



University of Hawaii at Manoa

Hawaii Natural Energy Institute

Holmes Hall 246 • 2540 Dole Street • Honolulu, Hawaii 96822

February 25, 1991

Mr. Norman Hayashi
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

DIV. OF WATER &
LAND DEVELOPMENT

91 FEB 27 P 3: 59

RECEIVED

Dear Mr. Hayashi:

As required in the County of Hawaii Planning Commission's geothermal resources permit (GRP 89-1), five (5) copies of the January, 1991 monthly report are enclosed.

If you have any questions, please call me at 522-5620.

Sincerely,

Harry Olson
Hawaiian Electric Industries/
Spark Matsunaga Fellow in
Geothermal Energy Research

Enclosure: January monthly report

JANUARY 1991 MONTHLY REPORT

Scientific Observation Hole (SOH) Program

Geothermal Resource Permit: GRP 89-1

Lilewa, Kapoho, and Halekamahina, Hawaii

TMK: 1-2-10:01; 1-4-01:02; and 1-4-02:32

Hawaii Natural Energy Institute

University of Hawaii

February 1991

SUMMARY

The operations resumed at SOH-1 on January 4, 1991, following the Christmas break from December 23, 1990 through January 3, 1991. The hole was conditioned to a total depth of 5526 feet January 4-5, 1991, and the pumps shut down while the hole equilibrated prior to logging. Temperature, pressure, caliper, spinner and gamma logs were run with all of the equipment failing except the temperature probe. A maximum temperature of 403° (F) was recorded at a depth of 5500 feet. Before rigging up the Tonto U-5000 rig at the SOH-2 site, the rig was moved to the HGP-A well, where a workover was done in cooperation with the Natural Energy Lab of Hawaii Authority (NELHA) and a Down Hole Coaxial Heat Exchanger experiment was performed for the Pacific International Center for High Technology Research (PICHTR). On January 22, 1991, the County of Hawaii Water Commission gave their approval for the SOH project to commence well construction/pump installation at the Airstrip well (9-6) and the well workover was performed on January 26, 1991. A grading and grubbing permit for SOH-2 was approved on December 4, 1990, and the site was cleared on January 25, 1991. A cement drill pad was poured and the site completed January 29-31, 1991.

SOH-3 remains in the permitting stage awaiting a grading and grubbing permit. An archaeology survey was completed and the report is scheduled to be submitted by the Archaeologist by the end of February. The burial of the sump material at SOH 4 is to be scheduled shortly.

I. INTRODUCTION

This document presents a monthly report to the County of Hawaii Planning Department to support the Scientific Observation Hole (SOH) program in the Kilauea middle and lower east rift zones. The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the depth drilled.

This report addresses: occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility; performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed; and emission measurements.

II. BACKGROUND

The County of Hawaii Planning Commission approved, on August 8, 1989, a geothermal resource permit application (GRP 89-1) to drill Scientific Observation Holes (SOHs) in the Kilauea middle and lower east rift zone. This document presents a monthly report, as required in Condition 6:

"The petitioner shall maintain a record in a permanent form suitable for inspection and five (5) copies shall be filed with the Planning Department on a monthly basis during drilling and for six (6) months after the completion of drilling to establish a hole specific baseline and such record shall be available to the community. The record shall include:

- a. Occurrence and duration of any start-up, shut-down, and operation mode of any SOH/facility.
- b. Performance testing, evaluation, calibration checks, and adjustment and maintenance of the continuous emission monitor(s) that have been installed.
- c. Emission measurements reported in units compatible with applicable standards/guidelines."

As designated, four holes are planned to be drilled along the Kilauea East Rift Zone on the Big Island of Hawaii. Three of the Big Island holes (SOHs 1, 2, and 4) are on agriculture land and have been permitted by the County of Hawaii Planning Commission. The fourth hole, designated SOH-3, is on

conservation land. SOH activities under Conservation District Use Permit (HA 12/20/85 - 1830) issued to the Estate of James Campbell have been approved.

