

December 19, 2022

**Office of the Regulator of Oil and Gas Operations**  
PO Box 1320  
Yellowknife NT, X1A 2L9

By Email: [orogo@gov.nt.ca](mailto:orogo@gov.nt.ca)

**RE: Information Request No 1.**  
**Abandonment of the Cameron M-31 Well (ACW-2022-SOG-M-31-WID 1122)**

ELM Inc, acting on behalf of Alvarez & Marsal Canada Inc in their capacity as the receiver for Strategic Oil and Gas Ltd is responding to the above noted information request sent on December 1<sup>st</sup>, 2022.

**1.1 Remedial Cementing**

OROGO has identified concerns if the gas migration may originate from lower zones below the bridge plug at 870 mKB or the permanent packer with blanking plug at 990 mKB. Currently there is no way to identify if gas may originate from these zones. The diagnostic tools used (Noise – Temperature and Cement Bond Logs) do not provide quality data with open perforations in the well, as the movement of gas from formation into the wellbore is much noisier than gas moving through the cement behind the casing, and gas bubbles in the wellbore interfere with a bond log. The only practical method to evaluate the lower formations would be to drill them all out, and cement them off individually, then drill it out again to run the logs, at which point the problem may have been solved. This option would be considered if the proposed program is unable to fix the gas migration issue in the well. However, we will not know if the well has been fixed until gas migration testing is carried out next summer, as further outlined below in section 1.4.

**1.2 Liner Abandonment**

This wellbore does not have a liner. The cement retainer was set at 745 for a circulation squeeze where cement was circulated through the annulus between the production and intermediate casings to surface. The production casing in this well extends full length, from surface to 1061.4 mKB. Attached to this letter is a new wellbore schematic that better shows the configuration of this well.

**1.3 Proposed Wellbore Diagram**

A proposed wellbore diagram is attached to this letter.

**1.4 Cut and Cap**

We have identified several wells requiring gas migration testing during the frost-free months of 2023. This well will also be tested along with L-29, I-10, J-04, and any others that we have yet to identify. If there is to be a winter 2024 program the well can be cut and capped then. If not, the well can be cut and capped in summer of 2023 by a labour crew transported by helicopter.

While further reviewing the well file, we found a better-quality wellhead diagram. It shows that the vent assembly on the well is for the intermediate casing. The surface casing is un-vented, much like a conductor casing. The language of the program has been modified, replacing “surface casing vent” with “intermediate casing vent” where appropriate. We have also found that while drilling the intermediate hole, a chunk of the surface casing broke off and fell down hole. The broken off section was never recovered; it was simply left as is. The diagrams have been updated to show the surface casing in this position. The program has also been updated with the latest information from the inspection carried out by Heli Source on October 28, 2022.

Should you have any questions or require further information, please contact the undersigned at [christopher@elminc.ca](mailto:christopher@elminc.ca)

Sincerely,

Christopher Gagnon, EIT

ELM Inc, acting as a consultant to Alvarez & Marsal Canada Inc



**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 HB ET AL CAMERON M-31  
300/M31 60-10N 117-00W

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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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**ROUTINE ABANDONMENT PROGRAM**

**BACKGROUND:**

- Zonal abandoned vertical gas well
- Completed and evaluated in the Keg River, Sulphur Point, and Slave Point formations, each zone abandoned after evaluation.
- Production zones abandoned with permanent bridge plugs and cement
- Remedial cementing January 1996 to fill annulus between production and intermediate casings with cement.
- Well filled with fresh water mixed with Nowcor 500 Inhibitor
- Well has confirmed gas migration.

