



**ELM**  
Environmental Liability Management

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# Routine Well Abandonment Program

Strategic Oil and Gas Ltd. C/O Alvarez & Marsal Canada  
Inc.

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STRATEGIC ET AL CAMERON J-62  
300/J62 60-10N 117-15W

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Elm Inc. Project Number: STRA050

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Developed by: Christopher Gagnon EIT  
Reviewed by: Malcolm McKean P.Eng

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February 24, 2023

**ROUTINE ABANDONMENT PROGRAM**

**BACKGROUND:**

- Zonally abandoned vertical gas well
- Well completed in the Sulphur Point formation
- Production zone abandoned with Permanent Bridge Plug and Cement
- Well may be filled with inhibited water.
- Bond log shows cement top is at 780 mKB.

**ABSTRACT:**

- Move on and rig up service rig
- Move on wireline and perforate
- Attempt to establish circulation to surface
- Squeeze cement
- If necessary, perforate and cement squeeze again
- Cut and cap the well

**CONTACTS:**

**Elm Inc. Calgary Office**

<b>Elm Inc. Calgary Office</b>		
Malcolm McKean P.Eng, Vice President Liability	██████████ – Cell	Malcolm@elminc.ca
Christopher Gagnon EIT, Operations Engineer	██████████ – Cell	Christopher@elminc.ca

**Elm Inc. Field Staff**

<b>Elm Inc. Field Staff</b>		
To be determined	To be determined	To be determined

**Client Contact**

<b>Client Contact</b>		
Duncan MacRae – Director, A&M	██████████ - Cell	dmacrae@alvarzeandmarsal.com

**Regulator Contact**

<b>Regulator Contact</b>		
OROGO - Office	867-767-9097	orogo@gov.nt.ca
OROGO - 24-hour emergency line	1-867-445-8551	
NWT Spill Line	1-867-920-8130	

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**WELL INFORMATION:**

**WELL NAME:** STRATEGIC ET AL CAMERON J-62  
**UNIQUE ID:** 300/J-62 60-10N 117-15W  
**SURFACE LOCATION:** 60.0253 , -117.4486  
**LICENSE #:** 1158  
**STATUS:** Suspended  
**TOTAL DEPTH:** 1605.0 mKB  
**ELEVATIONS:** **GL:** 751.9 m **KB:** 755.0 m  
**BGWP:** 600.0 mKB  
**PLUG BACK:** 1351 mKB (cement top on PBP at 1372)  
**H<sub>2</sub>S DATA:** unknown, assume 2%  
**SCVF:** None, tested Jan 17, 2019  
**GAS MIGRATION:** None, tested Sept 10, 2019 – soil vapor detected on site classified as “Biogenic-naturally occurring CH<sub>4</sub> Non-Impacted”  
**SITP:** 4130 kPa Oct 5, 2019  
**SICP:** 520 kPa Oct 5, 2019  
**RESERVOIR PRESSURE:** Static Gradient – Jan 16, 2012 – 8091 kPa – 5.8 kPa/m  
**MAX FLARE VOLUME:** 1.5 x wellbore volume at 10 MPa = 2.87 e3m<sup>3</sup>

*Significant flare volumes are not expected during this operation*

**LANDOWNER:** Crown

**DIRECTIONS:** Refer to maps

**COMPLETION:**

Sulphur Point: 1384.5 – 1389.0 mKB  
 Bridge Plug and Cement 1351 – 1372 mKB

**FORMATIONS:**

<b><u>Formation</u></b>	<b><u>MD (m)</u></b>
Wabamun	548
Jean Marie	684
Fort Simpson	694
Twin Falls	804
Hay River Shale	977
Beaverhill Lake	1257

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Muskwa	1291
Slave Point	1317
Fort Vermillion	1347
Watt Mountain	1368
Bistcho	1374
Sulphur Point	1384
Muskeg	1397
Keg River	1495
Chinchaga	1582
Precambrian	1604
TOTAL DEPTH	1605

**TUBULARS:**

**SURFACE CASING:** 244.5 mm, 48.07 kg/m, H-40, ST&C. Casing landed at 524.0 mKB. Cemented with 40 T 0-1-0 ‘G’ + 3.0% CaCl<sub>2</sub>.  
**No cement returns to surface.**

**PRODUCTION CASING:** 139.7mm, 23.07 kg/m, J-55, LT&C. Casing landed at 1605.0 mKB. Cemented with 35.0 T 1-1-2 + 4KCl. **Full mud returns during job.**  
**Full cement bond log ran March 12, 2020. Cement top is at 780 mKB.**

