associated with the location (For example: tanks, pipeline, process skids, access roads etc.)

Access road, above-ground tanks, pumpjack, metering shack

10.3.2 Flare Pits

Were there any associated flare pits during drilling or production?	No
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10.3.3 Storage Tanks

Were there any storage tanks associated with the site?	Yes
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Wellsite Reclamation Certificate Application Form
2010 Reclamation Criteria for Wellsites and Associated Facilities

If "Yes", list number, location, and capacity of the storage tanks				
Add Row	Type of Tank	Content	Location(s)	Capacity (m ³)
Delete	Above ground tank	Oil	North of well centre	64
Delete	Above ground tank	Oil	North of well centre	16
Delete	Above ground tank	Methanol	North of well centre	1
Were any other underground structure, such as pipelines, removed?				No

10.3.4 Fluid Disposal

How was fluid at producing wells, disposal wells, and/or battery sites shipped to/from the location?

- ☐ N/A
 ☒ Piped from the site
 ☒ Trucked from the site
☐ Piped to the site
 ☐ Trucked to the site
 ☐ Disposed of on site

10.3.5 Other Facilities or Infrastructure

Describe any other waste storage, handling, chemical storage, buried pits, landfills, etc
None known

10.3.6 Spills and Releases

Have there been any Spills/Releases/Complaints associated with the site?						Yes	
Spills		Reference or Incident #	Type	Product	Volume		
Add Row	Date				Spilled	Recovered	
Delete	19-Mar-2003	20030715	Spill	Crude oil	0.5	0.4	

Comments:

The spill occurred on a nearby wellsite in 08-19-081-12W6. It is unlikely the spilled material reached the subject wellsite.

10.3.7 Previous Environmental Site Assessments

List any previous ESA's conducted?				<input type="checkbox"/> None or unknown	
Delete Report	Report Information	Report Date:		13-Sep-06	
Consultant:	Mike Wurzer, Performance Environmental				
Report Title:	Pre-Construction Assessment				
Report Findings:	The report describes pre-construction site conditions and provides soil stripping recommendations.				
Add ESA Report					

10.4 Phase 1 Environmental Site Assessment Site Visit

Date:	May 12, 2018	Assessor(s)	Mark Przybylski	
Surrounding land use	N: Industrial	S: Agricultural	E: Industrial	W: Agricultural
Topography:	Undulating			
Vegetation:	Smooth brome grass			
Provide the proximity of receptors to the site. Fill in distances (m) for all that are within 300 metres of the site boundary.				
Residence:	>1km	Water well:	>1km	Surface waterbody (e.g., dugout, stream river): 600m (dugout)

10.4 Phase 1 Environmental Site Assessment Site Visit

Were equipment or tanks present, or were there visual signs of former facilities?	Yes
What was observed? 400 bbl oil tank, 100 bbl oil/emulsion tank, methanol tank, pumpjack	
Were there visual signs of open or potentially buried earthen pits?	No
What was observed?	
Was there evidence of past spills (include cumulative releases, well centre impacts, salt tolerant vegetation, etc.)?	No
What was observed?	
Was any adjacent land affected by operations on the site?	No
What was observed?	
Was any vegetation stress apparent?	No
Details (location, evidence):	
Does the site visit information conflict with specific file or the imagery review Information?	No
If YES, explain	

10.5 Aerial and Satellite Imagery Review

Aerial or satellite photographs of the site are required. Scales such as 1:5000 or 1:7500 should be used to show detail.

Producing wells and batteries: one pre-disturbance; one post-disturbance; one photograph for every 2 to 3 year interval while the site was active.

Dry and abandoned wells: one photograph of the active site, if available, is required. If active site photographs are not available, photographs of the pre and post disturbance are required.

Sites with above ground facilities and/or spills: photos of the site before, during (if available), and after the spill cleanup or facility removal are required

Review Date: 14-May-2018			Reviewed by: Darrys Carol	
Add	Photo Id:	Year	Scale:	Evidence of former infrastructure or areas of potential concern
Delete	AS 5195-052	2001	1:1,700	This is a pre-construction photo. The future wellsite location is within a cultivated field and in close proximity to three existing wellsites. No existing concerns on the subject site are visible.
Delete	AbaData Aerial Photo	Unknown	1:1,700	The lease boundaries and teardrop are clearly visible. A pumpjack is present at well centre. A bermed 400-600 barrel tank is situated in the northwest quadrant. There appear to be a production shack and methanol tank east of the bermed tank. No contamination concerns are evident.

10.6 Interviews - Phase 1 Environmental Site Assessment

Provide details of Interviewee's Comments. Request information on previous complaints, former facilities, presence and details of spills, pits, waste storage/handling, and vegetation control, etc

Private Land: Have you performed a site visit in the presence of the landowner/occupant?

Public Land: Have you performed a site visit in the presence of the occupant?

Date of site visit(s)

Landowner Interviewed:

John Leman

Date

12-May-2018

Interviewed By:

Mark Przybylski

Mr. Leman was informed of the Phase 1 Environmental Site Assessment. He stated he is not aware of any spills onsite and has no environmental concerns regarding the site.

Occupant Interview:

Date

Interviewed By:

Operator Interview:

Position:

Date

Interviewed By:

Additional Notes/Comments/Information

The subject well was drilled in 2006 and produced crude oil and gas from 2006 to present. The drilling waste disposal assessment indicates the waste and its disposal meet criteria. An incident investigation report dated December 3, 2006, indicates an unknown fluid was spilled at the wellhead. At the same time, 3% potassium chloride water overflowed onto the ground while being pumped into a truck. Amounts of either fluid are not specified. A construction report completed on December 11, 2006, states fluids were noticed on surface and that the construction crew was cleaning it up.

During the site visit for the current assessment, field staff searched for evidence of impacts from these incidents as well as from the spill on the adjacent wellsite; no impacts were noted.

Based on the information reviewed to date, further investigation is recommended to determine whether impacts from the spill incidents remain. An EM 38 assessment followed by sampling is recommended.

10.7 Conclusions and Recommendations

10.7.1 Did the Phase 1 ESA indicate that a Phase 2 ESA is required to evaluate the site for contamination?

☒ Yes ☐ No further investigation required

If YES, attach Phase 2 ESA report (see Schedule 4)

APRS Search Results

Legal Description (Sec. Twp. Rge. Meridian): 2 - 19 - 81 - 12 - 6

Project No.	Sub. ID	Coverage (Partial/Complete)	Date	Scale (1:)	Emulsion	Comments
06-082Tr(1-3)	4	C	2006-00-00	30000	B/W Pan-80	Roll:Trsg-0602; 1,814ppi - photogrammetric*
01-312	55	C	2001-00-00	30000	B/W Agfa-80	Rolls:AS-5194,5195,5196
98-167Tr 84D	2	C	1998-00-00	60000	B/W	Roll:Trsg-9804
95-158Tr 84D	9	C	1995-05-00	40000	B/W	Roll: Trs-9501
89-120A	7	C	1989-00-00	30000	B/W 2405	
88-209 84D	1	C	1988-08-02	40000	B/W Agfa-150	
84-102 W6	1	C	1984-00-00	60000	B/W Pan-2405	
84-006	16	C	1984-00-00	30000	B/W 2405	
F83-009	1	C	1983-09-22	30000	B/W Pan-2405	Roll:AS-2867; into B.C.
80-122	1	C	1980-05-04	60000	B/W PAN-2405	
79-032	42	C	1979-00-00	15000	B/W IR-2424	
79-032 84D	5	C	1979-00-00	15000	B/W IR-2424	
74-050	1	C	1974-08-04	50000	B/W IR-2424	
71-089	51	C	1971-06-12	31680	B/W Pan-2405	
70-322 84D	1	C	1970-00-00	80000	B/W Pan-2405	Roll:AS-1113
52-84D	1	C	1952-00-00	15840	B/W Pan-2405	
49-84D	2	C	1950-00-00	40000	B/W Super XX.	Years - 1950,1951



Scale 1:1,700



SHARP
Environmental ⁽²⁰⁰⁰⁾ LTD.