III. SOH-1 SITE

Drilling Activity

Tonto drilling services resumed operations on January 4, 1991, following the Christmas break from December 23, 1990, through January 3, 1991. The hole was conditioned to a total depth of 5526 feet and temperature logs were run with the assistance of representatives from the United States Geological Survey. A maximum temperature of 403° (F) was recorded at a depth of 5500 feet. Pressure, caliper and gamma ray surveys were planned, but were unable to be completed due to equipment failure. The Tonto U-5000 rig was released for work unrelated to the SOH program, and moved off the site on January 14, 1991.

Monitoring Program - Air Quality

The air quality monitoring station provides a continuous record of atmospheric H₂S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility container on-site and power is provided by the drill rig system.

This station was off-line over the Christmas break and was dismantled on January 11, 1991, in preparation for the move to the HGP-A site. Approximately 40 hours of data were collected at

the SOH-1 site before dismantling. Once operations began at the HGP-A well and the generator activated, the station operated normally with routine calibrations and no major data gaps (see Appendix for details). On January 30, 1991, this station was shut down and prepared for the move to the SOH-2 site.

Monitoring Program - Meteorological

Continuous wind speed and directional measurements are being made with a recording wind speed/direction sensor system. A data logger and back-up pressure-sensitive recorder is being used to record the wind speed and direction data. The unit is located in a utility container on-site and power is provided by the drill rig system.

This station was off-line over the Christmas break and was dismantled on January 11, 1991, in preparation for the move to the HGP-A site. Approximately 40 hours of data were collected at the SOH-1 site before dismantling. Once operations began at the HGP-A well and the generator activated, the station operated normally with routine calibrations and no major data gaps (see Appendix for details). On January 30, 1991, this station was shut down and prepared for the move to the SOH-2 site.

Monitoring Program - Noise

One noise monitoring station was located at the SOH-1 site during drilling. This station was off-line over the Christmas

break and was dismantled on January 11, 1991, in preparation for the move to the HGP-A site. Approximately 40 hours of data were collected at the SOH-1 site before dismantling. Once operations began at the HGP-A well and the generator activated, the station operated normally with routine calibrations and no major data gaps (see Appendix for details). On January 30, 1991, this station was shut down and prepared for the move to the SOH-2 site.

A second noise station was located at the Laughlin residence, about a quarter mile west of the SOH-1 drill site. The instrument at this station was off-line until January 14, 1991, awaiting repair by the manufacturer. After the new sound meter was installed and the recorder overhauled, this station operated normally throughout the rest of the month with routine calibration and equipment adjustment.

A third noise monitoring station was installed at the Pommerenk residence, about a mile east of the SOH-1 site. This monitor is powered by solar charged batteries, which required some adjustments this month, but functioned normally until January 18, 1991, when the station was dismantled and removed for placement at the SOH-2 drill site (see appendix for details).

Emissions Reports

An H₂S monitor was located on-site. The average H₂S level measured is about 1 ppb due to natural causes resulting from the decay of vegetation. The Colortek sensors were replaced weekly as a matter of routine and showed no indication of any emissions from the well. On January 11, 1991, the Colortek cannisters were removed and refurbished in preparation for installation at the SOH-2 drill site.

IV. SOH-2 SITE

A grading and grubbing permit was approved on December 4, 1990, and the site was cleared on January 25, 1991. A cement pad was poured and the site preparation completed January 29-31, 1991. Ambient noise monitoring was set up on January 18, 1991, and continued until the end of the month operating normally. A permit (3081-01) has been granted by the Department of Land and Natural Resources to inspect, modify, and if practical, install a pump into the existing airstrip well to supply water for drilling operations. On January 22, 1991, the County of Hawaii Water Commission gave their approval for the SOH project to commence well clean-out/pump installation at the airstrip well and the well workover was performed on January 26, 1991. Two water samples were taken from the airstrip well prior to use as a water supply for SOH-2 drilling operations. The first sample was taken with a bailer on January 27, 1991, and the second was a pumped sample taken on January 30, 1991. The results of the analyses

are as follows:

Date	Cl	Na	K	Ca	Mg
01/27/91	418	315	20.6	29.8	25.3
01/30/91	378	285	19.7	32.7	27

V. SOH-3 SITE

No drilling activity has been initiated. Access to the SOH-3 site has not been constructed, nor has the site been cleared or graded. SOH-3 is scheduled to be located at the True/Mid-Pacific alternate drill site 2 (approximately 3,000 feet north-north-west of the present drill site). All necessary reports have been submitted to DLNR for review and approval. An archaeology survey has been completed and the report is scheduled to be submitted by the Archaeologist by the end of February. DLNR has not to date made a decision regarding a medicinal plant survey, which may have to be done prior to the issuance of a grading and grubbing permit.

VI. SOH-4 SITE

Drilling Activity

Drilling is completed. No activity was performed during this period. County of Hawaii landfill officials found the mud pit material unsuitable (too wet) for disposal at County waste sites; therefore, Department of Health officials have given

approval to bury the material on-site. Ohia seedlings (from the DLNR nursery) will be planted as soon as the restoration work is completed.

Monitoring Program -

Air Quality, Meteorological, Noise and Emissions are not being monitored, since drilling has been completed at this site.

APPENDIX
MAINTENANCE REPORTS

SUPPLEMENTARY BILLING

J-002	<p>Wednesday, 1-2-91</p> <p>H2S ANALYZER</p> <p>Off-line, Rig shut down</p> <p>MET STATION</p> <p>Off-line, Rig shut down</p> <p>SOH-1 NOISE</p> <p>Off-line, Rig shut down</p> <p>POMERINCK NOISE</p> <p>Normal operation. Renewed chart.</p> <p>LOUGHLIN NOISE</p> <p>Off-line, Awaiting instrument repair.</p>	1.00
J-004	<p>Friday, 1-4-91</p> <p>H2S ANALYZER</p> <p>Off-line, Rig shut down.</p> <p>MET STATION</p> <p>Off-line, Rig shut down.</p> <p>SOH-1 NOISE</p> <p>Off-line, Rig shut down</p> <p>POMERINCK NOISE</p> <p>Normal operation. Full calibration of meter and recorder. Replaced batteries.</p> <p>LOUGHLIN NOISE</p> <p>Off-line. Awaiting instrument repair.</p> <p>COLORTEK CARDS</p> <p>Replaced colortek cards. No visible color change.</p>	2.00
J-007	<p>Monday, 1-7-91</p> <p>H2S ANALYZER</p> <p>Drilling operation resumed. Restored Analyzer operation and recalibrated.</p> <p>MET STATION</p> <p>Restored operation. Checked calibration. O.K.</p> <p>SOH-1 NOISE</p> <p>Restored operation. Replaced pen. Checked calibration of sound meter and chart recorder. O.K.</p> <p>POMERINCK NOISE</p> <p>Normal operation. Exchanged batteries.</p> <p>LOUGHLIN NOISE</p> <p>Off-line. Awaiting instrument repair.</p>	3.00
J-009	<p>Wednesday, 1-9-90</p> <p>H2S ANALYZER</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>MET STATION</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>SOH-1 NOISE</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>POMERINCK</p> <p>Normal operation for past 48 hours. Had to shut down this station to install voltage limiting diodes in</p>	1.00

SUPPLEMENTARY BILLING

J-002	<p>Wednesday, 1-2-91</p> <p>H2S ANALYZER</p> <p>Off-line, Rig shut down</p> <p>MET STATION</p> <p>Off-line, Rig shut down</p> <p>SOH-1 NOISE</p> <p>Off-line, Rig shut down</p> <p>POMERINCK NOISE</p> <p>Normal operation. Renewed chart.</p> <p>LOUGHLIN NOISE</p> <p>Off-line, Awaiting instrument repair.</p>	1.00
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J-009	<p>Wednesday, 1-9-90</p> <p>H2S ANALYZER</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>MET STATION</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>SOH-1 NOISE</p> <p>Rig shut down again. No power. Collected about 40 hours data.</p> <p>POMERINCK</p> <p>Normal operation for past 48 hours. Had to shut down this station to install voltage limiting diodes in</p>	1.00

supply line to meter batteries. Will restore operation by Friday.