**PRODUCTION STRING:** None.

Casing size and weight	Casing ID (mm)	Casing Drift (mm)	Casing Capacity (m3/m)	Top of Plugback	Casing Capacity to Plugback (m3)
244.5 mm 48.07 kg/m	228.63	224.66	0.041054	N/A	N/A
139.7mm 23.07kg/m	125.73	122.56	0.012416	1538	19.10

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## **DOCUMENTATION & REPORTING:**

Daily operation reports are to be emailed prior to 7:00 am the next day following operations. They are to be sent to the ELM Inc office via ElmDownholeOffice@elminc.ca

Daily reports are to include a detailed description of the day's events along with all third party services that were utilized and their respective billing charges. These billing charges are to be added and represented by a daily operational cost. These total daily operational costs are to be reflected in a to-date accumulative cost. Along with the daily report the email must include a brief description of the work that was done that day, as well as a 24 hour forecast for the work to be done the following day.

Any incident or injury is to be reported immediately, after appropriate first- and/or medical-aid has been administered to the Elm Inc. office staff in Calgary. After the situation has been placed under control and all affected parties have been aided or corrected, an incident investigation is to take place and attempt to gather all necessary information via written witness statements and summarized in an incident investigation form. Elm Inc. Calgary office staff will then inform the appropriate client representatives of what has taken place.

After the abandonment has been completed, the well site supervisor is to provide the office staff in Calgary with all third-party purchase orders and field tickets/service reports, material transfers, waste manifests along with all appropriate field safety documents. This needs to be completed immediately following the job.

## **SAFETY:**

A safety meeting is to be held with all service company personnel prior to each job. Wellsite supervisor must notify contractors of known hazards of which contractor(s) may be unaware. Wellsite supervisor must ensure that workers are aware of their responsibilities and duties under OH&S regulations and that worker comply with regulations. All service companies supplying materials will review Safety Data Sheets at this meeting for all products supplied and maintain these Safety Data Sheets available for worker's examination on location in compliance with WHIMIS regulations. All Safety meetings will be recorded on the daily reports.

Whenever possible, plan and conduct all workover procedures in a manner which will avoid the mixing of air & hydrocarbons in the well bore and connected surface piping. If mixing does occur, purge prior to pressurizing or exposing mixture to any other possible source of ignition.

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All applicable regulations, including, but not limited to the NWT Office of the Regulator of Oil and Gas Operations (OROGO) and Occupational Health and Safety regulations, are to be strictly adhered to. Written instructions must be posted in the doghouse or other conspicuous area prior to the wellsite supervisor leaving the lease. Wellsite supervisor must designate, in writing, a competent person to carry out principal contractor's responsibilities. All verbal notifications and approvals from government regulatory agencies will be recorded on the daily report. The name of the individual contacted, and the subject matter of approval or notification should be recorded on the same.

### **REGULATORY:**

OROGO regulations require that the Well Approval as signed by the regulator must be posted in a clearly visible location on the work site. The well approval, its additional terms, and this well abandonment program must be precisely followed. Any deviations from the program must be approved by OROGO and clearly documented on the morning report. Include the time, name of person approving changes, and the important points of the phone conversation.

### **ABANDONMENT PROGRAM:**

#### **Pre-Operations Notifications:**

1. Notify the Area Foreman 48 hours before operations to begin.

#### **Mobilize and Inspections:**

2. Mobilize to location and inspect access. Ensure that access is clear to allow two-way traffic in and out of the site.
3. Mobilize and move in a service rig with Class III BOP system, pump and tank, dog house and equipment truck, mobile boiler, pressure tank with flare, and air safety trailer.
4. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and prepare a site-specific ERP.
5. Disassemble the SCVF piping and ensure that it is not blocked. Re assemble the piping and install a bottle and hose type tester. Watch tester and ensure there are no bubbles in 10 minutes. Document test on daily report and on the "Surface Casing Vent Flow" form. If using a non-freezing liquid (example windshield washer fluid) for the test, document the liquid used and the density.

February 24, 2023**Rig Up Service Rig**

6. Transfer fresh water to the rig tank.
7. Lay circulating lines with connection to the pressure tank. Pressure test lines and manifold to 1.4 Mpa and 21 Mpa, 10 minutes for each test.
8. Stump test the BOP stack. Test the ram preventors to 1400 kPa low and 21,000 kPa high for 10 minutes each. Test the annular preventors to 1400 kPa low and 7000 kPa high, 10 minutes each. Review and function test the accumulator system.
9. Bleed off trapped pressure in well to the pressure tank. If well does not bleed down, then contact Calgary office immediately.
10. Break down wellhead, strip on a landing pup and stabbing valve. Then strip on the BOP stack. Pressure test the BOP stack connections to 1400 kPa and 21,000 kPa for 10 minutes each.
11. Close pipe rams and pressure test all connections to 1.4 Mpa and 21 Mpa, 10 minutes for each test.