Birchcliff Energy Ltd.
c/o **Knowledge Energy Inc.**
Aerial Photograph Enlargement
16-18-081-12W6 (DH) 02-19 (SF)

Date: September 16, 2001

Aerial: AS 5195-052



Scale 1:1,700



SHARP
Environmental ⁽²⁰⁰⁰⁾ LTD.

Birchcliff Energy Ltd.
c/o **Knowledge Energy Inc.**
Aerial Photograph Enlargement
16-18-081-12W6 (DH) 02-19 (SF)

Date: Unknown

Aerial: Abadata



Overview of site from southeast corner toward well centre



View north from well centre



SHARP
Environmental⁽²⁰⁰⁰⁾ LTD.

Knowledge Energy Inc.
00/16-18-081-12W6 (DH) 02-19 (SF)
Site Photos
May 12, 2018



View east from well centre



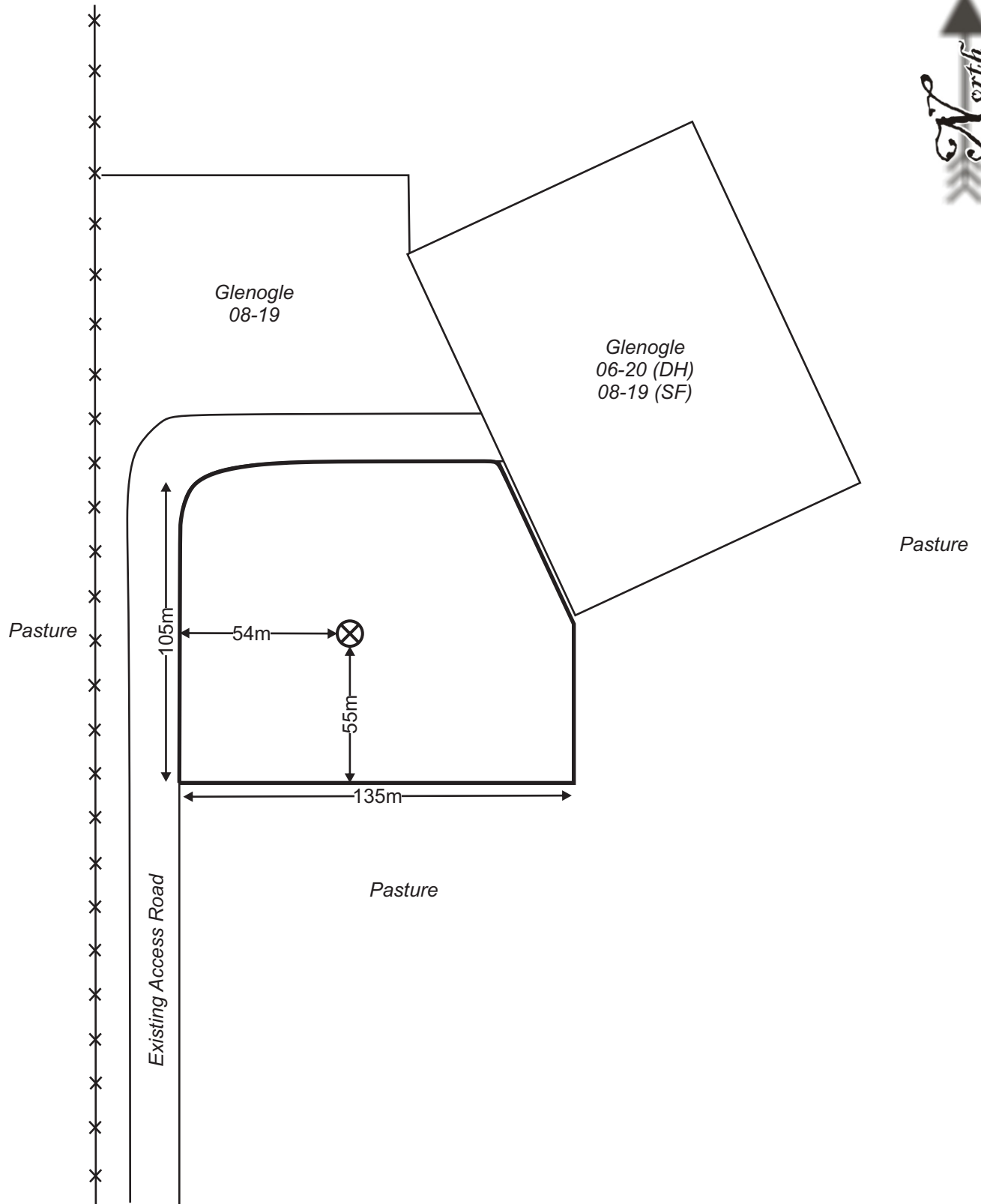
View south from well centre



View west from well centre



View of facilities north of well centre



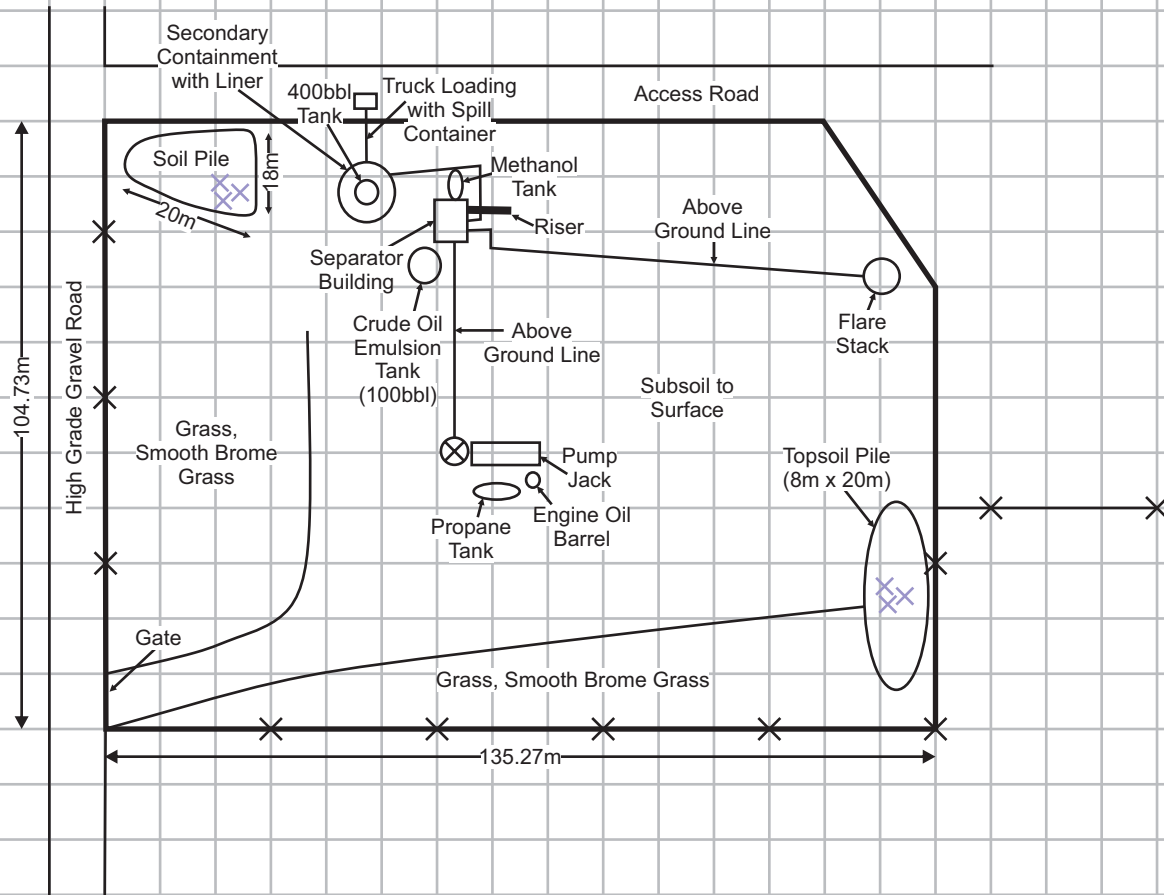
Not To Scale



SHARP
Environmental⁽²⁰⁰⁰⁾ LTD.

Birchcliff Energy Ltd.
c/o **Knowledge Energy Inc.**
16-18-081-12W6 (DH) 02-19 (SF)
Construction Sketch
May 14, 2018

XX = Canada Thistle



Field Notes:

- Canada Thistle in NW soil pile and on SE topsoil pile.
- No hydrocarbon sheen on ponded water within secondary containment of 400bbl tank.
- No hydrocarbon staining.

Not To Scale



SHARP
Environmental⁽²⁰⁰⁰⁾ LTD.

Birchcliff Energy Ltd.
c/o Knowledge Energy Inc.
16-18-081-12W6
Site Sketch
May 12, 2018

Professional Declaration for Reclamation Certificate Applications

Submit one Declaration for each report

- 1 This Declaration is made in conjunction with an application for a reclamation certificate (the "Application") made by
Knowledge Energy Inc. (Applicant)
for the following land(s): 02-19-081-12W6 (insert legal description).
- 2 I am a practicing professional member [Registration/member number] 1405
of the Alberta Institute of Agrologists
which is a regulated professional organization (the "Professional Organization"). I have a minimum of five years verifiable experience in remediation or reclamation relevant to the Competencies Table contained in the Competencies for Remediation and Reclamation Advisory Committee's Recommendations Report (ESRD 2006).
- 3 As a member of the Professional Organization, I have the ability to sign off on work required for reclamation certificate applications as defined by the Alberta Energy Regulator and am authorized by the Applicant to prepare and submit the attached report or document, (the "Professional Report") listed below.
- 4 To the best of my knowledge and the best of my professional ability, recognizing the standard of care expected of a reasonable professional doing this work, it is my professional opinion that all the information contained in the Professional Report is accurate and complete, and contains all the relevant information for the purposes of this Application.
- 5 The results reported in the Professional Report are consistent with all current and applicable Provincial policy, criteria, standards and guidelines for the remediation or reclamation.
- 6 The Professional Report, including all attachments, data and supplemental information, were prepared by me, or under my direct supervision, or was prepared by a third party(ies) and has been reviewed and accepted by me; and was prepared in accordance with an appropriate quality assurance/quality control system that ensured qualified personnel properly gathered and evaluated all the information contained in and underlying the Professional Reports. All the information submitted is, to the best of my knowledge, true, accurate and complete.
- 7 I carry, or my employer: SHARP Environmental (2000) Ltd.
(insert legal name of employer)
carries professional liability insurance (errors and omissions). This insurance will be maintained for the specified liability period, subject to insurance availability.

