FILE NAME: StationRecordBullPass.doc

LAST UPDATED: 3/16/2023

STATION RECORD

## BULL PASS

**ANTARCTICA**

**STATION:** BULL PASS (ANT003)

|  |  |  |  |
| --- | --- | --- | --- |
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|  |  |  |  |

**LOCATION:** Bull Pass, Antarctica.

GPS (1/11/99): 77° 31’ 07.8” S

161° 51’ 55.4” E

870 ft elevation

GPS (12/07/99): 77° 31’ 06.7” S

161° 51’ 57.1” E

649 ft elevation

GPS (12/07/99): 77° 31’ 05.9084” S

161° 51’ 55.5174” E

152.233 m (499.45 ft) elevation

NOTE: Differential GPS at the MRC probe by Erol Balks

GPS (12/14/00): 77° 31’ 06.1” S

161° 51’ 55.4” E

500 ft elevation

GPS (01/09/02): 77° 31’ 06.1” S

161° 51’ 55.3” E

522 ft elevation

GPS (01/15/03): 77° 31’ 06.2” S

161° 51’ 55.9” E

538 ft elevation

GPS (01/7/04): 77° 31’ 06.2” S

161° 51’ 56.2” E

472 ft elevation

GPS (01/17/05): 77° 31’ 06.2” S

161° 51’ 55.8” E

GPS (01/10/06): 77° 31’ 06.1” S

161° 51’ 55.8” E

502 ft elevation

GPS (01/24/11): 77° 31’ 06.5” S

161° 51’ 45.7” E

464 ft elevation

**INSTRUMENTATION:**

Summary

|  |  |  |
| --- | --- | --- |
| Quantity | Description | Comments |
| (1) | Campbell CR-10X-2M datalogger S/N: X14676. Wiring panel S/N: 6327. | Installed 1999. Replaced 12/00 because of factory recall. |
| 1 | Campbell CR-10X-2M datalogger S/N: X24396. Wiring panel S/N: 6327. | Installed 12/00, Replaced 01/12 |
| 1 | Campbell AM416 multiplexer S/N: 11647. | Installed 1999. |
| 1 | Campbell SM4M storage module S/N: 3469 (Bull Pass (A)); alternate S/N 3468 (Bull Pass (B)) | Installed 1/15/03. |
| 3 | Campbell BP24 24-amp-hr YUASA battery | Installed 2006, 2007, 2008 |
| (1) | Power-Sonic 30AH battery | Installed 1999. Provided by Ron Sletten. Removed in 2005. |
| 1 | Campbell CH12R charger/regulator S/N: 1804. | Installed 1999. |
| 1 | Campbell MSX-20 Solar panel. | Installed 1999. |
| 1 | Campbell ENC 16/18 enclosure. | Installed 1999. |
| 1 | Campbell CM10 3-m tower | Installed 1999. |
| 12 | Vitel dielectric constant soil moisture/temperature sensors. | Installed 1999. |
| 3 | Campbell 107B soil temperature sensors | Installed 1999. |
| 1 | MRC soil temperature probe | Installed 1999. |
| 2 | Humidity sensor chips | Installed (soil)1999. From Chris McKay. |
| 2 | Soil resistance sensors (field fabricated) | Installed (soil) 1999. |
| 1 | Campbell RM Young RTD Air Temp Probe w/hex plug. | Installed 1999. |
| 1 | Campbell HMP45C-L solar radiation shields for RTD probe | Installed 1999. |
| 1 | Licor LI200X pyranometer solar radiation sensors. | Installed 1999. |
| 1 | Licor pyranometer solar radiation sensor leveling fixtures. | Installed 1999. |
| 1 | Pyranometer mounting arms. | Installed 1999. |
| (1) | Met One wind speed & direction sensors (S/N: D4431) | Installed 1999; Replaced 12/99. Replaced 2005. Removed 01/07 |
| 1 | RM Young wind sensor | Installed 2007. |
| 1 | Wind sensor mounting arms | Installed 1999. |
| 1 | Campbell HMP45C Relative Humidity and Radiation Shield | Installed 01/08. Replaced 01/09 |