LOUGHLIN

Off-line. Awaiting instrument repair.

J-011 Friday, 1-11-91 4.00
H2S ANALYZER

Off-line. Dismantled this instrument in preparation for move to HGP-A drill site this weekend.

MET STATION

Off-line. Prepared these instruments for the move to HGP-A drill site.

SOH-1 NOISE

Off-line. Removed recorder and microphone for cleaning and tests. Replaced Sound meter pre-amplifier, tested and calibrated. Loaned the instrument to Don Thomas for hand-held readings in the residential area over the weekend.

POMERINCK 0815 Clouds 10% WS&DIR 270 @ 3-4

No data for past 48 hours. Installed power supply cables with voltage dropping diodes and tested O.K. Ran full calibration but no adjustments were required. Station now operational and batteries fully charged.

LOUGHLIN

Off-line. Expect return of sound meter from Mfg. by this weekend.

COLORTEC

No visible color change. Removed Colortec cannisters and refurbished in preparation for installation at new drill-rig location.

J-014 Monday, 1-14-91 2.00
H2S

Off line. Drill rig not yet set up.

MET

Off line. Drill rig not yet set up.

COLORTEK

Colortek cards not yet deployed.

HGP-A NOISE

Off line. No power yet.

POMERINCK NOISE

Operating normally. Chart & Pen O.K.

LOUGHLIN NOISE

Installed newly repaired sound meter, also overhauled Recorder. New chart and pen. Unable to run complete calibration due to area-wide power outage.

J-016 Wednesday, 1-16-91 1.00
H2S

Off line. No power yet.

MET

Off line. No power yet.

HGP-A NOISE

Off line. No power yet.

POMERINCK NOISE

Operating normally. Replaced main battery.

LOUGHLIN NOISE

Operating normally. Chart & pen O.K.

J-018 Friday, 1-18-91 4.00
HGP-A H2S

Repaired sample pump. Placed Analyzer in operation for initial run-in to stabilize before calibration.

HGP-A MET

Set up and calibrated Wind speed & Direction. Checked

chart recorder and general operation...O.K.

HGP-A NOISE

Off line. Data will be collected and shared by SAIC.

POMERINCK NOISE

Operating normally. Dismantled station and removed instruments for placement at next Drill-site. (SOH-2) For preliminary measurements.

LOUGHLIN NOISE

Operating normally. Will recalibrate station tomorrow.

J-019 Saturday, 1-19-91 2.00

SOH-2 NOISE

No data. Forgot to engage chart drive. Replaced chart and ran complete calibration on meter and recorder.

LOUGHLIN NOISE

Operating normally. Complete calibration on meter and Recorder.

J-021 Monday, 1-21-91 2.00

HGP-A H2S

Operating normally. Minor adjustments required.

HGP-A MET

Operating normally. Chart O.K.

HGP-A NOISE

Off-line.

LOUGHLIN NOISE 0820 Clouds 75% WS&DIR 340 @ 2-3

Operating normally. Chart & pen O.K.

SOH-2 NOISE 0915 Clouds 75% WS&DIR 340 @ 2-3

Operating normally. Chart, batteries & pen O.K.

J-023 Wednesday, 1-23-91 2.00

HGP-A H2S

Operating normally. Only minor adjustments.

HGP-A MET

Operating normally. Chart O.K.

HGP-A NOISE

Off-line.

LOUGHLIN NOISE

Pen ran dry. Lost some data.

SOH-2 NOISE

Operating normally. Replaced pen. Chart & Batteries O.K.

J-025 Friday, 1-25-91 3.00

HGP-A H2S

Operating normally. Full calibration. Routine.

HGP-A MET

Operating normally. Renewed chart.

HGP-A NOISE

Off-line.

LOUGHLIN NOISE.

Operating normally. Full calibration. Routine.

SOH-2 NOISE

Operating normally. Full calibration. Routine.