**ABSTRACT:**

- Move on wireline to run noise temperature log, and cement bond log
- If logs suggest gas is coming from below the cement retainer, move on service rig, drill out the retainer, drill out the abandonment plug, wash over the packer and push to bottom.
- If logs suggest the gas is coming from above the cement retainer, move on service rig and move to repair stage.
- Perforate and conduct cement squeezes to stop the gas migration
- 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 M-31**UNIQUE ID:** 300/M31 60-10N 117-00W*Note that there are several different variations of the UWI in the well file***SURFACE LOCATION:** 60.015813, -117.124201**LICENSE #:** 1122**STATUS:** Zonal Abandoned**TOTAL DEPTH:** 1060 mKB**ELEVATIONS:** **GL:** 354.7 m **KB:** 358.35 m**BGWP:** 600.0 mKB**PLUG BACK:** 730 mKb (Cement top on retainer)**H<sub>2</sub>S DATA:** Slave Point: 0.019% (Gas Analysis March 21, 1981)  
Sulphur Point: 0.19% (Gas Analysis March 21, 1980)  
Keg River: 0% (per lab analysis, but H<sub>2</sub>S reported in field)**ICVF:** No. Had vent buster monitoring from October 28, 2022, to December 8, 2022.**GAS MIGRATION:** Yes, observed bubbling in water beside well. Samples collected from site of bubbling confirmed presence of light alkane gas consistent with leaking thermogenic gases from a source at depth. Sept 15, 2022. Tested again with similar results October 28, 2022.**SITP:** 0 kPa**SICP:** 0 kPa**RESERVOIR PRESSURE:** Slave Point: Unknown, 8500 kPa on tubing during abandonment ops. Assume 10 Mpa.  
Sulphur Point: Unknown. Assume 10 Mpa.  
Keg River: 5430 kPa (March 6, 1980)**MAX FLARE VOLUME:** 1.5 x wellbore volume at 10 MPa = 1.34 e3m<sup>3</sup>*Significant flare volumes are not expected during this operation***LANDOWNER:** Crown**DIRECTIONS:** Refer to maps**COMPLETION:**

Keg River: 1009.0 – 1013.0 mKB (Abandoned)

Keg River: 1002.5 – 1005.0 mKB (Abandoned)

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Keg River: 998.0 – 1001.0 mKB (Abandoned)  
 Baker “Lock-Set” Packer with Blanking Plug: 990 mKB  
 Sulphur Point: 886.0 – 887.5 mKB (Abandoned)  
 Sulphur Point: 884.0 – 885.0 mKB (Abandoned)  
 Sulphur Point: 879.5 – 881.5 mKB (Abandoned)  
 Bridge Plug c/w 9.4 m cement: 860.4 – 870.0  
 Slave Point: 826.0 – 828.5 (Abandoned)  
 Slave Point: 819.0 – 822.5 (Abandoned)  
 Fish (Packer w/ tubing): 810 mKB (packer element)  
 Top of fish (tubing cut): 804.5 mKB (cut is flared to 100 mm)  
 Bridge Plug c/w 10m cement: 787.0 – 797.0 mKB  
 Remedial Perfs: 756.0 – 757.0 (cement squeezed)  
 Cement Retainer c/w 15.2 m cement: 730.0 – 745.2 mKB

*Circulated 12.5 T of cement through retainer and to surface with 0.5 m3 returns. Shut vent and squeezed to 5 MPA.*

**FORMATIONS:**

<b><u>Formation</u></b>	<b><u>MD (m)</u></b>
Beaverhill Lake	738
Slave Point	811
Fort Vermilion	848
Watt Mountain	863
Bistcho	868
Sulphur point	878
Muskeg	890
Keg River	978
Precambrian	1037
TOTAL DEPTH	1060

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**TUBULARS:**

**SURFACE CASING:** 244.5 mm, 48.07 kg/m, H-40, ST&C. Casing landed at 199 mKB. Cemented with 13.5 T Oil Well G Cement + 3% CaCl<sub>2</sub>

**1 m<sup>3</sup> cement Returns**

Surface casing broke off while drilling intermediate hole. Broke off at 157 mKb, and lower portion fell. Top at 207.0 and bottom at 251.5 mKb.

**Surface casing not part of wellhead. No vent assembly installed.**

**INTERMEDIATE CSG:** 177.8mm, 25.3 kg/m, H-40, ST&C. Casing landed at 796 mKB Cemented with 20.3 T Oil Well G Cement.

**10 Barrels (1.58 m<sup>3</sup>) Cement Returns**

**Intermediate casing has the vent assembly.**

**PRODUCTION CASING:** 114.3mm, 14.14 kg/m, J-55, ST&C

Casing landed at 1061.4 mKB. Cemented with 6.6T Oil Well G Cement.

*“Good returns throughout job”*

**Bond log was ran January 23, 1996, which was before remedial work that took place**

**PRODUCTION STRING:** Tubing hanger left in wellhead. No tubing.

Casing size and weight	Casing ID (mm)	Casing Drift (mm)	Casing Capacity (m <sup>3</sup> /m)	Top of Plugback	Casing Capacity to Plugback (m <sup>3</sup> )
244.5mm 48.07 kg/m	228.63	224.66	0.041053	N/A	
177.8mm, 25.3 kg/m	166.07	162.89	0.021659	N/A	
114.3mm, 14.14 kg/m	103.89	100.71	0.008476	730	6.19

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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.

