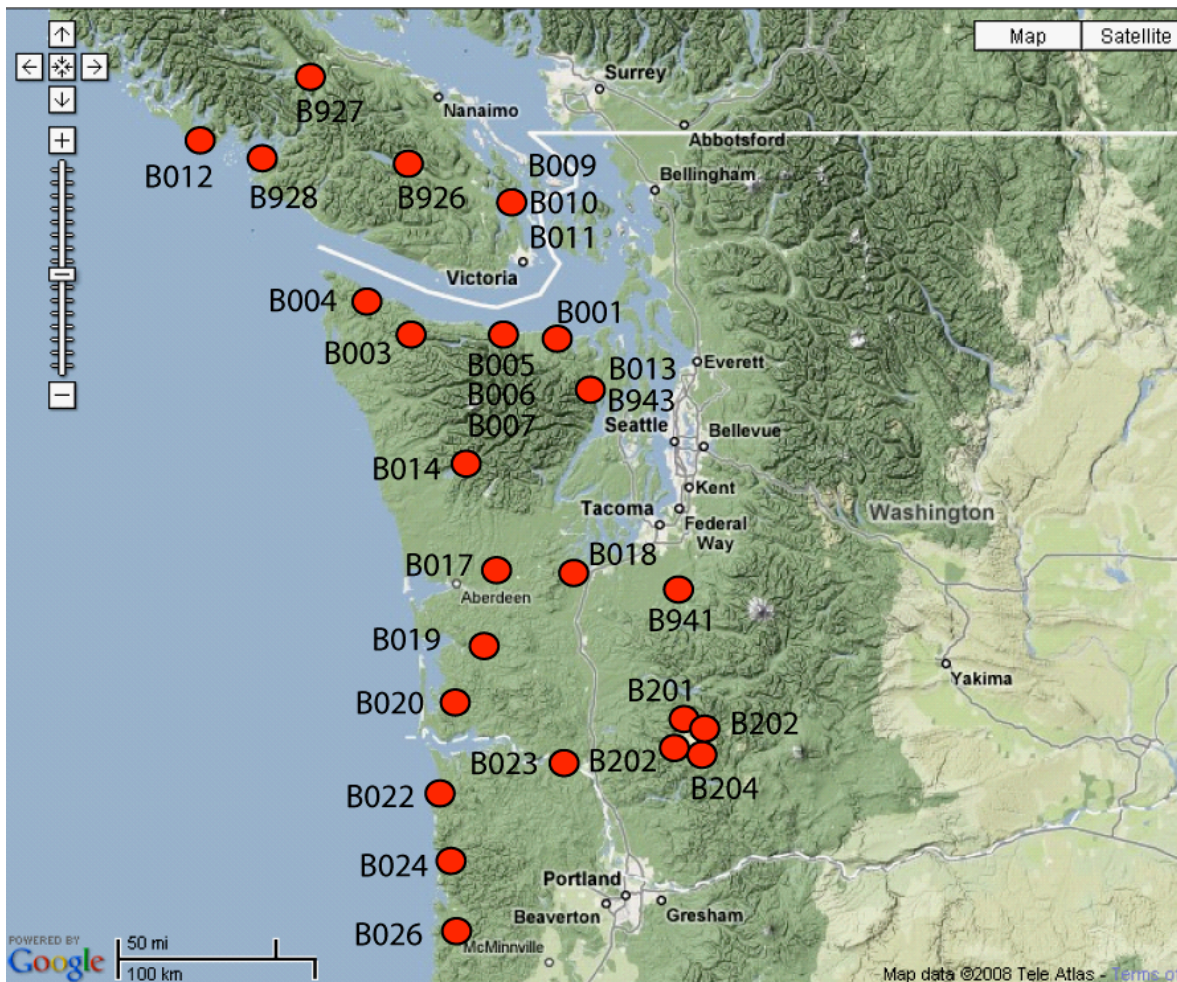


### Station Notes for B203, quarry203bwa2007

Latitude:	46.169 (WGS 84)
Longitude:	-122.334 (WGS 84)
Elevation:	814.4 m / 2672 ft
Install Depth:	226.3 m / 742.5 ft
Orientations:	CH0=290.7, CH1=230.7, CH2=170.7, CH3=140.7
Install Date:	2007-07-18
GTSM Technologies #:	US49
Executive Process	Version 1.14
Software:	
Logger Software:	Version 2.02.3
Home Page:	<a href="https://www.unavco.org/instrumentation/networks/status/pbo/overview/B203">https://www.unavco.org/instrumentation/networks/status/pbo/overview/B203</a>
Notes Last Updated:	July 17, 2019

Install depth is from the top of the casing to the bottom of the strainmeter.