COLORTEC

Colortec cards not deployed at this location.

J-028 Monday, 1-28-91 2.00

HGP-A H2S

Operating normally. Replaced lead-acetate.

HGP-A MET

Operating normally. Chart O.K.

HGP-A SOUND

Off-line

LOUGHLIN SOUND

Operating normally. No adjustments required.

SOH-2 SOUND

Operating normally. All parameters check out.

J-029	Tuesday, 1-29-90	4.00	600.19
	Purchased materials to convert and additional sound station to Solar power. (Solar panel, batteries, cable, misc. hardware and fittings) Prepared cables and fittings for installation on-site.		
J030	Wednesday, 1-30-91	2.00	
	HGP-A H2S		
	Operating normally. Only minor adjustments required.		
	This station will be shut down for move to new drill site at SOH-2 in a few hours.		
	HGP-A MET		
	Operating normally. Ready for shut-down and move.		
	HGP-A SOUND		
	Off-line.		
	LOUGHLIN SOUND.		
	Operating normally. Chart & pen O.K.		
	SOH-2 SOUND		
	Operating normally. Chart, batteries & Pen O.K.		

J-002 Wednesday 1-2-91

SON-I HAI

OFF LINE - Rig Shot Down

SON-I Met

OFF LINE - Rig Shot Down

SON-I Noise

OFF LINE - Rig Shot Down

Pom-pink Noise 0700 Clouds 40% W/S & DIR 325 @ 2-3Operating Normally - Renewed Chart
Look in Noise

OFF LINE - Awaiting Instrument Repair

J-004 Friday 1-4-91

SON-I HAI

OFF LINE - Rig Shot Down

SON-I Met

OFF LINE - Rig Shot Down

SON-I Noise

OFF LINE - Rig Shot Down

Pom-pink Noise

Operating Normally - Chart & Pen O.K. - Full Calibration

No Meter Adj. necessary - Adj. Recorder 240 down - Main

Batt 11.98 - Meter Batt 12.02 - 12.07 - Replaced with 12.47 - 12.51

Look in

OFF LINE - Awaiting Instrument Repair

J-007 Monday 1-7-91

SON-I HAI 0845On-Line - Restored operation - Checked Calibration - This
Instrument will require a few hours to stabilizeSON-I Met

On-Line - Restored Operation - Calibration check O.K.

SON-I Noise 0855 Clouds 95% W/S & DIR 290 @ 3-4

On-Line - Restored Sound Recording - Replaced Pen.

Checked Calibration - No Adj. Required ~~2000-3-4~~Pom-pink Noise 0925 Clouds 90% W/S & DIR 300 @ 2-3

Operating Normally - Chart & Pen O.K. Main Batt 11.67

Meter Batt 11.90 - 12.16 (swapped) Spares 12.43 - 12.44

Look in

OFF LINE

09 Wednesday 1-9-91

HAI

Inoperative - Rig Shut Down - No Power
Met

Inoperative - Rig Shut Down - No Power
SDH-1 Noise

Inoperative - Rig Shut Down - No Power
Pomeroy 0845 clouds 40% calm

Operating Normally but had to shut down station to
replace Voltage Limiting Diodes in supply line to
Meter Batteries - Will restore operation Friday.

Loughlin

OFF-Line - Meter Repair -

11 Friday - 1-11-91

HAI

Inoperative - Dismantled station in preparation for
Move to Next Location

Met

Inoperative - Dismantled for move to Next Location
SDH-1 Noise

Inoperative - Dismantled station for move to Next
Location - Replaced Meter Pre-Amplifier checked for
Normal operation + Calibrated - Loaned Meter to
Don Thomas for Hand Held measurements this weekend.

Pomeroy Noise 0815 - clouds 10% WSDR 27003-4

Installed New Voltage Dropping diodes - Tested and
Re-calibrated Meter + Recorder - No Adjustments Meter
All Batteries now fully charged.

Loughlin Noise

OFF Line

Colortec

No visible Color Change - Removed + Refurbished
Colortec Cansisters for Placement at New Location.