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



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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 wireline mast unit and mobile boiler.
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 intermediate casing vent 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.
  - NOTE: The intermediate casing vent on this well has non-standard fittings. Possibly half inch, to be confirmed in field.

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6. Read and record shut in pressures. Ensure well is dead.
7. Remove wellhead top section and remove tubing hanger from wellhead.
8. Rig up the wireline unit with lubricator and bench tested valve for well control.
9. Run in with high resolution noise temperature tool. Record temperature on trip into well. Pull noise log from PBTD to surface with stops every 5 meters and 30 second samples. Send completed logs to OROGO and Calgary, and to wireline company for analysis.
  - NOTE: Wireline company may recommend a change to this step. Contact Calgary and OROGO if a change is necessary.
10. Run in radial bond tools and record a high-speed log on trip in to PBTD. Run a full radial bond log from PBTD to surface. Send completed logs to wireline company for analysis, and to OROGO and Calgary office.
11. Rig out the wireline unit and all services. Re assemble wellhead top section.
12. Calgary office to review logs and determine next steps in abandonment program.
  - OPTION 1 – Logs suggest gas is coming from below the retainer
    - i. Move on and rig in service rig
    - ii. Drill out / wash over the cement retainer
    - iii. Drill out abandonment plug and wash over packer
    - iv. Cement squeeze the Slave Point
    - v. Perforate
    - vi. Cement squeeze
    - vii. Re abandon existing remedial perforations
    - viii. Rig out
    - ix. Cut and cap
  - OPTION 2 – Logs suggest gas is coming from above the retainer
    - i. Move on and rig in service rig
    - ii. Perforate
    - iii. Cement squeeze
    - iv. Rig out
    - v. Cut and cap

Each step above corresponds to a section of program below. Use the appropriate sections to carry out the work as directed by Calgary. Any change in scope must be pre-approved by Calgary and OROGO.

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The order of Option 1 may be changed depending on the log analysis. The existing remedial perforations at 756 - 757 mKB will need to be re abandoned before remedial work is done above them.

### **Move On and Rig Up Service Rig**

13. Mobilize and move in a service rig with Class III BOP system, doghouse, pump and tank, mobile boiler, pressure tank with flare, work string with +/- 1100 meters of 60.3mm tubing, and air safety hand.
14. 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.
15. Transfer minimum 10 m<sup>3</sup> of kill fluid to rig tank.
  - NOTE: If Option 1 has been selected, then use 1300 kg/m<sup>3</sup> kill fluid. The Slave Point formation is over pressured and has an estimated gradient of 12.4 kPa/m. If Option 2 has been selected, then use fresh water.
  - NOTE: If Option 1 has been selected, mix H<sub>2</sub>S scavenger as per manufacturer's directions.
16. Lay circulating lines from wellhead to pressure tank and to the rig tank. Stake lines and pressure test to 1400 kPa low and 14,000 kPa high for 10 minutes per test.
17. Stump test the BOP stack. Test the ram preventors to 1400 kPa low and 14,000 kPa high for 10 minutes each. Test the annular preventor to 1400 kPa low and 7000 kPa high, 10 minutes each. Review and function test the accumulator system.
18. Remove wellhead top section. Install tubing hanger with pup joint and stabbing valve.
19. Strip BOP stack onto the wellhead. Pressure test connections to 1400 kPa low and 14,000 kPa high.
20. Pressure test the wellbore as is to 7000 kPa for 10 minutes. Contact Calgary office if wellbore does not pressure test.

### **Drill Out / Wash Over Cement Retainer**

21. Move on tool company representative with power swivel and drilling assembly.

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22. Make up and run-in hole with bit on drill collars.
23. Trip in slowly for the last 2 joints until PBTD is felt at +/- 730 mKB.
24. Rig in the power swivel and the rig's circulating equipment. Begin drilling on the cement, using the kill fluid as the drilling fluid. Monitor returns while drilling.
25. Once through the cement, rig down the power swivel, pull out with the drilling assembly. Stand tubing in the derrick and lay out assembly.
26. Make up and run-in hole with wash over shoe with wash pipe.
27. Trip in hole slowly for the last 2 joints until the retainer is felt.
28. Rig in the power swivel and the rig's circulating equipment. Wash over the retainer.
29. Once through the retainer, rig down the power swivel, and pull out with the wash over assembly. Stand the tubing in the derrick, lay out the assembly, and inspect to ensure that all pieces of the cement retainer have been recovered.
30. If the retainer bullnose was not recovered, run in with a rare earth magnet on sand line, tag the assembly, and pull out. Repeat as necessary until magnet comes back with no metal debris on it.
31. If necessary, run back in with the wash over assembly as before and try to recover the retainer bullnose again.

