

January 18, 2023

**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: ACW-2023-SOG-2H-03-WID2073**

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 January 18, 2023.

1.1 Potential Wax in wellbore

OROGO has identified that this well had a history of wax build up. ELM has reviewed the previous operation reports from February 2019 and notes that most of the wax was most likely removed at that point, however there is the possibility that wax remains in the well.

Therefore, ELM has prepared a contingency section on the revised well abandonment program. Should wax be found, the contingency can be activated to clean out any wax remaining in the well.

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 ET AL CAMERON 2H-03  
302/H-03 60-10N 117-30W

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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 Horizontal well
- Well produced from the Sulphur Point formation
- Production Zone Abandoned with a Permanent Bridge Plug and Cement
- Well filled with 0.50% CRW-132 inhibited fresh water and topped up with 1.60 m3 50/50 Methanol Water
- Pump was full of wax, unknown if there is wax in the casing

**ABSTRACT:**

- Move on wireline to run cement bond log
- If bond log shows acceptable cement isolation, coil tubing unit to circulate well to fresh water
- If bond log shows insufficient cement isolation, use service rig to circulate well to fresh water and conduct isolation squeezes
- If in either scenario there is wax present, move on hot oiler with chemical and circulate clean.
- 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 2H-03  
UNIQUE ID: 302/H-03 60-10N 117-30W  
SURFACE LOCATION: 60.03899-117.501  
 Lat: 60° 2' 20" Long: 117° 30' 06" (In Decimal Degrees)  
LICENSE #: 2073  
STATUS: Zonally Abandoned  
TOTAL DEPTH: 2534.0 mKB (TVD: 1423.9 mKB)  
ELEVATIONS: **GL:** 770.2 m **KB:** 775.0 m  
BGWP: 600.0 mKB  
PLUG BACK: 1478.7 mKB (BP and 24.3m cement)  
H<sub>2</sub>S DATA: Unknown. Assume 2% H<sub>2</sub>S  
SCVF: None. Tested on February 25, 2019  
GAS MIGRATION: GCHEM vapor intrusion assessment on September 11&12, 2019 indicates gas is biogenic baseline.  
SITP: 0 kPa  
SICP: 0 kPa  
RESERVOIR PRESSURE: 9,010 kPa – from Acoustic Well Survey dated March 03, 2004. Page 26 of the Zonal Abandonment Program – Revised Jan 17, 2019.  
MAX FLARE VOLUME: 1.5 x wellbore volume at 10 MPa = 5.89 e3m3  
*Significant flare volumes are not expected during this operation*  
LANDOWNER: Crown

**DIRECTIONS:**

Refer to maps

**COMPLETION:**

Permanent Bridge Plug w/ cement – 1478.7 – 1503.0 mKB

*Pressure tested to 7 mPa for ten minutes. Solid Test.*

Sulphur Point – 1531.0 – 2529 mKB

Sulphur Point - see Packers Plus summary dated March 20, 2011

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**FORMATIONS:**

Formation	TVD (m)	MD (m)
Bluesky	542.4	542.3
Wabamun	558.1	558.2
Jean Marie	718.9	719.1
Fort Simpson	725	725.2
Twin Falls	837	837.2
Hay River Shale	997.2	997.4
Beaverhill Lake	1292.4	1292.7
Muskwa	1326.3	1329.9
Slave Point	1349.3	1356.2
Fort Vermillion	1379.7	1394.4
Watt Mountain	1399.3	1436.5
Sulphur Pt. Lst.	1400.6	1439.3
Sulphur Pt. Dol.	1417.5	1494.4

\*\*Formation Tops have been interpolated from Geology provided from H-03

**TUBULARS:**

**SURFACE CASING:** 244.5 mm, 48.07 kg/m, H-40, ST&C. Casing landed @ 360.0 m KB. Cemented with 19.0 tonnes Maxxcem 'G' + 1.0% CaCl<sub>2</sub> + 0.9% FL-5. 1.5 m<sup>3</sup> of good cement returns to surface.