**HISTORY:**  January 13, 1999: Station initiated. Two stacks of five Vitel Hydra probes were installed and attached to a Campbell Scientific CR10X-2M datalogger. Two additional Vitel sensors were installed under a rock at about 40 cm. One soil RH sensor (supplied by Sletten) was installed at five cm and another at 15 cm. Three Campbell 107 temperature sensors were installed and attached to the datalogger. One of the 107s was placed under a white rock, one under a black rock, and the third between the Vitel sensors under the rock at 42 cm. The two soil resistance sensors were placed at a depth of 15 cm (duplicates). Above ground sensors are one Licor pyranomerer, one Met One wind speed and direction sensor, and one RM Young RTD air temperature sensor. The above ground sensors were mounted on the tower using appropriate brackets. The air temperature sensor was mounted in a solar radiation shield. The wind and solar radiation sensors were mounted three meters above the ground surface. The air temperature/relative humidity sensor was mounted approximately 1.6 meters above the ground surface. The datalogger, a Campbell AM416 multiplexer, and a Campbell BP24 power supply, were located inside of a Campbell ENC16/18 enclosure. The enclosure was mounted on a Campbell CM10 3-m tower. Power is supplied by a Campbell (SolarX) MSX20 solar panel, mounted on the tower. The solar panel faces true north and is perpendicular to the surface of the earth. An additional Power-Sonic 30AH battery was connected in parallel to battery in the enclosure. The additional battery was placed in a wooden box. Datalogger was set to New Zealand Standard Time. Midnight is 2400. The datalogger program, *Ant3*, was downloaded to the datalogger. Measurements are made at 20-minute intervals and averaged and recorded every hour. Measurements of solar radiation and wind are made at 10-second intervals and averaged and recorded every hour. Wind speed sensor is not working.

December 7, 1999: Mountain to the north of site blocks sun early in the year. Adjusted solar panel to get better angle for the sun just over the mountain. Replaced faulty wind sensor. Downloaded data. Downloaded new CR10 program, *Ant3*, to eliminate duplicate output of Campbell 207 humidity sensors and correct solar radiation sensor multiplier (from 400 to 200). Vitel #45 looks low. R1 and R2 look low. Everything else looks OK. Added desiccant.

December 14, 2000: Checked solar panel for sandblast — no apparent damage. Downloaded data to Ant3.dat. Replaced recalled CR10X-2M datalogger with CR10X-2M-XT. Downloaded program *Ant3 v.2.00*. Program same as before — no changes. The positive wire for the second battery fell off. Soldered it to the main battery input wire. Everything seems to be working OK. Added desiccant. Downloaded data again on December 16, 2000.

January 9, 2002: Checked solar panel for sandblast — no apparent damage. Downloaded data to Ant3.dat. Downloaded data to Ant3.dat. Everything seems to be working OK. Some sand had blown into enclosure. Front of box sandblasted so that Campbell logo and STM Team decal almost gone.

January 15, 2003: Checked solar panel for sandblast — no apparent damage. Downloaded data to SM4M Bull Pass (B). Set datalogger ID to 71. Everything seems to be working OK. Some sand had blown into enclosure. Front of box sandblasted so that Campbell logo and STM Team decal are gone.

January 7, 2004: Retrieved the Campbell SM4M storage module S/N: 3469 (Bull Pass (A)) and installed the alternate S/N 3468 (Bull Pass (B)). Installed a second Campbell BP24 24-amp-hr YUASA battery. Replaced the desiccant. Checked the Li battery.