- 8 I am aware that it is an offence under section 227 of the Environmental Protection and Enhancement Act to provide false, misleading or inaccurate information and that there are significant fines for committing these offences, including the possibility of imprisonment. See below for the relevant sections.

Report Title: Schedule 2 - Phase 1 Environmental Site Assessment

Date: May 23, 2018

Name: Jeff Biegel, P.Ag.

Signature: 

Note: If you wish to sign the form with an electronic signature you are bound with the same force as though you had a fixed signature on paper.

Registration/Member number: 1405

Section 227 of the Environmental Protection and Enhancement Act

Offences s. 227 A person who

- (a) knowingly provides false or misleading information pursuant to a requirement under this Act to provide information,
- (b) provides false or misleading information pursuant to a requirement under this Act to provide information

is guilty of an offence.

Penalties s. 228(1) A person who commits an offence referred to in section 60, 87, 108(1), 109(1) or 227(a), (d), (f) or (h) is liable to

- (a) in the case of an individual, to a fine or not more than \$100 000 or to imprisonment for a period of not more than 2 years or to both fine and imprisonment, or
- (b) in the case of a corporation, to a fine of not more than \$1 000 000.

(2) A person who commits an offence referred to in section 61, 67, 75, 76, 79, 88, 108(2), 109(2) 110(1) or (2), 111, 112, 137, 148, 149, 155, 157, 163, 169, 170, 173, 176, 188, 191, 192, 209, 227(b), (c), (e), (g), or (i) or 251 is liable.

- (a) in the case of an individual, to a fine or not more than \$50 000, or
- (b) in the case of a corporation, to a fine of not more than \$500 000.

11.0 SCHEDULE THREE - Drilling Waste Documentation

Please check off the appropriate boxes indicating which documents are included in this Schedule

- ☐ Not required because well not drilled or application is for other AER facility
- ☒ Guide 50 Notification Form (*Directive 050: Drilling Waste Management*, AER 1996) or form with equivalent information used for reporting under *Guide G-50: Drilling Waste Management* (AER 1993)
- ☒ Assessing Drilling Waste Disposal Areas: Compliance Option Checklist.
- ☒ Assessing Drilling Waste Disposal Areas: Compliance Option Calculations.
- ☒ AER Professional Declaration Form*
- ☐ Other, describe

* This form must be signed for work completed after January 1, 2008. The AER will refuse any reclamation certificate applications that do not strictly adhere to ESRD's professional declaration requirements, outlined in Fact Sheet (R&R/10-01).

NOTIFICATION OF DRILLING WASTE DISPOSAL

The licensee certifies that the information on this form is correct and is submitted to the appropriate regulatory agency 48 hours prior to drilling waste disposal.

DAY MONTH YEAR
14 11 2006
YOUR FILE NUMBER
LWDTES06111201

1. REGULATORY OFFICE

Appropriate regulatory office: EUB - Grande Prairie
Second regulatory office (if applicable): _____

Fax: (780) 538-5582
Fax: () -

2. WELL INFORMATION

Well licensee: Birchcliff Energy Ltd.
Surface location: 02-19-081-12W6
Unique well identifier: 00/16-18-081-12W6/0
Sump location or storage location
1. Same as surface location /or:
2. Same as surface location /or:
Mud type: Gel chem
Date of Sampling: DAY MONTH YEAR Proposed Date of disposal: (48 hours notice is required) DAY MONTH YEAR 16 11 2006
Lab Name: PAL Lab Work Order: BC100
Operator/company Name: Dan Bobocel Phone: (780) 689-8038
contact Company Name: Crest Consultants Mobile: () - Fax: (780) 665-6101
Sampling company Name: Steve Whynott Phone: (780) 835-4646
contact Company Name: Sharp Environmental (2000) Ltd Mobile: (780) 834-0123 Fax: (780) 835-2084

If drilling sump wastes are to be disposed by landtreatment or alternate disposal methods, attach the required documentation and provide a summary in the comments section on page 2 of this form.

