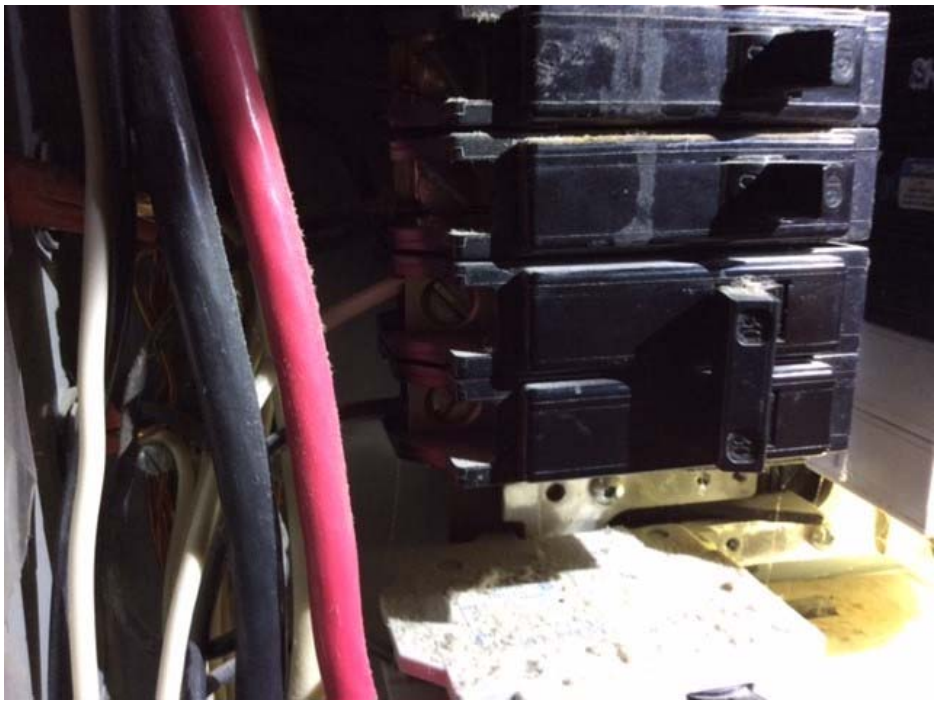
## Incident Summary (5623115))

| | | | | |
|---|---|---|---|---|
| SUPPORTING INFORMATION | Incident Date | | | *July 23, 2017* |
| | Location | | | *Armstrong, BC* |
| | Regulated industry sector | | | *Low Voltage Electrical System (30-750-volts)* |
| | Impact | Injury | Qty injuries | *1 individual and 2 pets* |
| | | | Injury description | *The one individual sustained electrical burns to legs and knees due to shock from being submersed in the body of water ( 2 pets were electrocuted)* |
| | | | Injury rating | *Major* |
| | | Damage | Damage description | *Initial damage to pump created a large release of electrical energy* |
| | | | Damage rating | *Major* |
| | Incident rating | | | *Major* |
| | Incident overview | | | - *Individual took the family pets to creek for a swim and to check submersible irrigation pump*<br>- *When the pets entered the water they immediately passed away*<br>- *The Individual, upon entering the water quickly afterwards to rescue the deceased pets received what is believed to be an electrical shock but was able to grab a branch, and crawl out and back up hillside to residence.*<br>- *The residence, approx. 150' uphill is where he collapsed and another individual found him* |
| INVESTIGATION CONCLUSIONS | Site, system and components | | | - *A residential submersible pump is normally installed and used to supply irrigation water for the grounds/gardens around the residence. The operation of the pump( when installed in an open body of water) requires ground fault protection and a control system so that in the event of electrical fault persons and property are protected* |
| | Failure scenario(s) | | | - *The water pump was reportedly malfunctioning prior to the incident, it was left in the creek and was potentially still energized.*<br>- *When the individual and pets went to the creek at the time of the incident they entered the creek near the pump and received what appeared to be an electric shock.* |