January 17, 2005: Retrieved the alternate Campbell SM4M storage module S/N: 3468 (Bull Pass (B)) and installed S/N 3469 (Bull Pass (A)). Swapped the outside battery. Used crimp type butt splices to connect the wiring. Outside wiring was encased in automotive wire sheathing. Put date on the new battery. Swapped desiccant packs. Replaced the Met-One anemometer. Bearings were noisy. Used existing wiring. Voltages: SPR-14.055 vdc, station batteries-12.68 vdc, Li battery-3.134 vdc. Station time 9:27 AM, actual time 11:12 AM NZST. Station was reset back to NZST. Drift spans two years because time was not reset last season. Taped down loose wires. Some pitting of NEMA cabinet from flying rocks and surface is sand blasted through into the fiberglass. It is still structurally sound, however. Solar panel is in good shape. Wiped off the LI200 pyranometer. Took station pictures looking N,E,S,W. Weather conditions: clear, -2C, wind 5-10 mph.

January 10, 2006: Added two new battery containment boxes that are located on the ground. Replaced one 24 amp-hr battery, which was on the ground. Secured boxes in place with rocks. Downloaded data and program from datalogger. Swapped storage modules (put in module with SN:5995). There was no difference between PC and station clock. Wind vane was tilted off its vertical axes and not giving correct data; need to replace for next time. Vitel #11 was not reading correctly. Everything else seemed to be working okay. Added three packs of desiccant. Weather conditions: partly cloudy, calm, 1°C.

January 16, 2007: The wind vane was broke off its vertical axis. Wind sensor was replaced with an RM Young sensor. Station clock was 1:10 minutes behind. Reset clock. Downloaded data and swapped storage modules. Downloaded new program (BULLREV3.dld). Added two desiccant packs. Everything seemed to be working okay.

January 17, 2008: Downloaded data and swapped storage modules. Station clock was one minute behind. Added a Campbell HMP45C, relative humidity sensor and radiation shield. The RH sensor is about 80 inches (2 m) above the ground. Downloaded new program to read the new RH sensor (BULLREV4.dld). The soil electrical resistance wires on the multiplexer were not in the correct location as indicated on the wiring diagram. These wires were rewired as indicated on the wiring diagram. They were reading zero—tried to fix program, but could not get any meaningful readings. The soil RH sensors were reading okay. Everything else seemed to be working okay. Replaced one 24 Ah battery. Added two desiccant packs.

January 19, 2009: 3:00 PM Downloaded data and swapped storage modules. Station clock was okay. Battery voltage was 14.07 volts. Replaced one 24 Ah battery. Relative humidity was reading 15%. Replaced top part of sensor and RH was then reading 11%, air temp was okay. Check program. Everything else seemed to be working okay.

January 19, 2010: Downloaded data and swapped storage modules. Station clock was 16 min behind; reset clock. It was noted later that the clock may have been set to the wrong time; maybe an hour off; check for next time. Lithium battery was reading 3.06 volts. Replaced one 24 Ah battery. Everything seemed to be working okay.

January 24, 2011: Downloaded data and swapped storage modules. Station clock was 1 hr behind; reset clock. Corrected the time in the raw data. Lithium battery was reading 3.19 volts. Replaced one 24 Ah battery. Added two desiccant packs. MRC was 0.5 cm out of the ground. Everything seemed to be working okay. Replace data logger for next time.

January 20, 2012: Swapped storage modules. Station clock was 30 sec behind. Lithium battery was 3.2 V and battery voltage was 13.4 V. Replaced the datalogger (program was already on the new datalogger along with a new battery). Lithium battery voltage was 2.92. Station clock was okay. Replaced one 24 Ah battery. Added two desiccant packs. MRC was 0.5 cm out of the ground. Added a guy kit to the tripod and secured the turn-buckles. Wind sensor was okay. Everything seemed to be working okay.