3. ON-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: _____ m³
Soil texture: _____

LANDSPREADING ☐

Application thickness: _____ cm Incorporation depth: _____ cm

Receiving Soil EC: _____ dS/m Receiving Soil SAR: _____

	Minimum area ha	Max application rate m ³ /ha	Max. amount added kg/ha
Chloride	_____	_____	_____
Sodium	_____	_____	_____
Nitrogen	_____	_____	_____
TDS	_____	_____	_____

Toxicity pass: _____ Predicted oil content after mix: _____ %
Proposed application rate: _____ m³/ha
Proposed area used for _____ ha

MIX-BURY-COVER ☐

Established water table depth: _____ m Intended mix ratio: _____
Volume to be _____ m³
Has site been used before? _____ Toxicity pass: _____

Post disposal

Chloride _____ mg/kg Oil _____ %
Total mass chloride: _____ kg Total mass nitrogen: _____ kg

4. OFF-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: 132 m³
Soil texture: Clay Horizon thickness: 15.0 cm

LANDSPRAYING ☐

PUMPOFF ☐

LWD ☒

Application thickness: 0.13 cm Incorporation depth: 15.00 cm
(if applicable)

Receiving soil EC: 0.20 dS/m Receiving soil SAR: 0.25

	Minimum area ha	Max. application rate m ³ /ha	Max. amount added kg/ha
Chloride	<u>0.13</u>	<u>1000.00</u>	<u>207.97</u>
Sodium	<u>0.39</u>	<u>341.30</u>	<u>250.00</u>
Nitrogen	_____	_____	_____
TDS	<u>0.28</u>	<u>466.00</u>	<u>1800.00</u>

Solids Loading Rate: 2.76 t/ha

Toxicity pass: NA

Predicted oil content after mix: _____ %

Proposed application rate: 13.20 m³/h

Proposed area used for disposal: 10.00 ha

Land owner: Mr. John Leman

Phone: (780) 353-2342

Date of consent: Oct 23, 2006

Landowner consent is required if the disposal is off site.

Horizontal Oil Well? No Hydrocarbons Added? No Salt Zone Encountered? No Nitrogen > 400 kg added? No
If you answered YES to any one of the above questions, please give details in the comments section on page 2.

COPY

JB

5. DETAILED INFORMATION

Over-saturated solids, fluids or total waste	Under-saturated solids	Clear liquids	Receiving soil
As received sample	As received sample	As received sample	As received sample
SG <u>1.13</u>	SG _____	pH _____	Soil density <u>1629.00</u> kg/m ³
Mud density <u>1130.00</u> kg/m ³	Mud density _____ kg/m ³	EC _____ dS/m	Oil content _____ % dry wt
DBD <u>208.79</u> kg/m ³	DBD _____ kg/m ³	TDS _____ mg/L	
Oil content _____ % dry wt	Oil content _____ % dry wt	Chloride _____ mg/L	Saturated paste extract
Phi <u>0.92</u>		Sodium _____ mg/L	pH <u>6.49</u>
	Saturated paste	Nitrogen _____ mg/L	EC <u>0.20</u> dS/m
As received filtrate	SG _____	Calcium _____ mg/L	Chloride <u>7.75</u> mg/L
pH <u>10.00</u>	Phi _____	Magnesium _____ mg/L	Sodium <u>5.20</u> mg/L
EC <u>5.99</u> dS/m			Nitrogen <u>0.10</u> mg/L
TDS <u>4193.00</u> mg/L	Saturated paste extract	SAR _____ mg/L	Calcium <u>22.85</u> mg/L
Chloride <u>225.76</u> mg/L	pH _____ dS/m	Hydrocarbon, diss _____	Magnesium <u>5.30</u> mg/L
Sodium <u>795.15</u> mg/L	EC _____ mg/L		SAR <u>0.25</u>
Nitrogen _____ mg/L	TDS _____ mg/L		
Calcium _____ mg/L	Chloride _____ mg/L		
Magnesium <u>364.36</u> mg/L	Sodium _____ mg/L		
SAR <u>11.47</u>	Nitrogen _____ mg/L		
	Calcium _____ mg/L		
	Magnesium _____ mg/L		
	SAR _____		

[illegible]

Microtox bioassay	Reading at 15 minutes	Notes
EC50 (15) original	%	
EC50 (15) charcoal	%	

Trace element analysis		Landspreading/Landspraying/LWD			Mix-Bury-Cover		
Analysis threshold kg	Conc of analyte mg/kg	Minimum area ha	Application rate m³/ha	Loading rate kg/ha	Max. load rate kg/ha	Total mass kg	Max. appl. quantity kg
B 2.5					5		10
Cd 0.75					1.5		3
Cr 50					100		200
Cu 100					200		400
Pb 50					100		200
Ni 12.5					25		50
V 50					100		200
Zn 150					300		600

Trace element analysis is only required if the amount of trace elements added to the mud exceeds the threshold

Saline/Sodic soil test results	Mix ratio:	Mix ratio:	Mix ratio:
Electrical Conductivity (dS/m)			
Sodium Adsorption Ratio			

Off-site disposal location (referenced from the north east corner of the section)						
			Section	Township	Range	Meridian
North-east corner	650 m South	800 m West	30	081	12	6
South-west corner	800 m South	1600 m West	30	081	12	6

COMMENTS

Approximately 132m3 of drilling waste was disposed of off-site in accordance with AENV regulations. Drill cuttings associated with this well will be sampled and disposed of at a later date.

Additional comments, disposal/treatment plan details, or site maps may be added on a separate page.

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Multiple Pits Analysis

<u>Pit</u>	<u>Volume</u>	<u>SG</u>	<u>Oil</u>	<u>pH</u>	<u>EC</u>	<u>Cl</u>	<u>Na</u>	<u>N</u>	<u>Ca</u>	<u>Mg</u>
Source		1.00		7.00	0.35	40.00	29.00		64.00	
Mainhole	28.00	1.11		10.00	5.60	210.00	740.00		336.00	
Bottomhole	104.00	1.13		10.00	6.10	230.00	810.00		372.00	

Multiple Soils Analysis

<u>Soil Site ID</u>	<u>Depth</u>	<u>Density</u>	<u>Oil</u>	<u>pH</u>	<u>EC</u>	<u>Cl</u>	<u>Na</u>	<u>N</u>	<u>Ca</u>	<u>Mg</u>
S-1	15.00	1623.00		6.55	0.19	9.50	5.00	0.10	21.20	5.20
S-2	15.00	1635.00		6.43	0.21	6.00	5.40	0.10	24.50	5.40

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NOTIFICATION OF DRILLING WASTE DISPOSAL

The licensee certifies that the information on this form is correct and is submitted to the appropriate regulatory agency 48 hours prior to drilling waste disposal.

DAY MONTH YEAR

YOUR FILE NUMBER

14 11 2006

LWDTES06111202

1. REGULATORY OFFICE

Appropriate regulatory office: EUB - Grande Prairie

Fax: (780) 538-5582

Second regulatory office (if applicable):

Fax: () -

2. WELL INFORMATION

Well licensee: Birchcliff Energy Ltd.