**INTERMEDIATE CASING:**

177.8 mm, 34.23 kg/m, L-80, LT&C. Landed at 1531.0 mKB. Cemented with 35.5 tonnes Maxxcem 'G' + 1.0% CaCl<sub>2</sub> + 0.9% FL-5. Full returns throughout. No cement returns to surface.

No cement bond log on file.

A new cement bond log will have to be run over the entire length of the wellbore.

**PRODUCTION LINER:**

114.3 mm, 17.26 kg/m, L-80, LT&C. Landed at 2529.0 mKB. Liner hanger at 1506.8 mKB. Not cemented in the hole. (Please see attached Cameron Hills 2H-03 RapidMATRIX Summary attached)

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**PRODUCTION STRING:** No tubing in well

Casing size and weight	Casing ID (mm)	Casing Drift (mm)	Casing Capacity (m3/m)	Top of Plugback (mKB)	Casing Capacity to Plugback (m3)
244.5 mm 48.07 kg/m	228.63	224.66	0.041053	N/A	N/A
177.8mm 34.23 kg/m	161.70	158.52	0.020535	1478.7	30.37
114.3mm, 17.26 kg/m	101.60	98.43	0.008107	N/A	N/A

**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](mailto: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.

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**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 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.

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## **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, mobile boiler, and pressure tank with flare.
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.

### **Run radial cement bond log**

6. Read and record shut in pressures. If necessary, rig in the pressure tank, stake circulating lines, pressure test each to 1400 kPa low and 21,000 kPa high, and bleed pressure through pressure tank and to flare stack.
7. Rig up the wireline unit with lubricator and bench tested valve for well control.
8. Run in with a gauge ring and casing collar locator to PBTD. Pull out with tools.
9. 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.
10. Inspect tools for any traces of wax. If wax is seen, contact Calgary office so provisions later in the program can be activated. Take a sample and send to chemical company so they can recommend a treatment.
11. Rig out the wireline unit and all services.



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12. Calgary office will review the log and determine if operations are to proceed to the “Circulate well with coil tubing” section or to “Remedial perforation” section. Calgary will also notify if the “Wax in well” section will be needed. WAIT ON ORDERS.

### **Circulate well with coil tubing**

13. Mobilize and move in a coil tubing unit with Class III BOP system, mobile boiler, water truck, and catch tank.
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. Rig in circulating lines to catch tank. Ensure lines are staked and the lines and manifold are pressure as required.
16. 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.
17. Record shut in pressures. Contact Calgary if well has pressure.
18. Break down wellhead and install BOP stack. Pressure test the BOP stack connections to 1400 kPa and 21,000 kPa for 10 minutes each.
19. Rig in coil tubing injector.
20. Run in with casing scraper on coil tubing and tag existing plug back at +/- 1478.7 mKB. Pick up 0.25 meters.
21. Forward circulate well over to fresh water, over displace by 2 m<sup>3</sup> to ensure well is clean. Direct returns through pressure tank and to flocc tank.
22. Pull out of hole with coil tubing. Inspect casing scraper. If there is wax on the scraper, contact Calgary office, and then proceeded to the “Wax in well” section.
23. Close blind rams and pressure test well to 7000 kPa for 10 minutes. Bleed off pressure to the pressure tank. Open the blind rams.
24. Rig out the coil tubing injector.
25. Rig out the BOP system and reinstall the wellhead.

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26. Rig out the coil tubing unit. Clean out the floc tank and transfer recovered fluids to the slop tank at the battery for transfer to Alberta disposal.
27. Ensure lease is cleaned of all garbage and debris. Demobilize all equipment. Proceed to the “Wellhead cut and cap” section.