J-014 Monday 1-14-93
H23

off line - Bell Rio not yet set up.
MOC

off line -
Colonizer

off line

Noise - H&P-A

off line

Noise - Compressor

Operating Normally - Exhaust Blower - Check + Fan OK
Longhorn Noise

Installed Motor - Recorder after check - unable to

calibrate due to Accu-wire Power outage - Review
will not be restored until 10 PM noon.

T-016 Wednesday 1-13-93
H25

off line

Met

off line

Noise - H&P-A

off line

Noise - Compressor

Operating Normally - Check + Fan OK - Replaced Main B.V.
Noise Longhorn

Operating Normally - Check + Fan OK

J-018 Friday 1-18-93

H&P-A/H25

Repaired Sample Pump + Check Analyzer in operation
Pen initial Run - in to stabilize before calibration

H&P-A/Net

Set-up & Calibrated W.S. + W.D. - Operating Normally.
H&P-A/Noise

off line - Noise Data will be collected by SAIC.

Compressor Noise

Operating Normally - Discharged + Replaced instruments
for placement at Net + Bell Site (SDH-2)

Longhorn Noise

Installation. H&P-A. Will be set up - Thursday

J-019 Saturday 1-19-91

SDH-2 Noise

No Data - forgot to engage Chart Drive - Replaced Chart and Pen Complete Calibration on Meter + Recorder.

Longlin Noise

Operating Normally - Complete Calibration - No Adjustments were Required.

J-021 Monday 1-21-91

HEPA H₂S

Range 0 - 2 PPB

Flow steady @ 3.0, chart + lead acetate O.K.

Tygon Dry - Pump + Bubbles O.K.

check 29.9%

Optics 2220-2210, down 10, No Adj.

Range - High 1:1 Low 1:1

Zero Calib 28 4 1 0

HEPA Met

Operating Normally - Chart O.K.

HEPA Noise

OFF line

Longlin Noise 0820 Clouds 75% WIS + DIR 340 @ 2-3

Operating Normally - Chart + Pen O.K.

SDH-2 Noise

Operating Normally - Chart + Pen O.K. - Main Batt 12.0

Meter Batt 11.89-11.90 - Spares 12.70-12.66

J-023 Wednesday 1-23-91

HEPA H₂S

Flow steady @ 3.0, chart + lead acetate O.K.

Tygon Dry - Pump + Bubbles O.K.

check 30.1%, up 2%

Optics 2220-2240, up 20, adj to 2240-2240

Range - High 1:1 Low 1:1

Zero Calib 28 19 3 1 0

HEPA Met

Operating Normally - Chart O.K.

Longlin Noise 0750 Clouds 80% WIS + DIR 315° @ 3-4

Pen ran dry - lost some data - Replaced Pen - Chart O.K.

SDH-2 Noise

Operating Normally - Replaced Pen - Main Batt 12.05

Meter Batt 11.6-11.4 - Spares 12.2-12.0

Friday 1-25-91

A H2S

Range 0-2 ppb

CW steady @ 3.0, Replaced Chart, head Acute O.K.

Upon Day - Pump + Bubbler O.K.

Heck 30.0%, down 1%

otics 2240-2250, up 10%, adj. to 2250-2250

Range - High 1.1 Low 1.1

2nd Calib 23 9 3 1 0

1st Calib - Exp 50 50 50 50 (Span Pot) 50

Act 28 40 44 47 (1/2 Pot) 50

Met

Operation Normally - Replaced Chart

Main Noise 0820 No Clouds Calm

Operation Normally - Chart + Pen O.K. - Full Calibration

Adj. Meter to 119.0 From 129.6 - Adj. Recorder 2 dt increase

2 Noise 0915 No Clouds Calm

Operation Normally - Chart + Pen O.K. - Full Calibration

Adj. Meter Adjustment Necessary - Adj. Recorder 2 dt increase

Main Pot 1240 Meter Pot 1133-1120, Exchanged with

spares 1211-1214.