**Circulate Out Inhibitor**

12. Pick up tubing and run-in hole. Land tubing just off plug back at +/- 1351 mKb.
13. Forward circulate well over to fresh water, over displace by 2 m<sup>3</sup> to ensure well is clean.
14. Pull out of hole with tubing and stand enough in derrick for next operations.
15. Close blind rams and pressure test well to 7000 kPa for 10 minutes. Bleed off pressure to the pressure tank. Open the blind rams.

**Remedial Perforation**

16. Move on wireline unit.
17. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and modify site specific ERP if necessary.
18. Rig in wireline lubricator and full opening valve for well control.

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19. Run in hole with a 1 meter, 86mm ERHSC perforating gun loaded with 25 gram charges at 17 shots per meter and 60 degree phasing. Correlate gun based on previous bond log.
  - NOTE: A correction of 3 meters must be made if correlating the CBL dated March 12, 2020, to open hole logs ran March 5, 1980.
20. Perforate the top of the Jean Marie formation at 680.0 – 681.0. Monitor well for gas inflow. Pull out of hole with fired gun and inspect to ensure that all charges have detonated.
21. Close blind rams. Pump down the casing and evaluate feed rate into the perforations. Attempt to establish circulation to surface. Contact Calgary office to confirm cementing plan. Options will be “Option 1 – Cement Retainer” or “Option 2 – Balanced Plug”.
  - NOTE: If a feed rate is not established Calgary will have to confirm further operational plans with OROGO, with potential for further up hole isolations.
22. Rig out the wireline unit.

### **Remedial Cementing Option 1 – Cement Retainer**

23. Pick up a cement retainer for 139.7 mm casing and setting tool.
24. Run in hole with retainer on 73 mm tubing and set as per Calgary’s direction.
  - NOTE: Check Calgary’s order against the collar log from the bond log. A cement retainer must not be placed within 5 meters of a casing collar. If required, contact Calgary to adjust retainer depth.
25. Sting out of cement retainer and pressure test down casing to 7 Mpa for 10 minutes.
26. Sting into retainer and confirm feed rates and pressures for cementing company to prepare a treatment program.
27. Pull into neutral and pressure test tubing to 5 Mpa above the pressure established during the feed rate in step 41. Do not exceed 21 Mpa.
28. Move on remedial cementing crew and vacuum truck.



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29. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and modify site specific ERP if necessary.
30. Mix cement as per cementing program.
  - NOTE: If circulating cement to surface, consider mixing lost circulation materials into the cement.
31. Pump cement down tubing and through retainer. Squeeze cement into formation / circulate to surface as per cementing program.
  - NOTE: if circulating cement to surface, do not shut-in surface casing vent until minimum 0.5 m<sup>3</sup> of cement has returned to surface.
32. Squeeze cement to final pressure as per cementing program. If cement was circulated to surface, shut in the vent for the squeeze.
33. Sting out of retainer and balance remaining cement on the retainer.
34. Slowly pull out 2 joints of tubing and tie in circulating equipment. Reverse circulate excess cement out of well, leaving at least 15 lineal meters of cement on top of the retainer. Circulate minimum 2 tubing volumes of fresh water and continue circulating with fresh water until returns are clean. Direct returns to vacuum truck and mix with sugar in truck to prevent cement from setting up.
35. Pull tubing and lay down, stopping with 5 joints left for a final circulation to fresh water. Pull out last 5 joints but do not top up to prevent wellhead from freezing solid.
36. Depending on the results of the cement squeeze, Calgary office may order another cement job. If so, return to the “Remedial Perforation” section.
  - NOTE: Potential up hole targets are the top of the Wabamun formation, and a pair of sands below the surface casing shoe.
37. Proceed to “Rig Out” section. If returns were lost while circulating, proceed to “Locate Cement Top” section.

### **Remedial Cementing Option 2 – Balanced Plug**

38. Run in hole with tubing open ended and land 16 meters below the perforations.
39. Move on remedial cementing crew and vacuum truck.