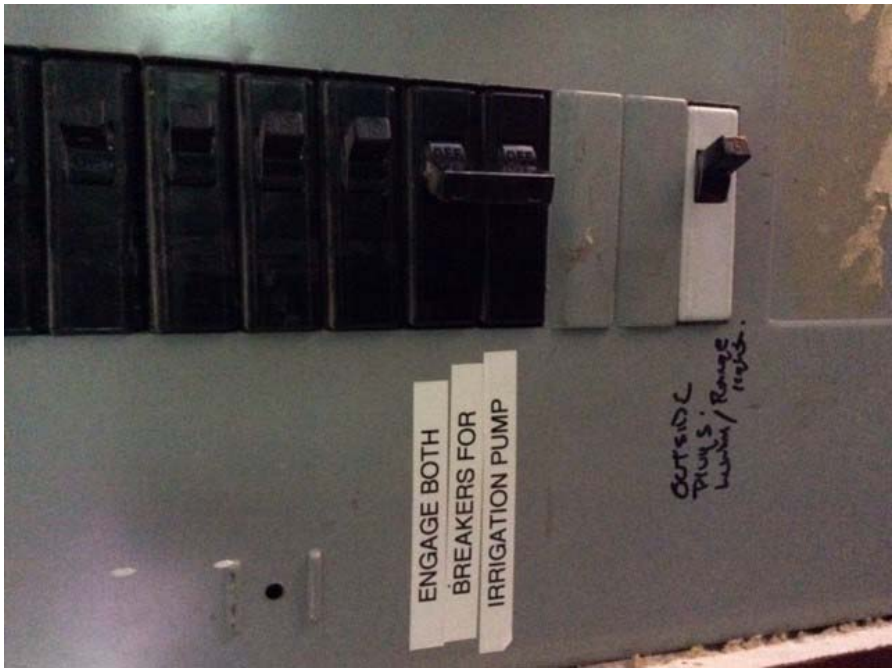
## Incident Summary (5623115))

| | |
|---|---|
| Facts and evidence | - *A witness stated they attempted to run the water pump a few days prior however it failed to operate. The pump was left alone and they would wait until the l homeowner returned from out of town, 'they believed they had the power de-energized'*<br>- *A second witness stated the wiring was existing when they purchased the site approx. 27 years ago. This witness stated he replaced the pump approx. 4-5 years ago*<br><br>*Investigation of site found;*<br><br>- *No GFCI protection for irrigation pump circuit installed at main supply source at residence or at stream location*<br>- *Multiple open splices and damaged cable were noted along the route from the residence to the stream.*<br>- *Non-compliant wiring and control methods for irrigation pump that included NMD cabling used in exposed / wet locations/*<br>- *Pump and pump control had no access to disconnecting means of equipment, with fuses not accessible without removing screws and enclosure cover*<br>- *Additional ground rods and ground cable installed with splices at creek*<br>- *A Myers submersible pump was installed in an open body of water- laying on the bottom of the creek bed*<br>- *Pump ground/bond conductor was not terminated or connected to electrical system*<br>- *Unapproved submersible splices were noted with no mechanical protection where required*<br>- *The manufacturer's instructions state that this type of pump is not to be installed in any pond, river or other open body of water that could be used for swimming or recreation due to risk of electrical shock*<br>- *Reviewed the electrical utility lines nearby to confirmed no trees or branches were in contact*<br>- *Testing at site showed a short to ground was found on all conductors.*<br>- *The pump was removed from site and taken to pump servicing center for further testing.*<br><br>*Investigation of pump at pump servicing facility;*<br><br>- *Confirmed that leads had shorted to ground*<br>- *Upon opening of the pump, the rotor was visibly jammed into stator at thrust bearing end, carbon thrust bearing was also destroyed,*<br>- *The thrust bearing was not in the right seated location* |
| Causes and contributing factors | *Evidence suggests that a mechanical failure of the pump assembly led to the electrical failure of the pump motor. With no short between phases and a resistance still in the circuit, the overcurrent device failed to see any fault.*<br><br>*It is highly probable the pump was energized at time of entry and that with multiple wiring issues of the installation it was very likely the combination of the ground- faulted submersible pump failure with no direct grounding connection to the electrical system and no approved ground fault protection created an energized body of water using the installed grounding rods as a path. A grounding system installed at the creek plus multiple unapproved splicing methods created a cable installation with a higher impedance path that did not allow the overcurrent device at the residence to operate properly* |