Surface location: 02-19-081-12W6

Well authorization/licence number: 0362675

Unique well identifier: 00/16-18-081-12W6/0

MSL or OGC number (if applicable):

Sump location or storage location 1. Same as surface location /or:

2. Same as surface location /or:

Mud type: Gel chem

Date of Sampling: DAY MONTH YEAR

Proposed Date of disposal: (48 hours notice is required)

DAY MONTH YEAR 16 11 2006

Lab Name: PAL

Lab Work Order: BC100

Operator/company Name: Dan Bobocel

Phone: (780) 689-8038

contact Company Name: Crest Consultants

Mobile: () - Fax: (780) 665-6101

Sampling company Name: Steve Whynott

Phone: (780) 835-4646

contact Company Name: Sharp Environmental (2000) Ltd

Mobile: (780) 834-0123 Fax: (780) 835-2084

If drilling sump wastes are to be disposed by landtreatment or alternate disposal methods, attach the required documentation and provide a summary in the comments section on page 2 of this form.

3. ON-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: _____ m³

Soil texture: _____

LANDSPREADING ☐

Application thickness: _____ cm Incorporation depth: _____ cm

Receiving Soil EC: _____ dS/m Receiving Soil SAR: _____

	Minimum area ha	Max application rate m ³ /ha	Max. amount added kg/ha
Chloride			
Sodium			
Nitrogen			
TDS			

Chloride			
Sodium			
Nitrogen			
TDS			

Toxicity pass: _____ Predicted oil content after mix: _____ %
Proposed application rate: _____ m³/ha
Proposed area used for: _____ ha

MIX-BURY-COVER ☐

Established water table depth: _____ m Intended mix ratio: _____

Volume to be _____ m³

Has site been used before? _____ Toxicity pass: _____

Post disposal

Chloride _____ mg/kg Oil _____ %

Total mass chloride: _____ kg Total mass nitrogen: _____ kg

4. OFF-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: 28 m³

Soil texture: Clay Horizon thickness: 15.0 cm

LANDSPRAYING ☐

PUMPOFF ☐

LWD ☒

Application thickness: 0.09 cm Incorporation depth: 15.00 cm
(if applicable)

Receiving soil EC: 0.31 dS/m Receiving soil SAR: 0.29

	Minimum area ha	Max. application rate m ³ /ha	Max. amount added kg/ha
Chloride	0.03	1000.00	211.88
Sodium	0.08	335.04	250.00
Nitrogen			
TDS	0.06	457.60	1800.00

Chloride	0.03	1000.00	211.88
Sodium	0.08	335.04	250.00
Nitrogen			
TDS	0.06	457.60	1800.00

Solids Loading Rate: 1.95 t/ha

Toxicity pass: NA

Predicted oil content after mix: _____ %

Proposed application rate: 9.33 m³/h

Proposed area used for disposal: 3.00 ha

Land owner: Mr. John Leman

Phone: (780) 353-2342

Date of consent: Oct 23, 2006

Landowner consent is required if the disposal is off site.

Horizontal Oil Well? No Hydrocarbons Added? No Salt Zone Encountered? No Nitrogen > 400 kg added? No
If you answered YES to any one of the above questions, please give details in the comments section on page 2.

COPY

JB

Unique well ID 00/16-18-081-12W6/0

[illegible]

Trace element analysis		Landspreading/Landspraying/LWD			Mix-Bury-Cover		
Analysis threshold kg	Conc of analyte mg/kg	Minimum area ha	Application rate m³/ha	Loading rate kg/ha	Max. load rate kg/ha	Total mass kg	Max. appl. quantity kg
B 2.5					5		10
Cd 0.75					1.5		3
Cr 50					100		200
Cu 100					200		400
Pb 50					100		200
Ni 12.5					25		50
V 50					100		200
Zn 150					300		600

Saline/Sodic soil test results	Mix ratio:	Mix ratio:	Mix ratio:
Electrical Conductivity (dS/m)			
Sodium Adsorption Ratio			

Off-site disposal location (referenced from the north east corner of the section)						
			Section	Township	Range	Meridian
North-east corner	200 m South	1500 m West	19	081	12	6
South-west corner	500 m South	1600 m West	19	081	12	6

An additional 28m3 of drilling waste was disposed of off-site in a separate spread field in accordance with AENV regulations. Drill cuttings associated with this well will be sampled and disposed of at a later date.

COPY

Multiple Pits Analysis

<u>Pit</u>	<u>Volume</u>	<u>SG</u>	<u>Oil</u>	<u>pH</u>	<u>EC</u>	<u>Cl</u>	<u>Na</u>	<u>N</u>	<u>Ca</u>	<u>Mg</u>
Source		1.00		7.00	0.35	40.00	29.00		64.00	
Bottomhole	28.00	1.13		10.00	6.10	230.00	810.00		372.00	

Multiple Soils Analysis

<u>Soil Site ID</u>	<u>Depth</u>	<u>Density</u>	<u>Oil</u>	<u>pH</u>	<u>EC</u>	<u>Cl</u>	<u>Na</u>	<u>N</u>	<u>Ca</u>	<u>Mg</u>
S-3	15.00	1495.00		6.52	0.31	7.90	7.70	0.80	37.40	8.70

COPY

The licensee certifies that the information on this form is correct and is submitted to the appropriate regulatory agency 48 hours prior to drilling waste disposal.

NOTIFICATION OF DRILLING WASTE DISPOSAL

DAY MONTH YEAR

YOUR FILE NUMBER

17 11 2006

SUMPTES06111401 - TW

1. REGULATORY OFFICE

Appropriate regulatory office: EUB - Grande Prairie

Second regulatory office (if applicable):

Fax: (780) 538-5582

Fax: () -

2. WELL INFORMATION

Well licensee: Birchcliff Energy Ltd.

Surface location: 02-19-081-12W6

Unique well identifier: 00/16-18-081-12W6/0

Sump location or storage location

1. Same as surface location /or:

2. Same as surface location /or:

Well authorization/licence number: 0362675

MSL or OGC number (if applicable):

02-19-081-12W6

Mud type: Gel chem

Date of Sampling: DAY MONTH YEAR 14 11 2006

Proposed Date of disposal: (48 hours notice is required)

DAY MONTH YEAR 19 11 2006

Lab Name: PAL

Lab Work Order: BC102

Operator/company Name: Dan Bobocel

Phone: (780) 689-8038

Company Name: Crest Consultants

Mobile: () - Fax: (780) 665-6101

Sampling company Name: Steve Whynot

Phone: (780) 835-4646

Company Name: Sharp Environmental (2000) Ltd

Mobile: (780) 834-0123 Fax: (780) 835-2084

If drilling sump wastes are to be disposed by landtreatment or alternate disposal methods, attach the required documentation and provide a summary in the comments section on page 2 of this form.