December 17, 2012: Downloaded data and swapped storage modules. Station clock was 11 minutes behind; reset clock. Lithium battery was 3.04 V and battery voltage was 14.06 V. Replaced one 24 Ah battery. MRC was 0.5 cm out of the ground. Guy cables were okay. Wind sensor was okay. Everything seemed to be working okay. Weather conditions: 1.1ºC and 15 mph winds, clear skies.

January 6, 2014: Swapped storage modules. Battery voltage was 13.9 V. Replaced one 24 Ah battery. Weather conditions: 5.2ºC and 10 mph winds.

January 15, 2015: 0853 NZDT. Downloaded datalogger and swapped storage modules. Lithium battery was 3.089. Difference between station and PC time was 7 min 40 sec. MRC probe fully buried. Changed battery during download. Weather measured on hand-held kestrel 3500; Measurement time 0924 NZDT; Wind max 1-3 Knots, Temp 1.5 Degrees F, RH: 60 %, Dewpoint -8.5 Degrees C, Wetbulb -3.2 Degrees C.

January 15, 2016: Downloaded datalogger and swapped storage modules. Lithium battery was 3.1 V. Station clock was 18 min ahead; reset clock. The oldest battery was replaced. Wind direction reading may be slightly off. MRC is 2.8 cm out of the ground.

January 2, 2017: Downloaded datalogger and swapped storage modules.

January 20, 2018: Downloaded datalogger and swapped storage modules. No data appeared to be downloaded. Program said it was running. Stopped and restarted the program. Number display gives zeros. Data file looks good. Replaced the oldest battery. Chips on RM Young blades. MRC Height 21mm.

January 12, 2019: Downloaded datalogger and swapped storage modules.

December 26, 2019: Downloaded datalogger and swapped storage modules.

February 5, 2021: Downloaded datalogger and swapped storage modules.

December 3, 2021: Downloaded datalogger and swapped storage modules. Swapped battery. MRC height above ground is 2 cm. Reset clock (NZST).

December 12, 2021: Downloaded datalogger and swapped storage modules. MRC height above ground is 1.5 cm. Rest clock to UTC. (2:42pm to 2:34am).

| MULTIPLEXER  POSITION | STACK | VITEL PROBE  # | DEPTH  (cm) | COMMENTS |
| --- | --- | --- | --- | --- |
| 1 | 1 | 1-2 | 2 |  |
| 2 | 1 | 1-20 | 20 |  |
| 3 | 1 | 1-30 | 30 |  |
| 4 | 1 | 1-50 | 50 |  |
| 5 | 1 | 1-120 | 120 |  |
| 6 | 2 | 2-2 | 2 |  |
| 7 | 2 | 2-20 | 20 |  |
| 8 | 2 | 2-30 | 30 |  |
| 9 | 2 | 2-50 | 50 |  |
| 10 | 2 | 2-120 | 120 |  |
| 11 | 3 | 3-8 | 42 | Under east side of rock. BAD SENSOR |
| 12 | 3 | 3-9 | 40 | Under west side of rock |

| MULTIPLEXER  POSITION | STACK | 107 TEMP  PROBE # | DEPTH  (cm) | COMMENTS |
| --- | --- | --- | --- | --- |
| 13H1 | 4 | 1 |  | Surface, under white rock. |
| 13L1 | 4 | 2 |  | Surface, under black rock. |
| 13H2 | 4 | 3 | 42 | Between Vitels 3-8 and 3-9. |

| MULTIPLEXER  POSITION | STACK | SENSOR  # | DEPTH  (cm) | COMMENTS |
| --- | --- | --- | --- | --- |
| 14H1 |  | RH3 | 5 | Relative humidity sensor. |
| 14L1 |  | RH4 | 15 | Relative humidity sensor. |
| 15H1 |  | R1 | 15 | Soil electrical resistance sensor. |
| 16H1 |  | R2 | 15 | Soil electrical resistance sensor. |