### **Drill Out Abandonment Plug and Wash Over Packer**

32. Make up and run-in hole with bit on drill collars.
33. Trip in slowly for the last 2 joints until PBTD is felt at +/- 794 mKB.
34. Rig in the power swivel and the rig's circulating equipment. Begin drilling on the cement, using the kill fluid as the drilling fluid. Monitor returns while drilling.
  - NOTE: Exercise caution while drilling and monitor for signs of a kick.
35. Once through the bridge plug, continue down to the top of the fish.
  - NOTE: If experiencing difficulty while drilling, pull out the drilling assembly and run a rare earth magnet on sand line. Continue with magnet runs until the magnet comes back clean. Run back in with previous drilling assembly and resume drill out.

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36. Pull out with the drilling assembly. Stand tubing in the derrick and lay out assembly.
37. Make up and run-in hole with wash over and wash pipe.
38. Trip in slowly for the last 2 joints until the fish neck is felt.
39. Rig in the power swivel and the rig's circulating equipment. Wash over the fish neck to remove the 100 mm flare from jet cutting the tubing.
40. Continue down and wash over the packer.
  - NOTE: Exercise caution while washing over the packer and monitor for signs of a kick.
41. Once the packer has been washed over, push the fish down to the new PBTD at +/- 861 mKB.
42. Rig down the power swivel, pull out with the drilling assembly. Stand tubing in the derrick and lay out wash over assembly.
43. Inspect the wash over assembly and ensure that all parts have been recovered.
  - NOTE: If the fish is recovered at surface, exercise extreme caution. There may be trapped pressure between the tubing plugs inside the fish.
44. If there is difficulty in washing over the fish, then contact Calgary to discuss options and contact OROGO for permission to deviate from the program.

### **Cement Squeeze the Slave Point**

45. Pick up a cement retainer for 114.3mm casing and setting tool.
46. Run in hole with retainer and position at 809.0 mKB. Set retainer as per manufacturer's instructions.
  - NOTE: A retainer may not be set within 5 meters of a casing collar. The nearest collars are at 802.5 and 814.8 mKB.
47. Sting out of cement retainer and pressure test down casing to 7 Mpa for 10 minutes.
48. Sting into retainer and confirm feed rates and pressures for cementing company to prepare a treatment program.

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49. Pull into neutral and pressure test tubing to 5 Mpa above the pressure established during the feed rate. Do not exceed 21 Mpa.
50. Move on remedial cementing crew and vacuum truck.
51. 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.
52. Mix cement as per cementing program.
53. Pump cement down tubing and through retainer. Squeeze cement into formation.
54. Squeeze cement to final pressure as per cementing program. If cement was circulated to surface, shut in the vent for the squeeze.
55. Sting out of retainer and balance remaining cement on the retainer.
56. 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 water and continue circulating until returns are clean. Direct returns to vacuum truck and mix with sugar in truck to prevent cement from setting up.
57. Depending on the depth of the next remedial perforation, Calgary may instruct well to be circulated over to fresh water, and the heavy kill fluid transferred to another well, the slop tank, or to disposal. Contact Calgary before circulating.
58. Pull out of hole with tubing and stand in derrick. Lay down retainer setting tool.

### **Re Abandon Existing Remedial Perforations**

59. Make up and run-in hole with 114.3mm permanent bridge plug and setting tool on tubing.
60. Position bridge plug at 748 mKB and set plug as per manufacturer's procedure.
  - NOTE: A permanent bridge plug may not be placed within 5 meters of a casing collar. The casing collars are located at 753.5 and 741.3 mKB
61. Close pipe rams and pressure test bridge plug to 7000 kPa for 10 minutes.
62. Rotate off the bridge plug as per manufacturer's procedure.

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63. Mix 500 L of cement in barrel. Circulate cement down tubing as per attached procedure. Pull tubing above cement as per attached procedure.
64. Continue with program as per Calgary's instructions.