3. ON-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: 160 m³

Soil texture: Clay

LANDSPREADING ☐

Application thickness: _____ cm Incorporation depth: _____ cm

Receiving Soil EC: _____ dS/m Receiving Soil SAR: _____

	Minimum area ha	Max application rate m ³ /ha	Max. amount added kg/ha
Chloride	_____	_____	_____
Sodium	_____	_____	_____
Nitrogen	_____	_____	_____
TDS	_____	_____	_____

Toxicity pass: _____ Predicted oil content after mix: _____ %
Proposed application rate: _____ m³/ha
Proposed area used for _____ ha

MIX-BURY-COVER ☒

Established water table depth: 5.2 m Intended mix ratio: 4:1

Volume to be 160 m³

Has site been used before? No Toxicity pass: Yes

Post disposal

Chloride 27.42 mg/kg Oil 0.01 %

Total mass chloride: 31.42 kg Total mass nitrogen: 58.04 kg

4. OFF-SITE DISPOSAL

Fluids: _____ m³ Solids: _____ m³ Total Waste: _____ m³

Soil texture: _____ Horizon thickness: _____ cm

LANDSPRAYING ☐

PUMPOFF ☐

LWD ☐

Application thickness: _____ cm Incorporation depth: _____ cm
(if applicable)

Receiving soil EC: _____ dS/m Receiving soil SAR: _____

	Minimum area ha	Max. application rate m ³ /ha	Max. amount added kg/ha
Chloride	_____	_____	_____
Sodium	_____	_____	_____
Nitrogen	_____	_____	_____
TDS	_____	_____	_____

Solids Loading Rate: _____ t/ha

Toxicity pass: _____

Predicted oil content after mix: _____ %

Proposed application rate: _____ m³/h

Proposed area used for disposal: _____ ha

Land owner: _____

Phone: _____

Date of consent: _____

Landowner consent is required if the disposal is off site.

Horizontal Oil Well? No Hydrocarbons Added? No Salt Zone Encountered? No Nitrogen > 400 kg added? No
If you answered YES to any one of the above questions, please give details in the comments section on page 2.

COPY

Unique well ID 00/16-18-081-12W6/0

Off-site disposal location (referenced from the north east corner of the section)							
				Section	Township	Range	Meridian
North-east corner	0 m South	0 m West					
South-west corner	0 m South	0 m West					

Additional comments, disposal/treatment plan details, or site maps may be added on a separate page.

JB

Compliance Option 1 Drilling Waste Disposal Assessment Checklist



If any response to the checklist questions leads to a Phase 2 ESA requirement, an environmental site assessment must be conducted in accordance with Compliance Option Three. If insufficient information is available to allow completion of the Compliance Option One checklist, Compliance Option Two or Three (Phase 2 ESA) must be completed.

1. General Disposal and Drilling Fluid Information:

If some or all of the drilling waste was managed on-site (the wellsite) or at a land treatment area or a remote sump, then the checklist must be completed. In some cases, the drilling waste may have been managed at a remote sump/site that is not linked to the wellsite and as such a separate reclamation certificate is required for that separate location. If the remote sump or land treatment area is linked to the wellsite, proceed with the checklist for the remote sump or land treatment area. Where remote sumps are associated with multiple disposals managed in separate cells, complete one checklist per disposal. Otherwise, complete one checklist by combining the information from all notification forms.

Section 1.0 to 1.3 must be completed for all disposals. The remaining sections do not need to be completed for wastes disposed of by the following methods:

- a) If drilling waste was managed at an AER or ESRD approved waste management facility, indicate this using the appropriate checkbox below and list the supporting documentation (e.g. waste manifests, truck tickets, invoices, Alberta Oilfield Waste Management Form) under Reference Documents.
- b) If the waste was disposed at an off-site location by pump-off, landspraying or landspray-while-drilling (LWD), or disposal onto forested public lands and the *Notification of Drilling Waste Disposal Form*, *Drilling Waste Management Disposal Form*, *Drilling Waste Pipeline Disposal Form*, or equivalent indicates the disposal method and location.

The notification form will indicate the type of drilling fluid system used. Water-based drilling fluids can be described in numerous ways for example; gel chem, floc water, fresh water gel, gypsum water, nitrate gypsum water, etc.

1.0 Well Information:	Unique Identifier (UI)	00/16-18-081-12W6 (DH) 02-19 (SF)
	Spud Date	November 1, 2006 Rig release: Nov. 11, 2006
	Well Depth	1700 metres

1.1 Disposal Method (Check all that apply):

On-site

- ☒ Mix-bury-cover
- ☐ Landspread
- ☐ Biodegradation, including land treatment
- ☐ Landspray-while-drilling
- ☐ Landspray
- ☐ Pump-off
- ☐ Disposal onto Forested Public Lands

Off-site

- ☒ Landspray-while-drilling
- ☐ Landspray
- ☐ Pump-off
- ☐ Disposal onto Forested Public Lands
- ☐ Land Fill/Waste Management Facility

Remote Sump/Site

- ☐ Mix-bury-cover
- ☐ Landspread
- ☐ Biodegradation, including land treatment
- ☐ Landspray-while-drilling
- ☐ Pump-off
- ☐ Landspray
- ☐ Disposal onto Forested Public Lands

☐ Other, specify: _____

	Yes	No
<p>1.2 Were there other drilling waste disposal events on the site (e.g. wellbore re-entry or another well drilled, using fluids containing drilling fluid additives)?</p> <p>If yes, were the disposal areas separate from one another?</p> <p>If the disposal areas were not separate, is documentation available to show that a disposal plan was followed that was agreed to by the licensee and the regulator?</p>	<input type="checkbox"/> <input type="checkbox"/> Drilling waste information must be evaluated for each disposal <input type="checkbox"/> Disposal plan and confirmatory information must be retained on file and provided to the AER upon request.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Compliance Option Two or Three required
<p>1.3 Were cuttings or solids disposed of on-site that were associated with off-site waste disposal?</p> <p>If Yes, is separate analytical information or unique notification available?</p> <p>If separate information or notification is not available, is the known volume (include references in Reference Documents) or estimated volume of waste disposed of on-site less than 50 m³?</p> <p>If the volume of cuttings or solids disposed of on-site is unknown, estimate the volume using following calculation and enter the data and results at right:</p> <p>$V_C = V_T - V_{OFF}$</p> <p>Where: V_C = Volume of cuttings or solids on-site (m³) V_{OFF} = Volume of cuttings or solids disposed of off-site (m³) V_T = Total volume of cuttings or solids (m³) and:</p> $V_T = \left(\frac{WDm}{2000} \right)^2 \times 3.14 \times WDp \times 1.2$ <p>Where: WDm = Well diameter (mm) WDp = Well Depth (m)</p> <p>* If different hole sections have different diameters, V_C may be calculated for each section separately. Provide the data and result for each section at right or as an attachment.</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <p>Enter data below:</p> $V_C = \underline{\hspace{2cm}}(m)$ $V_T = \underline{\hspace{2cm}}(m)$ $V_{OFF} = \underline{\hspace{2cm}}(m^3)$ $WDm = \underline{\hspace{2cm}}(mm)$ $WDp = \underline{\hspace{2cm}}(m)$	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Phase 2 required

Compliance Option 1

Drilling Waste Disposal Assessment Checklist



	Yes	No
<p>1.4 Were water-based drilling fluids used (gel chemical drilling fluid system)?</p> <p>If Yes, were all or part of the wastes disposed of on-site?</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
<p>1.5 Was the drilling fluid described as an advanced gel chemical system?</p> <p>If Yes, were all or part of the wastes disposed of on-site before November 1, 2012?</p> <p>If wastes were disposed of on-site before November 1, 2012, was the disposal done in compliance with an approval from the AER?</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Approval and post-disposal sampling results must be retained on file and provided to the AER upon request.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Compliance Option Two or Three Required
<p>1.6 Is a mud list available and can all the additives on the mud list be identified and described?</p> <p>Record the additives and their description (e.g., chrome-free lignosulfonate, aldehyde-based bactericide, etc.) on the attached form.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Phase 2 required
<p>1.7 For mix-bury-cover disposal, was the disposal completed before November 1, 2012?</p> <p>If Yes, was calculated or measured post-disposal chloride concentration 800 mg/kg or less?</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> Phase 2 required
<p>1.8 For mix-bury-cover or landsread disposal, was the disposal completed on or after November 1, 2012?</p> <p>If yes, did electrical conductivity, nitrogen concentration or sodium loading rate trigger a requirement for post-disposal sampling?</p> <p>If post-disposal sampling was required, did all post-disposal samples meet the soil endpoints specified in Section 3 of <i>Directive 50</i> (2012 version).</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Phase 2 required