**DATA:**

DATALOGGER OUTPUT:

| COL | OUTPUT | UNITS | LOCATION | SENSOR | COMMENTS |
| --- | --- | --- | --- | --- | --- |
| 1 | Station ID | N/A | N/A | Campbell CR10 | 003 |
| 2 | Year | N/A | N/A | Campbell CR10 |  |
| 3 | Day | N/A | N/A | Campbell CR10 |  |
| 4 | Time | N/A | N/A | Campbell CR10 | NZ standard time |
| 5 | Battery | Volts | Enclosure | Campbell CR10 |  |
| 6 | Lithium Bat | Volts | Datalogger | Campbell CR10 | Added 1/16/07 |
| 7 | Int Temp | ºC | Datalogger | Campbell CR10 |  |
| 8 | Air Temp | ºC | Air 1.6 m | Campbell RM Young RTD |  |
| 9 | Solar Rad | W/m2 | Air 3 m | LiCor LI200X |  |
| 10 | Wind Speed | mph | Air 3 m | Met One; replaced with RM Young sensor 01/16/07 | Original defective  Replaced Dec 99 |
| 11 | Wind Dir | azimuth | Air 3 m | Met One; replaced with RM Young sensor 01/16/07 | True North |
| 12 | 1V1 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 13 | 1V2 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 14 | 1V3 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 15 | 1V4 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 16 | 2V1 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 17 | 2V2 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 18 | 2V3 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 19 | 2V4 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 20 | 3V1 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 21 | 3V2 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 22 | 3V3 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 23 | 3V4 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 24 | 4V1 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 25 | 4V2 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 26 | 4V3 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 27 | 4V4 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 29 | 5V1 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 29 | 5V2 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 30 | 5V3 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 31 | 5V4 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 32 | 6V1 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 33 | 6V2 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 34 | 6V3 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 35 | 6V4 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 36 | 7V1 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 37 | 7V2 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 38 | 7V3 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 39 | 7V4 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 40 | 8V1 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 41 | 8V2 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 42 | 8V3 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 43 | 8V4 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 44 | 9V1 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 45 | 9V2 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 46 | 9V3 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 47 | 9V4 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 48 | 10V1 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 49 | 10V2 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 50 | 10V3 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 51 | 10V4 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 52 | 11V1 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 53 | 11V2 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 54 | 11V3 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp | Low output - Bad sensor |
| 55 | 11V4 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 56 | 12V1 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 57 | 12V2 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 58 | 12V3 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 59 | 12V4 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 60 | Soil Temp | ºC | Soil | Campbell 107 | Surface under white rock. |
| 61 | Soil Temp | ºC | Soil | Campbell 107 | Surface under black rock. |
| 62 | Soil Temp | ºC | Soil 42 cm | Campbell 107 | Under rock between Vitels. |
| 63 | Soil RH | % | Soil 5 cm | Campbell 207 chips | McKay |
| 64 | Soil RH | % | Soil 15 cm | Campbell 207 chips | McKay |
| 65 | Soil electrical resistance |  | Soil 15 cm |  | Field fabricated. |
| 66 | Soil electrical resistance |  | Soil 15 cm |  | Field fabricated. |
| 67 | Soil Temp | ºC | Soil 0 in | MRC Temperature Probe |  |
| 68 | Soil Temp | ºC | Soil 3 in | MRC Temperature Probe |  |
| 69 | Soil Temp | ºC | Soil 6 in | MRC Temperature Probe |  |
| 70 | Soil Temp | ºC | Soil 9 in | MRC Temperature Probe |  |
| 71 | Soil Temp | ºC | Soil 12 in | MRC Temperature Probe |  |
| 72 | Soil Temp | ºC | Soil 18 in | MRC Temperature Probe |  |
| 73 | Soil Temp | ºC | Soil 24 in | MRC Temperature Probe |  |
| 74 | Soil Temp | ºC | Soil 30 in | MRC Temperature Probe |  |
| 75 | Soil Temp | ºC | Soil 36 in | MRC Temperature Probe |  |
| 76 | Soil Temp | ºC | Soil 42 in | MRC Temperature Probe |  |
| 77 | Soil Temp | ºC | Soil 48 in | MRC Temperature Probe |  |
| 78 | Resistance |  |  | MRC Temperature Probe | Reference value |
| 79 | Soil RH | % | Soil 5 cm | Campbell 207 chips | Repeat of 62. Eliminated from program Dec 99. |
| 80 | Soil RH | % | Soil 15 cm | Campbell 207 chips | Repeat of 63. Eliminated from program Dec 99. |