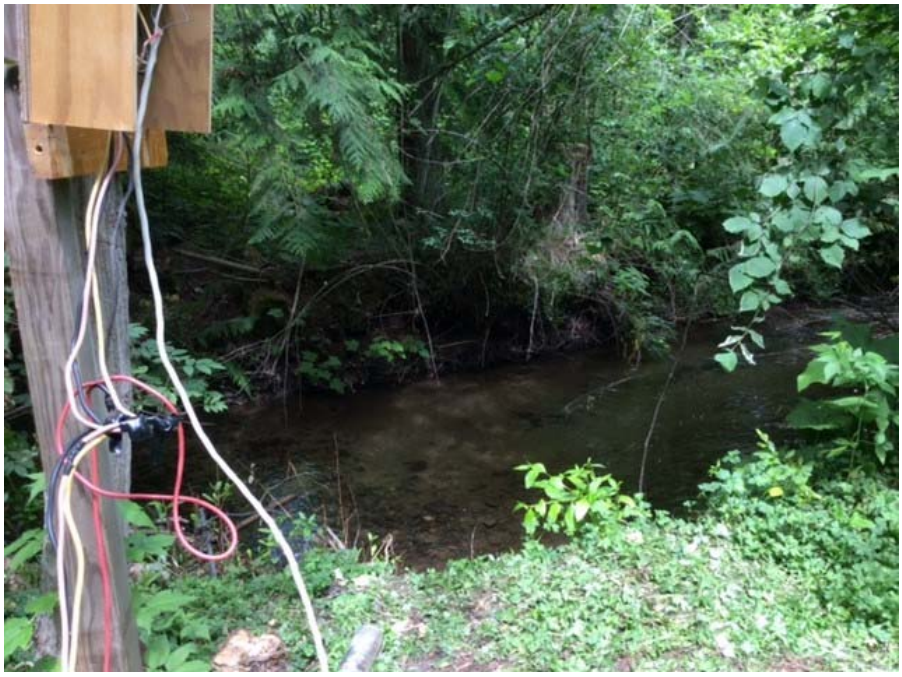
*Photos( See Below)*



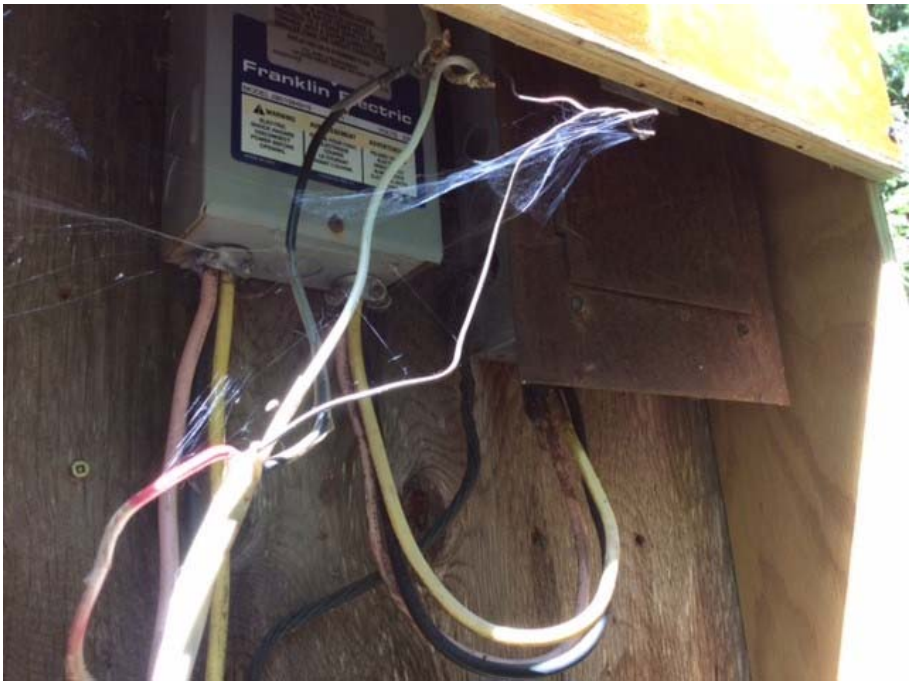
*Pump 2P 30 amp residence Overcurrent Device*