Compliance Option 1 Drilling Waste Disposal Assessment Checklist



	Yes	No
<p>1.9 Was a remote site used?</p> <p>If Yes, is the remote site included in this reclamation application?</p> <p>If not included, is the remote site a multi-well disposal location?</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> In Comments section, indicate which well the remote site will be linked with for the purposes of reclamation</p>	<p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> Single well remote disposal site must be included with reclamation certificate application, unless it already has received a Reclamation Certificate.</p>
<p>1.10 Were cement returns buried on-site or at a remote site linked to the well?</p>	<p><input type="checkbox"/> UNKNOWN</p>	<p><input type="checkbox"/></p>

2. Hydrocarbon & Toxicity Management

If hydrocarbon based drilling fluids were used (i.e. diesel inverts, synthetic or mineral oil systems) or hydrocarbons were added to the drilling fluid or the well is a horizontal oil well then it must be demonstrated that the resulting drilling waste was handled appropriately as per *Directive 50* or *Directive 58*. In most cases, if hydrocarbons were added to the system or if the well was a horizontal oil well it is still possible to dispose of the resulting drilling waste on the location and remain within allowable disposal limits but hydrocarbon testing and toxicity testing must have been conducted and documented.

	Yes	No
<p>2.1 Were hydrocarbon-based drilling fluids used or were hydrocarbons added to the drilling fluid or was the well a horizontal oil well?</p> <p>If Yes, is documentation available showing that the wastes were disposed of in a manner consistent with <i>Directive 50</i> (1996 version for disposals before November 1, 2012 or 2012 version for disposals on or after November 1, 2012) or <i>Directive 58</i>?</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/> Phase 2 required</p>



**Alberta
Energy
Regulator**

	Yes	No
<p>2.2 For mix-bury-cover or landspread disposal, was the disposal completed before November 1, 2012 and was hydrocarbon present?</p> <p>If yes to both, is the predicted post-disposal hydrocarbon concentration at or below the appropriate guideline? (subsoil: 0.1%, topsoil: 0.5%)?</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/> Phase 2 required</p>
<p>2.3 For mix-bury-cover or landspread disposal, was the disposal completed on or after November 1, 2012?</p> <p>If yes, did hydrocarbon concentrations in the waste trigger a requirement for post-disposal sampling?</p> <p>If post-disposal sampling was required, did all post-disposal samples meet the soil endpoints specified in Section 3 of <i>Directive 50</i> (2012 version).</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> Phase 2 required</p>
<p>2.4 Was a luminescent bacteria toxicity (Microtox) test required?</p> <p>If Yes, did the waste pass the toxicity test requirements as outlined in <i>Directive 50</i> (waste must pass either the original or charcoal toxicity test)?</p> <p>If the waste failed the toxicity test (i.e., EC50 (15) original and EC50 (15) charcoal treated, reading at 15 minutes < 75%) is there evidence that demonstrates the waste was treated to remove toxicity and retested or disposed of as per <i>Directive 58</i> (i.e., appropriately approved waste management facility)?</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> Phase 2 required</p>

Compliance Option 1

Drilling Waste Disposal Assessment Checklist



3. Metals (Trace Elements) Management

Some drilling fluids contain trace metals and other toxic compounds. Metal-containing additives that have been or are being used include barite (BaSO_4), zinc carbonate (ZnCO_3), and chrome-based thinners. If these additives were used, the attached calculation tables must be completed and the results used to determine if a Phase 2 ESA is required.

	Yes	No
3.1 Was the disposal completed before November 1, 2012?	<input checked="" type="checkbox"/> Complete questions 3.2 to 3.5	<input type="checkbox"/> Go to question 3.6
3.2 Was barite added to the drilling fluid? If Yes, did it meet the requirements specified in the attached metal calculation table?	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Show calculation on attached form	<input type="checkbox"/> <input type="checkbox"/> Phase 2 required
3.3 Was zinc carbonate added to the drilling fluid? If Yes, did it meet the requirements specified in the attached metal calculation table?	<input type="checkbox"/> <input type="checkbox"/> Show calculation on attached form	<input checked="" type="checkbox"/> <input type="checkbox"/> Phase 2 required (Cadmium analysis will also be required.)
3.4 Were chrome-based thinners added to the drilling fluid? If Yes, did it meet the requirements specified in the attached metal calculation table?	<input type="checkbox"/> <input type="checkbox"/> Show calculation on attached form	<input checked="" type="checkbox"/> <input type="checkbox"/> Phase 2 required
3.5 Were any other metals added that triggered testing required by Section 3 or 5 of <i>Directive 50</i> (1996 version)? If Yes, are waste analytical data and application rates (land treatment, landspreading) or maximum application (mix-bury-cover) available? If above data are available, did the application rate or maximum application meet <i>Directive 50</i> (1996 version) requirements?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> Phase 2 required <input type="checkbox"/> Phase 2 required
3.6 Did metal concentrations in the waste trigger a requirement for post-disposal sampling? If yes, did all post-disposal samples meet the soil metal endpoints specified in Section 3 of <i>Directive 50</i> (2012 version)?	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> Phase 2 required

Compliance Option 1 Drilling Waste Disposal Assessment Checklist



Mud Additives (Attach additional pages if necessary.)

Product Name	Amount Used (units)	Brief Description of Product
Alkapam 1103	3 sx (25 kg)	Anionic water-soluble polymer - flocculant
Barite	120 sx (40 kg)	Weighting material
Bentonite	203 sx (40 kg)	Drilling gel, viscosifier
Caustic soda	19 sx (22.7 kg)	Sodium hydroxide - alkalinity pH control, calcium reducer
Cellophane	10 sx (11.4 kg)	Lost circulation material
Desco CF	32 sx (11.36 kg)	Chrome-free deflocculant
Drispac	7 sx (22.7 kg)	Polyanionic cellulose polymer - filtrate reducer, shale control inhibitor, viscosifier
Envirofloc	23 sx (36.4 kg)	Calcium nitrate - flocculant
Fed Seal	18 sx (18.1 kg)	Blend of natural and synthetic fibres - lost circulation material
Hyperdrill	8 sx (25 kg)	Anionic polyacrylamide - flocculant
Kelzan	3 sx (25 kg)	Xanthan gum - viscosifier
Kwik Plug	4 sx (22.7 kg)	Bentonite sealant - lost circulation material
Lignite	10 sx (22.7 kg)	Thinner, dispersant
Sawdust	189 sx (11.4 kg)	Lost circulation material

Reference Documents (List all source documents used in the completion of this checklist. Attach additional pages if necessary. Documents must be supplied to the AER if requested.)

Daily Drilling Reports for 00/16-18-081-12W6 (DH) 02-19 (SF)
D50 Notifications of Drilling Waste Disposal
Abacus Datagraphics database
SHARP Environmental (2000) Ltd. Mud Binder
PSAC Historic Mud List

Comments (Please provide any additional comments relevant to the decision process within the checklist. Attach additional pages if necessary.)