DATALOGGER OUTPUT: As of 01/17/08

| COL | OUTPUT | UNITS | LOCATION | SENSOR | COMMENTS |
| --- | --- | --- | --- | --- | --- |
| 1 | Station ID | N/A | N/A | Campbell CR10 | 003 |
| 2 | Year | N/A | N/A | Campbell CR10 |  |
| 3 | Day | N/A | N/A | Campbell CR10 |  |
| 4 | Time | N/A | N/A | Campbell CR10 | NZ standard time |
| 5 | Battery | Volts | Enclosure | Campbell CR10 |  |
| 6 | Lithium Bat | Volts | Datalogger | Campbell CR10 | Added 1/16/07 |
| 7 | Int Temp | ºC | Datalogger | Campbell CR10 |  |
| 8 | Air Temp | ºC | Air 2 m | Campbell RM Young RTD |  |
| 9 | Air Temp | ºC | Air 2 m | Campbell HMP45C | Added 1/17/08 |
| 10 | RH | % | Air 2 m | Campbell HMP45C | Added 1/17/08 |
| 11 | Solar Rad | W/m2 | Air 3 m | LiCor LI200X |  |
| 12 | Wind Speed | mph | Air 3 m | Met One; replaced with RM Young sensor 01/16/07 | Original defective  Replaced Dec 99 |
| 13 | Wind Dir | azimuth | Air 3 m | Met One; replaced with RM Young sensor 01/16/07 | True North |
| 14 | 1V1 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 15 | 1V2 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 16 | 1V3 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 17 | 1V4 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 18 | 2V1 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 19 | 2V2 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 20 | 2V3 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 21 | 2V4 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 22 | 3V1 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 23 | 3V2 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 24 | 3V3 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 25 | 3V4 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 26 | 4V1 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 27 | 4V2 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 29 | 4V3 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 29 | 4V4 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 30 | 5V1 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 31 | 5V2 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 32 | 5V3 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 33 | 5V4 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 34 | 6V1 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 35 | 6V2 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 36 | 6V3 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 37 | 6V4 | Volts | Soil 2 cm | Vitel Soil Moisture/Temp |  |
| 38 | 7V1 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 39 | 7V2 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 40 | 7V3 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 41 | 7V4 | Volts | Soil 20 cm | Vitel Soil Moisture/Temp |  |
| 42 | 8V1 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 43 | 8V2 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 44 | 8V3 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 45 | 8V4 | Volts | Soil 30 cm | Vitel Soil Moisture/Temp |  |
| 46 | 9V1 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 47 | 9V2 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 48 | 9V3 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 49 | 9V4 | Volts | Soil 50 cm | Vitel Soil Moisture/Temp |  |
| 50 | 10V1 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 51 | 10V2 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 52 | 10V3 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 53 | 10V4 | Volts | Soil 120 cm | Vitel Soil Moisture/Temp |  |
| 54 | 11V1 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 55 | 11V2 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 56 | 11V3 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp | Low output - Bad sensor |
| 57 | 11V4 | Volts | Soil 42 cm | Vitel Soil Moisture/Temp |  |
| 58 | 12V1 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 59 | 12V2 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 60 | 12V3 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 61 | 12V4 | Volts | Soil 40 cm | Vitel Soil Moisture/Temp |  |
| 62 | Soil Temp | ºC | Soil | Campbell 107 | Surface under white rock. |
| 63 | Soil Temp | ºC | Soil | Campbell 107 | Surface under black rock. |
| 64 | Soil Temp | ºC | Soil 42 cm | Campbell 107 | Under rock between Vitels. |
| 65 | Soil RH | % | Soil 5 cm | Campbell 207 chips | McKay |
| 66 | Soil RH | % | Soil 15 cm | Campbell 207 chips | McKay |
| 67 | Soil electrical resistance |  | Soil 15 cm |  | Field fabricated. |
| 68 | Soil electrical resistance |  | Soil 15 cm |  | Field fabricated. |
| 69 | Soil Temp | ºC | Soil 0 in | MRC Temperature Probe |  |
| 70 | Soil Temp | ºC | Soil 3 in | MRC Temperature Probe |  |
| 71 | Soil Temp | ºC | Soil 6 in | MRC Temperature Probe |  |
| 72 | Soil Temp | ºC | Soil 9 in | MRC Temperature Probe |  |
| 73 | Soil Temp | ºC | Soil 12 in | MRC Temperature Probe |  |
| 74 | Soil Temp | ºC | Soil 18 in | MRC Temperature Probe |  |
| 75 | Soil Temp | ºC | Soil 24 in | MRC Temperature Probe |  |
| 76 | Soil Temp | ºC | Soil 30 in | MRC Temperature Probe |  |
| 77 | Soil Temp | ºC | Soil 36 in | MRC Temperature Probe |  |
| 78 | Soil Temp | ºC | Soil 42 in | MRC Temperature Probe |  |
| 79 | Soil Temp | ºC | Soil 48 in | MRC Temperature Probe |  |
| 80 | Resistance |  |  | MRC Temperature Probe | Reference value |
| 81 | Soil RH | % | Soil 5 cm | Campbell 207 chips | Repeat of 62. Eliminated from program Dec 99. |
| 82 | Soil RH | % | Soil 15 cm | Campbell 207 chips | Repeat of 63. Eliminated from program Dec 99. |