### **Remedial perforation**

28. Mobilize and move in a double service rig with Class III BOP system, doghouse, pump and tank, mobile boiler, pressure tank with flare, work string with +/- 1500 meters of 73mm tubing, and air safety hand.
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 prepare a site-specific ERP.
30. Transfer minimum 10 m<sup>3</sup> of fresh water to rig tank.
  - NOTE: Formations are under pressured, fresh water will be adequate for well kills. Ensure 1.5 times hole volume is on location for well kill, well is currently full.
31. Lay circulating lines from wellhead to pressure tank and to the rig tank. Stake lines and pressure test to 1.4 mPa low and 21 Mpa high for 10 minutes per test.
32. Bleed off any well pressure to the pressure tank and flare.
33. 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 preventor to 1400 kPa low and 7000 kPa high, 10 minutes each. Review and function test the accumulator system.
34. Break down the wellhead, if necessary install a landing pup and stabbing valve, then install the BOP stack. Pressure test the connections to 1.4 mPa low and 21 Mpa high for 10 minutes per test.
35. Pick up tubing off trailer and run-in hole with a casing scraper. Find PBTD at +/- 1478.7 mKb, then pull up 1 meter.
36. Forward circulate well over to fresh water, over displace by 2 m<sup>3</sup> to ensure that well is all fresh water.
37. Pull out of hole with tubing. Inspect the casing scraper for signs of wax. If there is wax, contact Calgary office and proceed to “Wax in well” section. Stand enough tubing for next operations, lay down remaining tubing.

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38. Close in blind rams. Pressure test the well to 7 Mpa for 10 minutes. Bleed off pressure and open the blind rams.
39. Move on wireline unit.
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. Rig in wireline lubricator and full opening valve for well control.
42. 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.
43. 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.
44. Rig out the wireline unit.

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

45. Pick up a cement retainer for 177.8mm casing and setting tool.
46. 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.
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.
49. Pull into neutral and pressure test tubing to 5 Mpa above the pressure established during the feed rate in previous step. Do not exceed 21 Mpa.

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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 / 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.
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 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.
57. 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.
58. Depending on the log analysis and the previous cementing operations, Calgary may order another zone to be perforated. If so, return to the “Remedial Perforation” section and contact OROGO for permission to proceed.
59. Remove BOP stack and re install wellhead.
60. Rig out the service rig. Clean the rig tank and take to slop tank at battery or to next location to use as kill fluid.
61. Ensure location is cleaned of all garbage and debris.
62. Proceed to “Wellhead cut and cap” section.

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

63. Run in hole with tubing open ended and land 16 meters below the perforations.

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64. Move on remedial cementing crew and vacuum truck.
65. 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.
66. Mix cement as per cementing program.
  - NOTE: Minimum cement plug volume is 1 m<sup>3</sup>
67. Pump cement down tubing and balance in well as per cementing program.
68. Slowly pull tubing above estimated cement top and reverse circulate 2 tubing volumes of fresh water to clean up tubing.
69. Squeeze cement into formation as per cementing program. Final squeeze pressure must exceed 7 Mpa.
70. 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.
71. After cement has set up (overnight at minimum) run in with tubing and probe cement plug. Apply 1800 decanewtons to confirm top of plug.
72. Pressure test plug and casing to 7 MPA for 10 minutes.
73. 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.
74. Depending on the log analysis and the previous cementing operations, Calgary may order another zone to be perforated. If so, return to the “Remedial Perforation” section and contact OROGO for permission to proceed.
75. Remove BOP stack and re install wellhead.
76. Rig out the service rig. Clean the rig tank and take to slop tank at battery or to next location to use as kill fluid.
77. Ensure location is cleaned of all garbage and debris.
78. Proceed to “Wellhead cut and cap” section.

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### **Wax In Well**

- NOTE: This is a contingency section to be used if wax was found in one of the previous sections. It can be used with either a service rig or coil tubing unit.
79. Move on and rig in a hot oiler, additional water, and dewaxing chemical.
  80. Run in hole with scraper and tag PBTD at 1478 mKB.
  81. Circulate heated water mixed with dewaxing chemical. Continue circulating until returns are clean.
  82. Circulate well back over to fresh water.
  83. Pull out of hole with scraper. Inspect scraper to see if there is any wax left. If so, repeat the process. Otherwise, return to the previous point in the program.

### **Wellhead Cut and Cap**

84. Move in waterjet cut and cap crew and equipment.
85. 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.
86. 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.
87. 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.
88. Backfill open excavation. Photograph the backfill.
89. Install abandoned well sign 1 meter north of the well. Sign is to meet the requirements as outlined in the attachment.
90. Release all services. Field operations are complete.

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## **Final Reporting**

91. Prepare a final downhole diagram showing the final well configuration
92. 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.
93. 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.