The D50 Notifications indicate 132m³ and an additional 28m³ of total waste were disposed of by landspray-while-drilling, and 160m³ of cuttings were mix-bury-covered onsite. Based on the notifications, the attached metal calculation and the preceding checklist, the waste and its disposal meet current ADWDA (GoA, 2014) criteria.

The likelihood of contamination in the disposal area is low. Further investigation of this area is not recommended at this time.

Recommendation: Further Phase II investigation related to reported previous spills onsite. EM38 survey with minor sampling to confirm if any impacts remain.

Metal Calculations for Compliance Options One and Two

Note: Different default mix ratios are provided depending on whether the well was drilled before or after October 22, 1996. The 1996 version of *Guide 50, Drilling Waste Management*, which was issued by the Energy Resources Conservation Board on this date, increased the minimum mix ratio requirement from 1:1 to 3:1.

Barite:

Directions: Fill in the number of sacks and adjust for sack weight if different than 40 kg. Enter the Well Depth in metres. The spreadsheet will calculate the number of sacks per metre. This value must be less than or equal to **0.22**. If the value exceeds the objective, a Phase 2 ESA (Compliance Option 3) must be conducted.

Total Number of Sacks (40 kg/sack*)		Well Depth (m)		Mix Ratio**		Sacks per Metre
120	÷	1700	÷	4	=	0.017647

* Sack weight may be adjusted by dividing the number of sacks by 40 and multiplying by the actual sack weight in kilograms. This value should be entered as the number of sacks

** Enter the number of parts of soil mixed with one part of waste. For example, for a 3:1 mix ratio (3 parts soil to 1 part waste) enter "3". If this value is not known, enter 1 for wells drilled before October 22 1996, or 3 for wells drilled on or after this date.

Zinc Carbonate:

Alternative 1:

If waste zinc, mix ratio and waste dry bulk density data are available use the following calculator to estimate post-disposal zinc concentration.

Directions: Enter the total zinc concentration in mg/kg measured in the waste, the Waste Dry Bulk Density in kg/m³, and Mix Ratio in the appropriate cells. The spreadsheet will calculate the post-disposal zinc concentration. This value must be less than or equal to **200 mg/kg**. If the value exceeds this objective, a Phase 2 ESA (Compliance Option 3) must be conducted.

Waste Zinc Concentration (mg/kg)		Waste Dry Bulk Density* (kg/m ³)		Mix Ratio**						Post-Disposal Zn Concentration (mg/kg)
	x		÷		÷	1500	+	70	=	#DIV/0!

* Waste Dry Bulk Density = (Waste Specific Gravity – 1) x 1600

** Enter the number of parts of soil mixed with one part of waste. For example, for a 3:1 mix ratio (3 parts soil to 1 part waste) enter "3". If this value is not known, enter 1 for wells drilled before October 22 1996, or 3 for wells drilled on or after this date.

Alternative 2:

If the above data is not available use the following equation to calculate the number of sacks of zinc carbonate added per meter drilled.

Directions: Fill in the number of sacks and adjust for sack weight if different than 25 kg. Enter the Well Depth in metres. The spreadsheet will calculate the number of sacks per metre. This value must be less than or equal to **0.00650**. If the value exceeds the objective, a Phase 2 ESA (Compliance Option 3) must be conducted.

Total Number of Sacks (25 kg/sack*)		Well Depth (m)		Mix Ratio**		Sacks per Metre
	÷		÷		=	#DIV/0!

* Sack weight may be adjusted by dividing the number of sacks by 25 and multiplying by the actual sack weight in kilograms. This value should be entered as the number of sacks.

** Enter the number of parts of soil mixed with one part of waste. For example, for a 3:1 mix ratio (3 parts soil to 1 part waste) enter "3". If this value is not known, enter 1 for wells drilled before October 22 1996, or 3 for wells drilled on or after this date.

= Required Field

Professional Declaration for Reclamation Certificate Applications

Submit one Declaration for each report

- 1 This Declaration is made in conjunction with an application for a reclamation certificate (the "Application") made by
Knowledge Energy Inc. (Applicant)
for the following land(s): 02-19-081-12W6 (insert legal description).
- 2 I am a practicing professional member [Registration/member number] 1405
of the Alberta Institute of Agrologists
which is a regulated professional organization (the "Professional Organization"). I have a minimum of five years verifiable experience in remediation or reclamation relevant to the Competencies Table contained in the Competencies for Remediation and Reclamation Advisory Committee's Recommendations Report (ESRD 2006).
- 3 As a member of the Professional Organization, I have the ability to sign off on work required for reclamation certificate applications as defined by the Alberta Energy Regulator and am authorized by the Applicant to prepare and submit the attached report or document, (the "Professional Report") listed below.
- 4 To the best of my knowledge and the best of my professional ability, recognizing the standard of care expected of a reasonable professional doing this work, it is my professional opinion that all the information contained in the Professional Report is accurate and complete, and contains all the relevant information for the purposes of this Application.
- 5 The results reported in the Professional Report are consistent with all current and applicable Provincial policy, criteria, standards and guidelines for the remediation or reclamation.
- 6 The Professional Report, including all attachments, data and supplemental information, were prepared by me, or under my direct supervision, or was prepared by a third party(ies) and has been reviewed and accepted by me; and was prepared in accordance with an appropriate quality assurance/quality control system that ensured qualified personnel properly gathered and evaluated all the information contained in and underlying the Professional Reports. All the information submitted is, to the best of my knowledge, true, accurate and complete.
- 7 I carry, or my employer: SHARP Environmental (2000) Ltd.
(insert legal name of employer)
carries professional liability insurance (errors and omissions). This insurance will be maintained for the specified liability period, subject to insurance availability.

- 8 I am aware that it is an offence under section 227 of the Environmental Protection and Enhancement Act to provide false, misleading or inaccurate information and that there are significant fines for committing these offences, including the possibility of imprisonment. See below for the relevant sections.

Report Title: Schedule 3 - Drilling Waste Documentation

Date: May 23, 2018

Name: Jeff Biegel, P.Ag.

Signature: 

Note: If you wish to sign the form with an electronic signature you are bound with the same force as though you had a fixed signature on paper.

Registration/Member number: 1405

Section 227 of the Environmental Protection and Enhancement Act

Offences s. 227 A person who

- (a) knowingly provides false or misleading information pursuant to a requirement under this Act to provide information,
- (b) provides false or misleading information pursuant to a requirement under this Act to provide information

is guilty of an offence.

Penalties s. 228(1) A person who commits an offence referred to in section 60, 87, 108(1), 109(1) or 227(a), (d), (f) or (h) is liable to

- (a) in the case of an individual, to a fine or not more than \$100 000 or to imprisonment for a period of not more than 2 years or to both fine and imprisonment, or
- (b) in the case of a corporation, to a fine of not more than \$1 000 000.

(2) A person who commits an offence referred to in section 61, 67, 75, 76, 79, 88, 108(2), 109(2) 110(1) or (2), 111, 112, 137, 148, 149, 155, 157, 163, 169, 170, 173, 176, 188, 191, 192, 209, 227(b), (c), (e), (g), or (i) or 251 is liable.

- (a) in the case of an individual, to a fine or not more than \$50 000, or
- (b) in the case of a corporation, to a fine of not more than \$500 000.