DATA PROCESSING ALGORITHMS:

Vitel Hydra Probe soil moisture, temperature, complex dielectric constant, electrical conductivity, and salinity are determined from the raw data (four voltages), and a calibration option (1, 2, or 3), depending on the soil texture, with a program supplied by Vitel, Inc. Option 1 (sand) is used here.

DATA STORAGE AND ACCESS:

Contact Cathy Seybold or Deb Harms. Data are in Excel files organized by calendar year. Data can be downloaded from the NSSC website at <http://soils.usda.gov/survey/scan/>. Each file consists of a page containing all downloaded data for that year and 12 pages of processed Vitel sensor data (one page for each sensor) with the following column headings: SENSOR, SOIL (calibration option), ER (real part of the soil dielectric constant), EI (imaginary part of the soil dielectric constant), TEMP (soil temperature ºC), ER-COR (temperature corrected ER), EI\_COR (temperature corrected EI), WATER (volume fraction soil water content), SALINITY (soil salinity in g/l NaCl), SOIL\_COND (soil electrical conductivity in S/m or mhos/m), SOIL\_COND\_COR (temperature corrected SOIL\_COND in S/m or mhos/m), WATER\_CON\_COR (temperature corrected soil water electrical conductivity in S/m or mhos/m). The column headings for the annual data are: ID (site), YEAR, DAY OF YEAR, HOUR, TIME, DATE, BATT VOLT (battery voltage), INT TEMP ºC (datalogger temperature), AIR TEMP (ºC), RH (%), SOLAR RADIATION (w m-2), WIND SPEED (mph), WIND DIR (deg from true north), 1V1 (2-cm depth, Vitel stack 1), 1V2 (2-cm depth, Vitel stack 1), 1V3 (2-cm depth, Vitel stack 1), 1V4 (2-cm depth, Vitel stack 1), 2V1 (20-cm depth Vitel, stack 1), 2V2 (20-cm depth Vitel, stack 1), 2V3 (20-cm depth Vitel, stack 1), 2V4 (20-cm depth Vitel, stack 1), 3V1 (30-cm depth Vitel, stack 1), 3V2 (30-cm depth Vitel, stack 1), 3V3 (30-cm depth Vitel, stack 1), 3V4 (30-cm depth Vitel, stack 1), 4V1 (50-cm depth Vitel, stack 1), 4V2 (50-cm depth Vitel, stack 1), 4V3 (50-cm depth Vitel, stack 1), 4V4 (50-cm depth Vitel, stack 1), 5V1 (120-cm depth, Vitel stack 2), 5V2 (120-cm depth, Vitel stack 2), 5V3 (120-cm depth, Vitel stack 2), 5V4 (120-cm depth, Vitel stack 2), 6V1 (2-cm depth, Vitel stack 2), 6V2 (2-cm depth Vitel, stack 2), 6V3 (2-cm depth Vitel, stack 2), 6V4 (2-cm depth Vitel, stack 2), 7V1 (20-cm depth, Vitel stack 2), 7V2 (20-cm depth, Vitel stack 2), 7V3 (20-cm depth, Vitel stack 2), 7V4 (20-cm depth, Vitel stack 2), 8V1 (30-cm depth, Vitel stack 2), 8V2 (30-cm depth Vitel, stack 2), 8V3 (30-cm depth Vitel, stack 2), 8V4 (30-cm depth Vitel, stack 2), 9V1 (50-cm depth, Vitel stack 3), 9V2 (50-cm depth Vitel, stack 3), 9V3 (50-cm depth Vitel, stack 3), 9V4 (50-cm depth Vitel, stack 3), 10V1 (120-cm depth, Vitel stack 3), 10V2 (120-cm depth Vitel, stack 3), 10V3 (120-cm depth Vitel, stack 3), 10V4 (120-cm depth Vitel, stack 3), 11V1 (42-cm depth, Vitel stack 3), 11V2 (42-cm depth Vitel, stack 3), 11V3 (42-cm depth Vitel, stack 3), 11V4 (42-cm depth Vitel, stack 3), 12V1 (40-cm depth, Vitel stack 3), 12V2 (40-cm depth Vitel, stack 3), 12V3 (40-cm depth Vitel, stack 3), 12V4 (40-cm depth Vitel, stack 3), SOIL T under white rock ºC, SOIL T under black rock ºC, SOIL T 42 cm ºC, SOIL RH % 5 cm, SOIL RH % 15 cm, SOIL ELECTRICAL RESISTANCE (1) 15 cm, SOIL ELECTRICAL RESISTANCE (2) 15 cm, MRC1 0-in ºC, MRC2 3-in ºC, MRC3 6-in ºC, MRC4 9-in ºC, MRC5 12-in ºC, MRC6 18-in ºC, MRC7 24-in ºC, MRC8 30-in ºC, MRC9 36-in ºC, MRC10 42-in ºC, MRC11 48-in ºC, MRC12 reference resistor, WIND SPEED (m s-1).

**SOILS:**

CLASSIFICATION: Coarse-loamy, mixed, superactive, hypergellic Nitric Anhyorthel.

Sampled for characterization at time of station installation.

LAB PEDON NUMBER: 99P0327

SITE IDENTIFICATION NUMBER: 99FN143003

**LANDSCAPE:**

SLOPE: 3 %

ASPECT: South (180º)

ELEVATION: 250 m.

**VEGETATION:**

GROUND COVER: None

CANOPY COVER: None

**COMMENTS:** Soil described by John Kimble and Iain Campbell. Soil samples collected for characterization.

Note: NZ standard time is used here because Scott Base uses NZ time. Actually, NZ and Scott Base use daylight savings time during the summer.

**NOTES FOR NEXT STATION VISIT:**