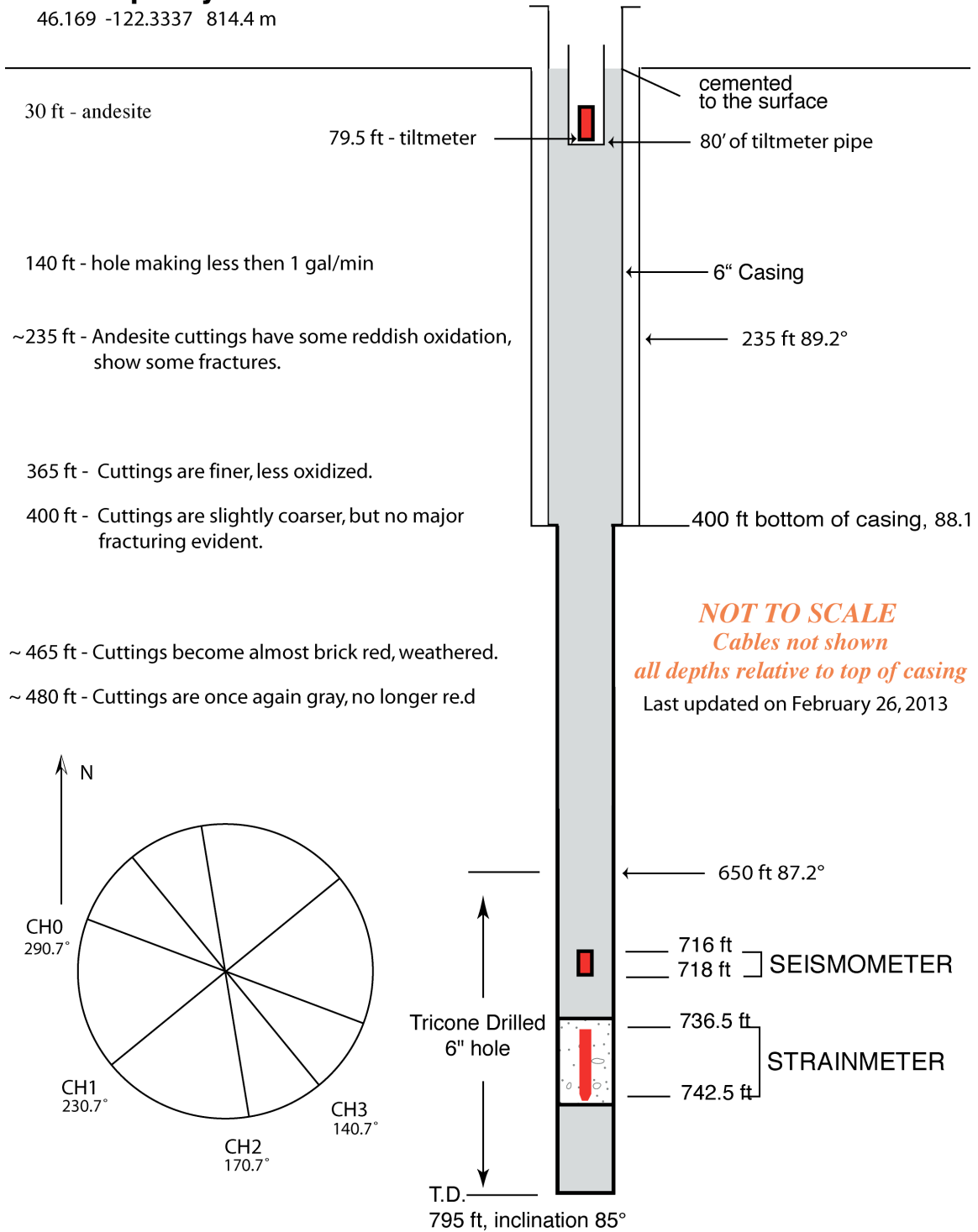
Orientations are in degrees East of North.