### **Perforate**

65. Move on wireline unit.
66. 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.
67. Rig in wireline lubricator and full opening valve for well control.
68. 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. Perforating depth to be determined by Calgary office. Pull out spent guns and inspect to ensure all shots have fired.
69. 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.
70. Rig out the wireline unit.

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

71. Pick up a cement retainer for 114.3mm casing and setting tool.
72. Run in hole with retainer on 60.3 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.
73. Sting out of cement retainer and pressure test down casing to 7 Mpa for 10 minutes.

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74. Sting into retainer and confirm feed rates and pressures for cementing company to prepare a treatment program.
75. Pull into neutral and pressure test tubing to 5 Mpa above the pressure established during the feed rate. Do not exceed 21 Mpa.
76. Move on remedial cementing crew and vacuum truck.
77. 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.
78. Mix cement as per cementing program.
79. 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 intermediate casing vent until minimum 0.5 m<sup>3</sup> of cement has returned to surface.
80. Squeeze cement to final pressure as per cementing program. If cement was circulated to surface, shut in the vent for the squeeze.
81. Sting out of retainer and balance remaining cement on the retainer.
82. 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 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.
83. Calgary will advise if there is another zone to perforate and squeeze, or if there are no further operations pending. Pull out of hole and stand tubing if there is further work. Otherwise proceed to “rig out” section.

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

84. Run in hole with tubing open ended and land 16 meters below the perforations.
85. Move on remedial cementing crew and vacuum truck.
86. 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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87. Mix cement as per cementing program.
  - NOTE: Minimum cement plug volume is 1 m<sup>3</sup>
88. Pump cement down tubing and balance in well as per cementing program.
89. Slowly pull tubing above estimated cement top and reverse circulate 2 tubing volumes of water to clean up tubing.
90. Squeeze cement into formation as per cementing program. Final squeeze pressure must exceed 7 Mpa.
91. 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.
92. After cement has set up (overnight at minimum) run in with tubing and probe cement plug. Apply 1800 decanewtons to confirm top of plug.
93. Pressure test plug and casing to 7 MPA for 10 minutes.
94. Calgary will advise if there is another zone to perforate and squeeze, or if there are no further operations pending. Pull out of hole and stand tubing if there is further work. Otherwise proceed to “rig out” section.

### **Rig out**

95. Circulate well over to fresh water.
96. 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
97. Remove BOP stack and re install wellhead.
98. Rig out the service rig. Clean the rig tank and send fluid to disposal.
99. Ensure location is cleaned of all garbage and debris.
100. Proceed to “wellhead cut and cap” section.

### **Wellhead Cut and Cap**

101. Move in waterjet cut and cap crew and equipment.

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102. 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.
103. 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.
104. 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.
105. Backfill open excavation. Photograph the backfill.
106. Install abandoned well sign 1 meter north of the well. Sign is to meet the requirements as outlined in the attachment.
107. Release all services. Field operations are complete.

### **Final Reporting**

108. Prepare a final downhole diagram showing the final well configuration
109. 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.
110. 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> Ave SW**  
**Calgary AB T2P 2V7**  
**AP@Elminc.ca**

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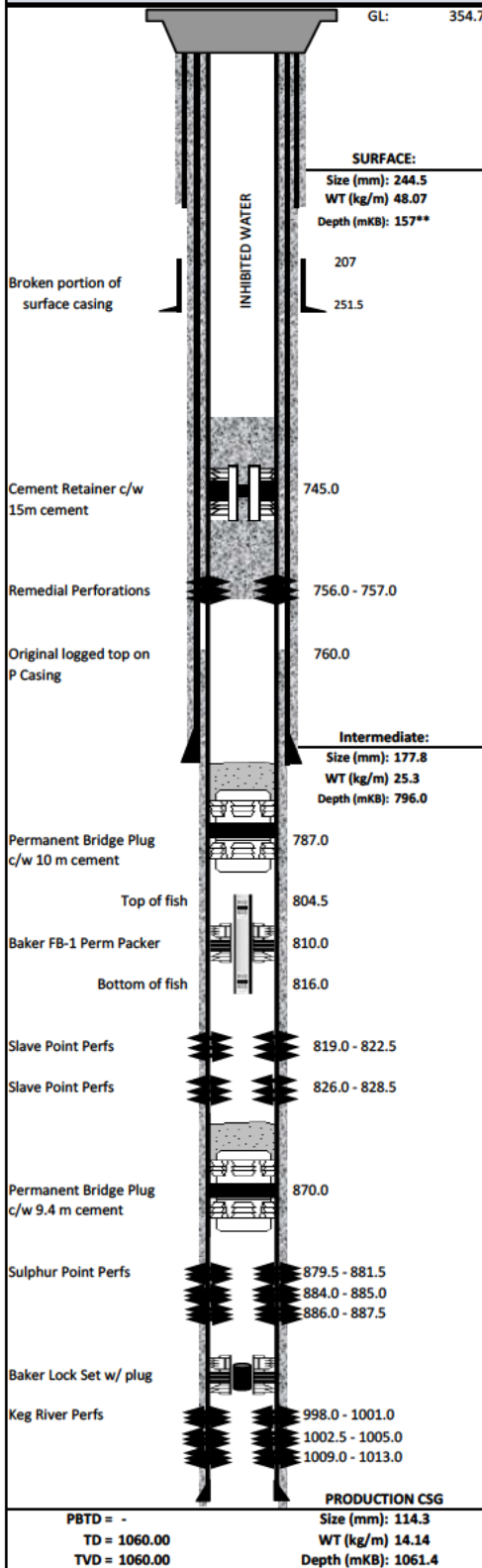
**Elm Inc. Terms of Service:**