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40. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and modify site specific ERP if necessary.
41. Mix cement as per cementing program.
  - NOTE: Minimum cement plug volume is 1 m<sup>3</sup>
42. Pump cement down tubing and balance in well as per cementing program.
59. Slowly pull tubing above estimated cement top and reverse circulate 2 tubing volumes of fresh water to clean up tubing.
60. Squeeze cement into formation as per cementing program. Final squeeze pressure must exceed 7 Mpa.
61. Once cement has flat lined, close in well with pressure and rig off cementers. Clean up equipment into vacuum truck and mix sugar in truck to prevent cement from setting up.
62. After cement has set up (overnight at minimum) run in with tubing and probe cement plug. Apply 1800 decanewtons to confirm top of plug.
63. Pressure test plug and casing to 7 MPA for 10 minutes.
64. Pull tubing and lay down, stopping with 5 joints left for a final circulation to fresh water. Pull out last 5 joints but do not top up to prevent wellhead from freezing solid.
65. Depending on the results of the cement job, Calgary may order another remedial perforation. If so, return to the “Remedial Perforation” section.
  - NOTE: Potential up hole targets are the top of the Wabamun formation, and a pair of sands below the surface casing shoe.
66. Proceed to “Rig Out” section. If returns where lost while circulating, proceed to “Locate Cement Top” section.

### **Locate Cement Top**

67. Move on and rig up wireline unit.
68. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and modify site specific ERP if necessary.

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69. Run in hole with either radial bond tool or a temperature tool. Pull log to locate cement top.
  - NOTE: Choice of logging tool to find cement top will depend on how long since the previous squeeze. Less than 24 hours, use the temperature tool.
70. Send completed logs to wireline company for analysis, and to OROGO and Calgary office.
71. Rig out the wireline unit.
72. Calgary office will review the logs and determine a new perforating interval. Return to the “Remedial Perforation” section and perforate the interval provided by Calgary Office.

### **Wellhead Cut and Cap**

73. Move in waterjet cut and cap crew and equipment.
74. Hold and record a safety and procedure meeting with all personnel on location. Perform a walk around inspection to ensure no hazards on the site. Document meeting topics and prepare a site-specific ERP.
75. Install a bottle and hose type tester on the vent assembly. Watch tester and ensure there are no bubbles in 10 minutes. Document test on daily report and on the “Surface Casing Vent Flow” form. If using a non-freezing liquid (example windshield washer fluid) for the test, document the liquid used and the density.
76. Rig in the waterjet cut and cap crew. Cut and cap the well 1.5 meters below ground level following the waterjet company procedures. Take pictures of the well before the cut, with the wellhead removed, the cut surface, and the vented cap before and during instillation.
77. Backfill open excavation. Photograph the backfill.
78. Install abandoned well sign 1 meter north of the well. Sign is to meet the requirements as outlined in the attachment.
79. Release all services. Field operations are complete.

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## **Final Reporting**

80. Prepare a final downhole diagram showing the final well configuration
81. Ensure that all tickets and costs are recorded on the morning reports. If a vendor has not submitted their tickets, then put in an estimated cost.
82. Tickets are to be coded with the well name, AFE number, date, and field supervisor's signature. Ensure vendors electronically send all invoices to

**ELM Inc.**  
**#1000, 205 – 5<sup>th</sup> Avenue SW**  
**Calgary AB T2P 2V7**  
**AP@elminc.ca**

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**Elm Inc. Terms of Service:**

1. The price estimate for this well is presented as a most probable cost based on similar repair operations and is to be used for AFE purposes only. This estimate is only as good as the information provided to Elm. Elm will co-ordinate and supervise the entire operation, pay all third party services and submit a final invoice based on actual costs incurred for equipment and services. Depending on the complexity of the abandonment, location and age of the well, Elm recommends adding 10-25% contingency to the estimates attached.
2. This estimate does not contain any lease clean up costs other than back filling around the wellhead after it has been cut off. If requested Elm's Reclamation Division will perform a site assessment that will be used to determine a cost estimate for surface reclamation. A preferential price to do the site assessment will be given if done in conjunction with the downhole abandonment.
3. Elm does not accept any liability for the well, lease, facility and or property it is working on. Elm acts as an independent consultant, providing mainly consulting and supervision services, with some specialized equipment included.
4. Elm will accept liability for the proper placement of bridge plugs and / or cement plugs that we set, however we do not accept liability for any unforeseen or unmentioned down hole problems. This would include failure of the casing to pressure test, collapsed casing, stuck pipe, tubing or rods, scale and or wax build up, surface casing vent flows, gas migration etc.
5. Elm does accept the responsibility of Prime Contractor for sites that have an agreement assigning the Prime Contractor Status.
6. The cost estimate included services and third party costs as listed, if other services are required they will be billed as per our cost schedule. The client will be informed of any costs to be incurred outside of this summary prior to the work being done. These services usually include: disposal costs, stuck and towing or cat work for access, rental and / or trucking of work strings, trucking of tubing, rods, and / or well heads, sour service, required safety equipment and extra charges associated working in hot or cold temperatures.

Elm's objective is to offer the safest and most efficient abandonment while saving the operator both time and money. We feel that by working with you on this project, we can achieve our goals and maintain the high level of professionalism that is reflected in the end product.