Pacific Northwest PBO strainmeter network, April, 2008

# B203 quarry203bwa2007

46.169 -122.3337 814.4 m



### Instrumentation at Strainmeter

Instrument	Units	Bottle/ASCII Scale Factor	SEED Scale Factor
Pore Pressure	Hecto Pascals	NONE INSTALLED	-
GTSM Barometer	Kilopascals	1.0	0.0001
Rain Gauge	Millimeters/hour	1.0	0.252
Down hole Temperature Sensor	Degrees Celsius	1.0	0.0001
Logger Temperature Sensor	Degrees Celsius	1.0	0.0001
Setra Barometer	Hecto Pascals	1.0	unknown

### 1. Installation notes

July 14, 2007

Raised hole from 794' to target depth of ~788'. US49 was put on test.

July 17, 2007

It was decided to shoot for a larger, higher install target zone between 750' and 735'. A four section dump bailer with neat cement twice was run to get as much of a raise as the engineers felt comfortable with using the bailer. 7 x 94lbs of Portland cement was used.

July 18, 2007 UTC

15:30 Crew on site. Sound hole. 744' soft bottom.

17:15 Johnson and Dittman on site after meeting with park personal at B204. Added 1 gallon of

gravel to hole

18:00 Sound hole 742.5' Just in install zone.

18:15 Calculate install and tie off marks. Install at cable mark 295.65. Tie off at 298 .

18:47 Shut down US49 .

19:00 Compass test X :2.494, 2.980 Y: 3.191, 2.679, Waiting on Game Wardens who are using access road that needs to be blocked off to do install

20:00 Game Wardens return. They offer to keep an eye on site. Warn about security issues.

20:13 Begin mixing grout.

20:16 Last bag of grout added. 1 bag, batch 161594414R7, 8 bags 161597333R7

20:17 Last water added .

20:27 Finish mixing. Pour into baler.

20:31 Baler full. 1336 on bottom of hole. Good trip .

20:44 Out of grout.

20:48 Out of hole.

20:49 GTSM in hole.

21:05 At install zone, 742.5'

21:08 GTSM powered on.

21:14 GTSM21 renamed X 3.058 Y 2.957

21:27 Called good. Clean up site .

23:00 leave site.

July 19, 2007 UTC

15:27 Arrive on site. Test seismometer 103 V: 2.409 kOhms H1 2.406 kOhms H2 2.375 kOhms

16:15 Lower seismometer on steel cable.

17:00 Seismometer 5' above bottom. Trip in 1.5" trimmy pipe

17:35 1.5" in hole. Grout at 723 feet, which puts seismometer at 718 feet. Trip in 80' of tilt meter pipe.

17:59 Tilt meter pipe in hole. Sealed on bottom using plastic soda bottle and duct tape. No end caps with pipe. Used slick tape to tie pipe to well head to keep from pulling out.

18:15 Begin cementing up hole with 5 yards Portland cement.

20:15 Hole cemented up. We had a few issues with new grout pumper, but nothing too bad.

20:30 Done cleaning up grouter and tripping out pipe.

20:31 Dig cable pit.

20:54 Shut down GTSM to bury cable.  
22:06 Pad poured.  
22:49 GTSM back on. Clean up site.  
23:36 Pulled data off of GTSM. Data looks good so far. 1645 leave site.

#### 20 July 2007 UTC

16:15 WCJ Arrives on site. Put together VSAT. Tim and Steve working on Propane for TEG. James and Andy picking up equipment from CVO. 1015 Sound hole. Cement 17feet down. Fill up hole with left over bags of cement.  
17:35 Done cementing  
1755 Shut down GTSM to set up enclosure. Of course it start raining. Recorded rain was real. Not a test  
18:21 VSAT aimed. Took ten minutes to aim and pass ACP test in pouring rain. (This is a good time in good weather!)  
19:09 GTSM back online.  
20:32 Reboot GTSM logger after changing IP's. Pack up for move to Windy Ridge.  
22:23 Shut down generator. Comms should be up till 5pm at least.  
22:30 Leave site.

#### July 23, 2007 UTC

20:00 Engineers visited the site to swap the old batteries with charged ones.

## 2. General Information

- No pore pressure infrastructure is installed at this site.
- Sensitivities of all EH channels corrected in the dataless on March 4, 2010.