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.



### CURRENT WELL DIAGRAM



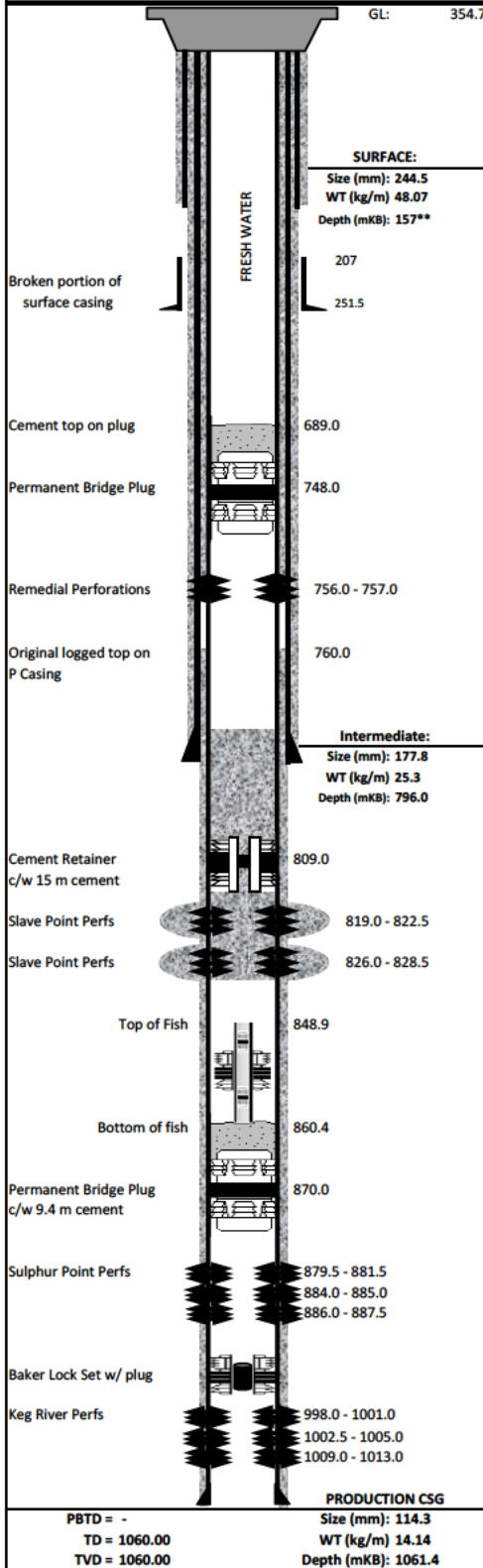
GENERAL DETAILS							REV #				
WELL NAME: Strategic HB et al Cameron M-31			FIELD: Cameron Hills				1.0				
UWI: 300/M31 60-10N 117-00W			LICENSE: 1122								
SURFACE:			LATITUDE: 60.015813		LONGITUDE: -117.124201						
COMPANY: Strategic Oil And Gas Ltd			DRAWN BY: C. Gagnon		DATE: 06 Dec 2022						
DEVIATION: Vertical		WELL STATUS: Abandoned									
ELEVATIONS & DEPTHS											
KB (mKB)	GL (m)	KB-SCF (m)	KB-GR (m)	BGWP (mKB)	PBTD (mKB)	TD (mKB)	TVD (mKB)				
358.35	354.7		3.65	600.00		1060	1060				
CASING STRINGS											
STRING	SIZE (mm)	WEIGHT (kg/m)	GRADE	CPLG	DRIFT I.D. (mm)	SHOE DEPTH (mKB)					
Surface:	244.5	48.07	H-40			157**					
Intermediate:	177.8	25.3	H-40			796					
Production:	114.3	14.14	J-55			1061.4					
Liner:											
Open Hole:											
CEMENTING											
STRING	DETAIL			Returns (m <sup>3</sup> )	Log Cmt Top (mKB)	Calc'd Top (mKB)					
Surface:	13.5 T Oil Well G + 3% CaCl <sub>2</sub>			1 m <sup>3</sup>							
Intermediate:	20.3 T Oil Well G			1.58 m <sup>3</sup>							
Production:	6.6 T Oil Well G (Original Cement Job)				760.00						
COMPLETION DATA											
ITEM	DEPTH			STATUS							
Cement Retainer c/w 15 m cement	730 - 745										
Remedial Perforations - 12.5 T Cement circulated through and to surface	756.0 - 757.0			Abandoned							
Permanent Bridge Plug c/w 10 m cement	787 - 797										
Top of fish	804.5										
Jet Cut tubing (flared out to 100 mm)											
Baker Model "L" Sliding Sleeve											
Pup Joint with permanent tubing plug											
Baker Model FB-1 Permanent Packer	810										
Pup Joint with permanent tubing plug											
Baker Model 'F' profile nipple with FSG plug											
Perforated Pup Joint											
Baker Model 'R' profile nipple with FSG plug											
Re Entry guide											
Bottom of fish	816.09										
Slave Point Perforations - Cement Squeezed	819.0 - 822.5			Abandoned							
Slave Point Perforations - Cement Squeezed	826.0 - 828.5			Abandoned							
Permanent Bridge Plug capped with 9.4 m cement	860.4 - 870.0										
Sulphur Point Perforations	879.5 - 881.5			Abandoned							
Sulphur Point Perforations	884.0 - 885.0			Abandoned							
Sulphur Point Perforations	886.0 - 887.5			Abandoned							
Baker "Lock-Set" Packer w/ Blanking Plug	990										
Keg River Perforations	998.0 - 1001.0			Abandoned							
Keg River Perforations	1002.5 - 1005.0			Abandoned							
Keg River Perforations	1009.0 - 1013.0			Abandoned							
LANDOWNER			LANDOWNER #			OCCUPANT			OCCUPANT #		
DIRECTIONS:						Sign Off					