Monday 1-28-91

A H2S

Range 0-2 ppb

CW steady @ 3.0, Chart O.K. - Replaced head Acute

Upon Day - Pump + Bubbler O.K.

Heck steady @ 30.0%

otics steady @ 2260-2260

Range - High 1.1 Low 1.1

1st Calib 27 5 1 0

Met

Operation Normally - Chart O.K.

Main Noise 0817 Clouds 60% W.S. DR 310 @ 23

Operation Normally - Chart + Pen O.K.

2 Noise 0900 Clouds 90% W.S. DR 340 @ 3-4

Operation Normally - Chart + Pen O.K. - Main Pot 1193

Ex. Bubbler's 1173-1174, Spares 1262-1264

J-029 Tuesday 1-29-91

Purchased Material to convert Sound Instrument
shelter to solar-powered operation

Solar Panel!

Main Meter & spare Batteries

Wiring, Hand Wire, Voltage Converter Cable & Clips

Fabricated Wiring & Electrical Harness to Charge
Batteries and Operate Recorder & Sound Meter

J-030 Wednesday 1-30-91

HEP-A H₂S

Range 0-2 ppm

Flow steady @ 3.0, Chart & Lead Detrit = O.K.

Tygon Day - Pump & Bubbler O.K.

Check 30.1%, up .5%

Colts 2290-2300, up 10%, adj. to 2300-2300

Range - High 1.1 Low 1.1

Zero Calib 27 L 2 0

HEP-A Met

Operation Normally - Chart O.K.

Lowelin Sound O.K. Clouds 5% Calm

Operation Normally - Chart & Pen O.K.

SOH-2 Sound

Operation Normally - Chart & Pen O.K.

Main Batt 12.16, Meter Batteries 1138-1132, Spares 12.20-12.26

425 CHART REDUCTION -- HGP-A Station

From 1-1-91 to 1-31-91

HOUR:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Avg	Max	Total	
0101	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0102	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0103	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0104	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0105	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0106	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0107	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	2	7	
0108	0	0	0	0	0	1	0	1	2	1	2	2	2	*	2	1	1	1	1	**	**	**	**	**	1	2	17	
0109	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0110	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0111	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0112	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0113	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0114	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0115	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0116	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0117	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	
0118	**	**	**	**	**	**	**	**	**	**	1	1	1	2	2	2	3	2	2	1	1	1	1	0	1	3	20	
0119	0	0	0	0	0	0	0	0	1	1	1	1	1	2	1	2	2	2	1	0	1	1	1	0	1	2	19	
0120	0	0	1	1	1	0	0	0	0	1	0	1	1	1	2	1	2	1	1	1	2	1	1	1	1	1	2	20
0121	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	2	2	1	1	1	1	0	1	2	23	
0122	0	0	0	0	0	0	0	1	1	0	1	1	1	2	2	2	1	1	1	1	1	0	0	0	1	2	16	
0123	1	0	0	0	1	1	1	1	0	1	1	1	2	1	1	2	2	1	1	0	1	0	0	0	1	2	19	
0124	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	2	2	1	1	1	1	0	0	0	1	2	13	
0125	0	0	0	0	0	0	0	0	0	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	2	23	
0126	1	0	1	1	1	0	0	0	0	0	0	1	1	2	1	2	2	2	2	1	1	1	1	1	1	2	22	
0127	0	1	0	1	1	0	0	1	0	1	1	1	2	2	1	1	0	2	2	2	2	2	2	2	1	2	27	
0128	1	1	1	1	1	2	1	1	2	2	2	2	3	3	3	2	3	2	2	2	2	2	1	1	2	3	43	
0129	1	1	1	1	0	0	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1	0	0	1	2	28	
0130	1	1	1	1	1	1	2	2	2	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	1	2	12	
0131	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	

308

AVG.	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	1		
MAX.	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	2	3	2	2	2	2	2	2	2	2	3	