## 3. Strainmeter Maintenance

- July 31, 2007 - Wade Johnson visited the site to work on the power.  
16: 00 UTC - On site. Test the TEG. Turn off power to enclosure. Reading 7.21 Volts on test points, should be 6.7 +/- .2 volts. He could still hear boiling water in combustion chamber so he adjust the fuel pressure.  
16:08 - Open enclosure. Batteries at 13.08 Volts  
16:32 - The TEG test points are set at 6.50 volts. Fuel pressure still set higher than he would like it, but will need to wait for more water to boil off.  
17:00 - Leave site. Plan to return this week.
- November 16, 2007 – Wade Johnson visited the site to get the TEG back online. After some work they got it to fire up again. They also noted that the starter wire had some corrosion on it. The TEG is now set to remote operation so it should fire up with out a visit if it goes out again. The batteries were at 10.75 V when they showed up.
- July 14, 2008 – Larry Fitzgerald, the contractor installing the bunker at this site, will be installing it on Wednesday and wanted to know if anyone from UNAVCO would be on site then. Chuck Kurnik diverted there to meet with him.

The inside dimensions of the bunker are 18' x 8' x 7' tall. The TEG and hut will fit inside, with some minor modifications. This is what was decided, and Larry will take care of all of it before or during the installation:

- The TEG must be rotated on its stand so that it can be accessed from inside the bunker.
- The sheet metal cowling surrounding the heat sink fins on the TEG may need to be shortened to accommodate the bunker after the site is graded.

- The north hut door will be modified to a "drop-in" style. As is, there is not enough space between the door and the inside of the bunker to allow the hut door to open.
- The south hut door will be lined up with the man-door in the bunker such that it will open sufficiently to allow access to the inside of the hut.
- The propane tank will be moved behind the bunker so that it is less visible.

Future maintenance:

- New pole mount required for VSAT. It is broken.
  - Rain gage is on the hut. After the bunker is installed the rain gage will be of no use inside the bunker.
- September 8, 2008  
1230 PST on site  
Swap out dead batteries for 10 new ones  
start TEG, takes ~6 start attempts to ignite. Propane fumes from misfires pretty strong inside bunker. BSM on at 1330. Channels at G3, G1, G0, G2. Likely a result of instrument cooling down being off for so long. Unable to adjust quadrature. Attempted to move rain gage outside the bunker, notice that it was damaged during the winter so didn't bother. Site needs new rain gage. Unplugged VSAT and cisco from backpanel since VSAT pole mount is broken. Plan is to either put site on radio network or replace mount in October.  
TEG putting out 14V and 7 amps when I leave at 1430.
  - September 26, 2008  
The VSAT was repaired at B203 by Wade today and this site is now back online.
  - October 24, 2008  
Wade on site, moved antenna.
  - November 20, 2008  
Rain gauge added.
  - April 27, 2009  
Out of propane, data flow stopped.
  - June 4, 2009  
Mike Gottlieb at site, it is out of propane. BSM batteries ok, but coms batteries are dead, so it will require 6 new batteries.
  - June 12, 2009  
Site has propane, but the TEG is not working properly now. It was only putting out 6 amps (~72 watts instead of 120), which was insufficient to charge the batteries and run the electronics. In order to preserve the new batteries everything was left disconnected. Will need to return with a spare TEG to get the site operational.  
B203 RTs upgraded to 1.20.

- July 2, 2009. Mike Gottlieb at site. Brought new TEG, but was unable to get it to run continuously. Tried old TEG again, but encountered similar problems. Do not appear to be getting fuel into combustion chamber after startup. Plan: return in a few days with more information/diagnostics to figure out why the TEG keeps dying.
- August 12, 2009 – Mike Gottlieb took another new TEG to the site, and was able to get it running. It took ~24 hours for the batteries to charge enough to turn on the VSAT.
- October 19, 2009 – Mike Gottlieb installed a Setra pressure sensor, and upgraded to blue fiber optic modems.
- August 8, 2010 – Used birddog for seismic calibration. Also deployed broadband at 350 deg magnetic at 19:18.
- August 11, 2010 - Removed broadband seismometer from station after collecting orientation data.
- September 2, 2010 - TEG was off when Wade and Mike arrived at the station. Batteries showed 10.5 volts, which is below cutoff for TEG starter. Checked LVD settings and verified that TEG should have restarted when batteries were between 11.8 and 11.0V. It is unclear why this did not happen. Recharged batteries with generator and TEG for several hours. Wade and Chad removed generator when batteries at 13V and TEG outputting ~100 W. Station online when leaving, but goes back offline soon after. Marmot is dead and will need to be replaced. Station needs another visit.
- October 19, 2010 – Checked batteries by turning off TEG. Batteries settled to charge of 12.7V, holding fairly steady. Decided not to swap batteries, but to add 3 more (new total 3+3 main and 2 gtsm = 8).
- January 4, 2010 – Got to site and saw that the IDU did not have transmit or system lights lit. Logged in, and saw good signal strength (77), but the unit would not transmit to check crosspole. Inspection of the co-ax connector showed corrosion in the transmit end by the ODU. They re-terminated both outdoor connections, and better weather-sealed them to prevent future corrosion. Site came back online.
- April 8, 2011 - The IDU on site was powered off and would not turn on. It was replaced, as was the power supply. The ODU was also replaced due to some corrosion on the transmit connector. The propane tanks was at 25-30%.
- July 14, 2011 – Mike visited the site to get it back online. The TEG was off and the propane tank was full. He removed 6 batteries and replaced them with 5. TEG fired, run for 10 minutes, then died. He could not get it to restart with manual switches. He adjust spark electrode gap. After that the TEG started, and run continuously the rest of the time he was on site. He also moved the TEG starter back to LVD 1. It was directly linked to the batteries, which was why the 6 batteries died in only 2 weeks