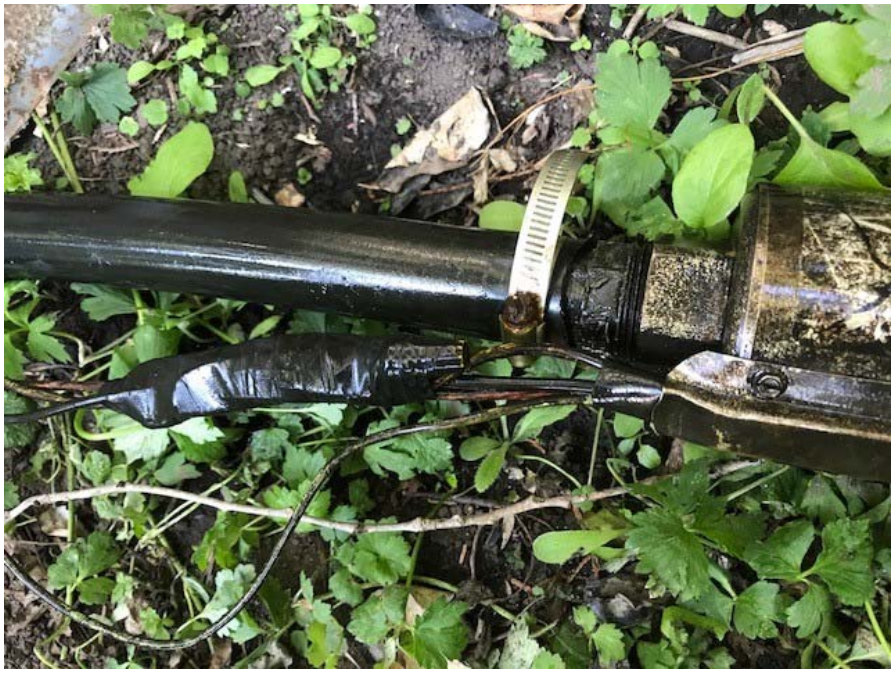

*Pump O/C device label*



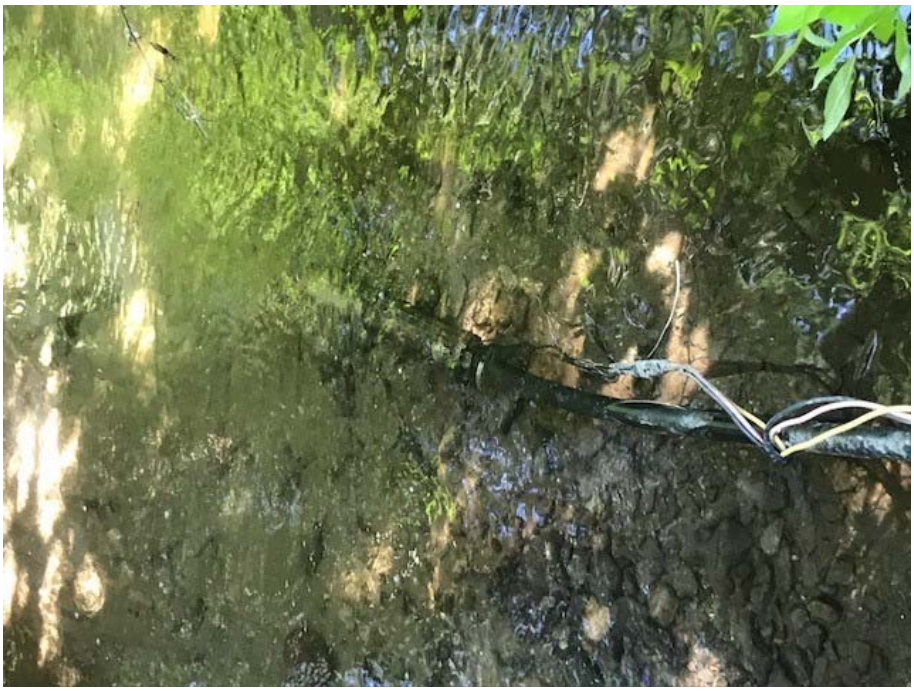
*Creek Pump location*



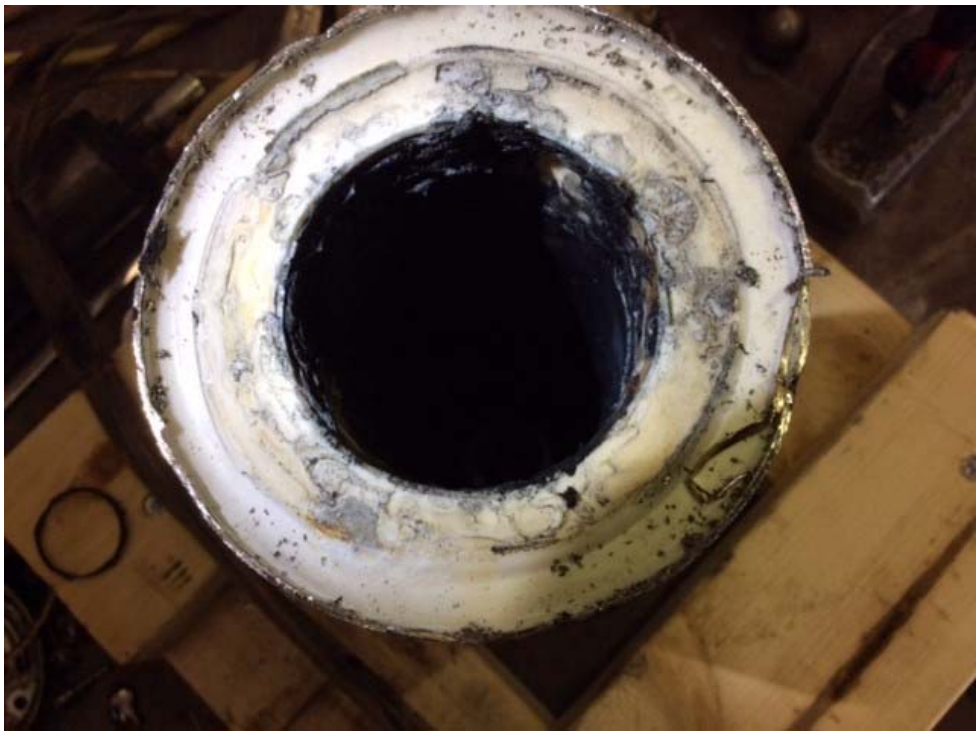