**REMARKS:**  
 Diagram does not include potential perforations and cement squeezes to isolate porosity / repair uphole gas migration sources

\*\*Note surface casing was originally landed at 199 mKB. It parted while drilling the intermediate hole. The new bottom of the casing is at 157 meters, and the dropped portion is between 207 to 251.5 mKB.



PROPOSED WELL DIAGRAM



GENERAL DETAILS							REV #	1.0	
WELL NAME: Strategic HB et al Cameron M-31			FIELD: Cameron Hills						
UWI: 300/M31 60-10N 117-00W			LICENSE: 1122						
SURFACE:			LATITUDE: 60.015813		LONGITUDE: -117.124201				
COMPANY: Strategic Oil And Gas Ltd			DRAWN BY: C. Gagnon		DATE: 01 Dec 2022				
DEVIATION: Vertical		WELL STATUS: Abandoned							
ELEVATIONS & DEPTHS									
KB (mKB)	GL (m)	KB-SCF (m)	KB-GR (m)	BGWP (mKB)	PBTD (mKB)	TD (mKB)	TVD (mKB)		
358.35	354.7		3.65	600.00		1060	1060		
CASING STRINGS									
STRING	SIZE (mm)	WEIGHT (kg/m)	GRADE	CPLG	DRIFT I.D. (mm)	SHOE DEPTH (mKB)			
Surface:	244.5	48.07	H-40			157**			
Intermediate:	177.8	25.3	H-40			796			
Production:	114.3	14.14	J-55			1061.4			
Liner:									
Open Hole:									
CEMENTING									
STRING	DETAIL			Returns (m <sup>3</sup> )	Log Cmt Top (mKB)	Calc'd Top (mKB)			
Surface:	13.5 T Oil Well G + 3% CaCl <sub>2</sub>			1 m <sup>3</sup>					
Intermediate:	20.3 T Oil Well G			1.58 m <sup>3</sup>					
Production:	6.6 T Oil Well G (Original Cement Job)				760.00				
COMPLETION DATA									
ITEM	DEPTH			STATUS					
Permanent Bridge Plug capped with 59m cement (500 Litres)	689 - 748								
Remedial Perforations - 12.5 T Cement circulated through and to surface	756.0 - 757.0			Abandoned					
Cement Retainer capped with 15 meters cement	794 - 809								
Slave Point Perforations - Cement Squeezed	819.0 - 822.5			Abandoned					
Slave Point Perforations - Cement Squeezed	826.0 - 828.5			Abandoned					
Top of fish	848.86								
Jet Cut tubing (washed over)									
Baker Model "L" Sliding Sleeve									
Pup Joint with permanent tubing plug									
Baker Model FB-1 Permanent Packer (Washed over w/slips milled off)									
Pup Joint with permanent tubing plug									
Baker Model 'F' profile nipple with FSG plug									
Perforated Pup Joint									