without input power. He used the generator and Iota a/c charger to help charge batteries for 1 hour (total input of  $18\text{A} \times 13\text{V} = 230\text{ watts}$ ). Mains were at  $13.7\text{ V}$ , GTSM at  $12.7\text{ V}$ , when he disconnected the generator. TEG was producing  $\sim 90\text{ W}$  ( $7\text{ A}$  at  $13\text{ V}$ ). Mains batteries are dropping quickly, apparently the GTSM was drawing  $5.5\text{ A}$  ( $\sim 65\text{W!}$ ) in order to slowly charge its 2 batteries. Leave site at 19:30 local time to make it out by dark. Coms are up but expected to go down. They should come back once the GTSM batteries are floating again, and it is no longer drawing  $65\text{ W}$ .

- September 27, 2011 – Arrived on site to find main battery bank at  $11.5\text{V}$ , GTSM at  $12\text{V}$ , the TEG off, and all equipment off. There was still 60% fuel in the tanks. TEG starter switch was in Local mode, not Remote mode. Hooked up generator to help charge batteries. Took apart fuel regulator on TEG, and tried to clean fuel filter. The filter should be replaced soon. Started TEG, fired on 1st try. The TEG probably went off and couldn't restart because it was in "Local" mode. Left at 12:00 local time, main battery bank was at  $12.6\text{V}$ , GTSM  $12.95\text{V}$ , TEG outputting  $\sim 100\text{ W}$ . All equipment was online, but coms are expected to go down for a few days until batteries are done charging.
- October 7, 2011 – Station was having significant power issues. After the last visit, the GTSM was drawing close to  $100\text{ w}$  to charge 2 batteries, which consumed all the input power from the TEG and then some. This caused the 5 mains batteries to drop below the LVD 1 cutoff, which killed the TEG (which had its starter connected to the LVD). I got to site, used a honda generator to charge the batteries, and restarted the TEG. Mike Gottlieb moved the starter for the TEG back to the batteries to make sure it stays on. After waiting for TEG to reach maximum output ( $\sim 90\text{ w}$ ), he checked and saw the GTSM was still drawing  $100\text{ w}$ , with almost negligible charging to its 2 batteries. He replaced the 2 batteries with 1 new one, which improved the situation noticeably. This battery charged much more quickly, and reduced the GTSM draw. The TEG eventually began providing enough power to have all voltages increasing.
- February 7, 2012 – Liz Van Boskirk and Chad Pyatt visited the site. IDU was offline, but all other up hole electronics were online. Swapped old IDU with new IDU, still no power. Swapped old IDU power supply with new power supply, IDU online. Swapped back to old IDU with new power supply. Site communications back online. Old power supply was on the floor of the hut. Condensation had gotten into the power supply and it failed.
- May 8, 2012 – Mike found the IDU powered off at the station. He tried a new power supply, but could only get the power light to come on (not even the LAN light). He replaced it and updated the cisco to the new IPs. He left the new power supply in place as well. He also replaced the powerbox.
- July 27, 2012 – Liz visited the site and found a failed router. The connector from the rain gauge into the GTSM power box was replaced.
- July 29, 2012 – The router was replaced. The rain gauge was tipped twice to test it.
- August 13, 2012 – The logger board was replaced due to a compact flash card failure (empty data directory). VSAT timer was installed.