*As found existing power feeder exposed with no protection*



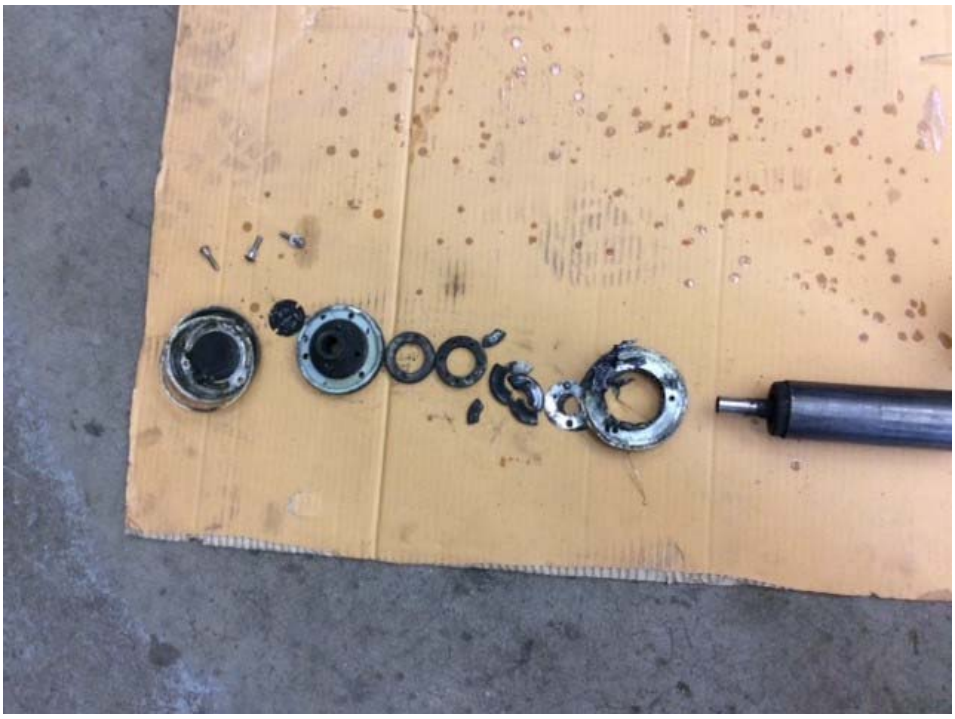
*As found splice to motor*



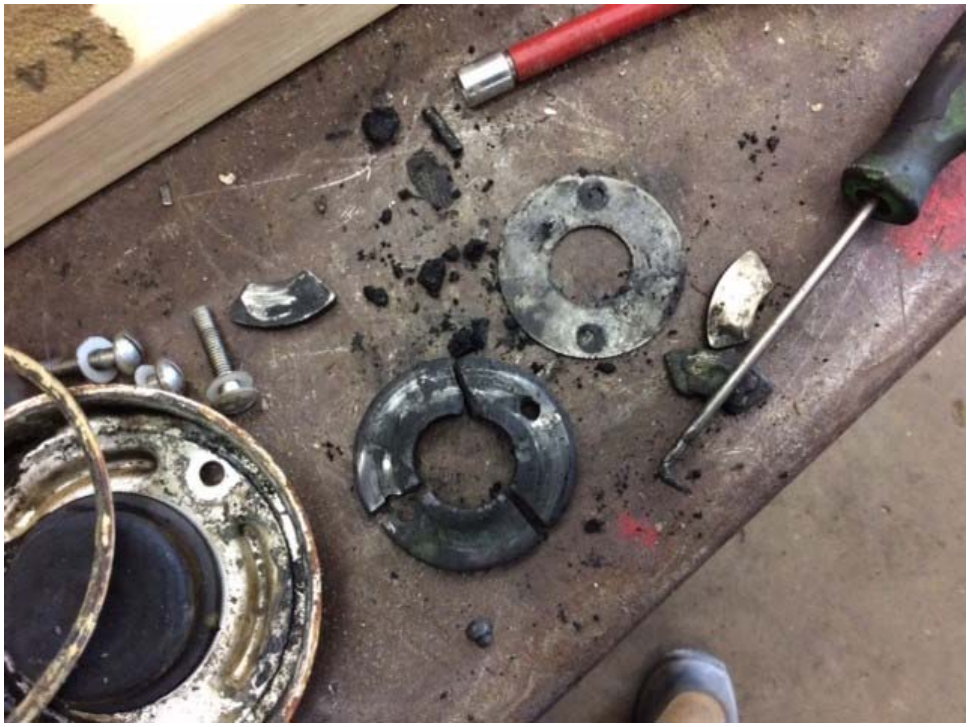
*Pump re-inserted by ESO's for metering/ meggar testing following day*



Cut end of stator- damaged noted from rotor jammed at upper right. Windings visible



Thrust bearing pump end layout



Broken Carbon Thrust Bearing