Baker Model 'R' profile nipple with FSG plug									
Re Entry guide									
Bottom of fish (sitting on top of PBP)	860.4								
Permanent Bridge Plug capped with 9.4 m cement	860.4 - 870.0								
Sulphur Point Perforations	879.5 - 881.5			Abandoned					
Sulphur Point Perforations	884.0 - 885.0			Abandoned					
Sulphur Point Perforations	886.0 - 887.5			Abandoned					
Baker "Lock-Set" Packer w/ Blanking Plug	990								
Keg River Perforations	998.0 - 1001.0			Abandoned					
Keg River Perforations	1002.5 - 1005.0			Abandoned					
Keg River Perforations	1009.0 - 1013.0			Abandoned					
LANDOWNER				LANDOWNER #		OCCUPANT		OCCUPANT #	
DIRECTIONS:						Sign Off			

REMARKS:  
 Diagram does not include potential perforations and cement squeezes to isolate porosity / repair uphole gas migration sources

\*\*Note surface casing was originally landed at 199 mKB. It parted while drilling the intermediate hole. The new bottom of the casing is at 157 meters, and the dropped portion is between 207 to 251.5 mKB.



D&S PETROLEUM CONSULTANTS LTD.

WELL EQUIPMENT SUMMARY

73F9

Well Name PARAMOUNT HB ETAL CAMERON HILLS M-31 Date \_\_\_\_\_

Wellhead:

Choke \_\_\_\_\_

Wing Valve \_\_\_\_\_

Master Valve \_\_\_\_\_

Stuffing Box \_\_\_\_\_

Other \_\_\_\_\_

Tubing:

Bonnet McEvoy "QAD" Tubing Head Adapter 6" - 2000 x 2 3/8 EUE

Spool \_\_\_\_\_

Hanger 7" x 2 3/8" McEvoy Low Boy Tubing Hanger

Valves Figure 120 - 2 3/8" McEvoy 2000 WOG RM - 12

Casing:

Spool 8" x 4 1/2" McEvoy Low Boy Secondary Seal

Slips \_\_\_\_\_

Valves 1 - Balon 2" LP Bull Valve 2000#

1 - 1 1/4" McEvoy Removal Plug C/W Removal Nipple

Intermediate Casing:

Bowl 8" - 2000 x 7" McEvoy Low Boy Casing Head

Slips 8" x 4 1/2" McEvoy Low Boy Casing Hanger

Valves 1-2" Casing Vent 1-2" Bull Plug

Pumping Equipment:

Unit MNF \_\_\_\_\_ Torque \_\_\_\_\_ Beam \_\_\_\_\_ Stroke \_\_\_\_\_

Motor MNF \_\_\_\_\_ Type \_\_\_\_\_ H.P. \_\_\_\_\_ H.P. Conn \_\_\_\_\_

Bottom Hole Pump \_\_\_\_\_ Depth \_\_\_\_\_

Rods: No. \_\_\_\_\_ Size \_\_\_\_\_ Grade \_\_\_\_\_ Length \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Pony Rods \_\_\_\_\_

Polish Rods \_\_\_\_\_

Remarks \_\_\_\_\_

Field Supervisor Peter Proust

WELLHEAD DIAGRAM

FOR

PARAMOUNT HB ETAL CAMERON HILLS M-31