- September 12, 2012 – Checked TEG fuel, air filters, gas orifice. Sediment bowl was empty. Adjusted air/fuel ratio to improve performance (Vset was only 3.9 V, increased air flow until Vset was 6.7 V). Installed the voltage sense upgrade (set points on 12.3 V off 13.76 V) Fuel tanks at 55%. Repointed VSAT, improved signal strength to 76, but xpole is only 63. Pole mount is broken and needs to be replaced. Checked LVD set points:  
LVD1 off 11.04 on 11.9  
LVD2 off 12.42 on 12.74
- November 7, 2012 – Replaced part of the pole mount, and re-pointed the dish.
- July 26, 2013 – Mike visited the site to see why it was offline. He found the regulator and the hose connecting the 2 propane tanks was missing. Northern Energy Propane will go up on Monday AM and replace the parts. He left a generator running at the station, which should keep the site collecting data until then. All data logging equipment was still running at site, so hopefully we can get this repaired without losing any data.
- July 1, 2014 – Swapped CH2 and CH3 RT boards to address poor data quality. Adjusted quad/chop for all channels.
- July 20, 2014 – An active seismic experiment was scheduled for the nights of July 22, July 23 and July 30, 2014. <http://imush.org/blog/2014/07/20/realtime-recordings-of-the-active-shots>
- May 14, 2015 – Tiltmeter averaging rate increase to 200.
- May 19, 2015 – Tiltmeter averaging rate increased to 360.
- September 22, 2015 – Replaced oscillator board to see if has any affect on data quality issues.
- January 8, 2016 – Station offline from heavy snowfall in December. Cleaned off VSAT dish, which had a large mound of snow on it. Station come back online.
- April 20, 2016 – Corrected file storage configurations from FW 2.02.3.
- May 3, 2017 – Station was out of propane, so no power. All batteries will need to be replaced. There was still 1/2 mile of snow blocking access to site, so propane truck will not be able to get there for another few weeks.
- June 28, 2017 – Replaced IDU. Old unit would only give a signal strength of zero. New IDU could only get signal strength of 51, cross pole 67, seems to work though. Could be trees are starting to block the skyview. Added rain gutters to the hut.
- November 2, 2018 - VPN tunnel was not staying up on cisco. Tried replacing router, no change. TEG output was low, causing coms LVD to drop every 20-30 minutes. This might be the cause of poor downloads. Also VSAT connection was not great, maybe due to tree growth. Will need another visit for TEG maintenance. If that does not help, will need to move VSAT dish higher on hill.
- November 6, 2018 – Power issues and slow coms were contributing to dataflow falling behind. Needed to tune TEG, make sure VPN was stays up and throughput was ok. Upon arrival TEG was only outputting 63 watts. Replaced fuel filter. Ran setup procedure, was



able to bring Vset up from about 5.9V to 6.46V. 3 turns clockwise of air control. Ran generator during this time. With steady power, VPN tunnel seemed to be staying up better. Power output from TEG was still climbing when Mike left, but already doing better (72 W) than upon arrival. Power flow appeared to be going the right direction. Will have to monitor over next few days/week to make sure power improves, dataflow resumes, and there are no lingering coms issue.

- May 8, 2019 – Site was offline during the winter. On arrival power was on, TEG was on, fuel at 10%. IDU had no transmit light or system light. No signal strength, rebooted, then 65. IDU said “transmit cable not connected”, re-terminate both ends. Did not help, IDU stopped responding all together. Rebooted IDU again, back to same error (no transmit cable connected). Replace ODU, worked briefly with a very slow connection. IDU page did not come up, needed to reboot to get it working. Signal was 66, crosspole 55 (Fail). Didn't have long ethernet cable to adjust it. Connection dropped. Tried walking back and forth adjusting 3-6 deg, no improvement. Will need to come back and really adjust dish again. Connection down from failed transmit test, did not come back.
- May 3, 2019 – Tried to repoint VSAT. Max signal strength 68, couldn't get cross pole to pass (hit 60 3 times in 45 mins) mostly in the 50s. Low signal strength likely due to alder trees blocking sky view. Need to move dish.
- June 19, 2019 – After several visits the VSAT dish was moved to a new pole much further up the hill. Tried repointing, but still got the same results (67 max pointing, high 50s max cross pole). Can't pass transmit test still. Skyview does not appear to be the problem. Running out of options to try. Will come back with several more ODUs and new firmware for IDU, see if that helps.