**=Power or Equip. failure: *=Calibration

Meteorology Station Log

SOH-4

1-1-91 to 1-31-91

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0101		0102		0103		0104	
0000	-	-	-	-	-	-	-	-
0100	-	-	-	-	-	-	-	-
0200	-	-	-	-	-	-	-	-
0300	-	-	-	-	-	-	-	-
0400	-	-	-	-	-	-	-	-
0500	-	-	-	-	-	-	-	-
0600	-	-	-	-	-	-	-	-
0700	-	-	-	-	-	-	-	-
0800	-	-	-	-	-	-	-	-
0900	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-
1100	-	-	-	-	-	-	-	-
1200	-	-	-	-	-	-	-	-
1300	-	-	-	-	-	-	-	-
1400	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-
1600	-	-	-	-	-	-	-	-
1700	-	-	-	-	-	-	-	-
1800	-	-	-	-	-	-	-	-
1900	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2100	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-
2300	-	-	-	-	-	-	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0105		0106		0107		0108	
0000	-	-	-	-	-	-	290	2
0100	-	-	-	-	-	-	270	3
0200	-	-	-	-	-	-	275	4
0300	-	-	-	-	-	-	275	3
0400	-	-	-	-	-	-	275	4
0500	-	-	-	-	-	-	275	3
0600	-	-	-	-	-	-	280	3
0700	-	-	-	-	-	-	280	3
0800	-	-	-	-	-	-	290	3
0900	-	-	-	-	305	4	320	5
1000	-	-	-	-	285	4	45	5
1100	-	-	-	-	295	4	50	6
1200	-	-	-	-	345	5	60	5
1300	-	-	-	-	310	4	60	5
1400	-	-	-	-	325	4	90	4
1500	-	-	-	-	330	3	85	3
1600	-	-	-	-	335	4	70	2
1700	-	-	-	-	300	3	70	2
1800	-	-	-	-	285	2	70	2
1900	-	-	-	-	290	2	70	2
2000	-	-	-	-	275	2	70	2
2100	-	-	-	-	270	3	70	2
2200	-	-	-	-	230	2	70	2
2300	-	-	-	-	280	3	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0109		0110		0111		0112	
0000	-	-	-	-	-	-	-	-
0100	-	-	-	-	-	-	-	-
0200	-	-	-	-	-	-	-	-
0300	-	-	-	-	-	-	-	-
0400	-	-	-	-	-	-	-	-
0500	-	-	-	-	-	-	-	-
0600	-	-	-	-	-	-	-	-
0700	-	-	-	-	-	-	-	-
0800	-	-	-	-	-	-	-	-
0900	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-
1100	-	-	-	-	-	-	-	-
1200	-	-	-	-	-	-	-	-
1300	-	-	-	-	-	-	-	-
1400	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-
1600	-	-	-	-	-	-	-	-
1700	-	-	-	-	-	-	-	-
1800	-	-	-	-	-	-	-	-
1900	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2100	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-
2300	-	-	-	-	-	-	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0113		0114		0115		0116	
0000	-	-	-	-	-	-	-	-
0100	-	-	-	-	-	-	-	-
0200	-	-	-	-	-	-	-	-
0300	-	-	-	-	-	-	-	-
0400	-	-	-	-	-	-	-	-
0500	-	-	-	-	-	-	-	-
0600	-	-	-	-	-	-	-	-
0700	-	-	-	-	-	-	-	-
0800	-	-	-	-	-	-	-	-
0900	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-
1100	-	-	-	-	-	-	-	-
1200	-	-	-	-	-	-	-	-
1300	-	-	-	-	-	-	-	-
1400	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-
1600	-	-	-	-	-	-	-	-
1700	-	-	-	-	-	-	-	-
1800	-	-	-	-	-	-	-	-
1900	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2100	-	-	-	-	-	-	-	-
2200	-	-	-	-	-	-	-	-
2300	-	-	-	-	-	-	-	-

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0117		0118		0119		0120	
0000	-	-	-	-	140	2	345	10
0100	-	-	-	-	140	2	350	10
0200	-	-	-	-	140	2	340	10
0300	-	-	-	-	140	2	350	10
0400	-	-	-	-	145	2	335	8
0500	-	-	-	-	150	2	325	6
0600	-	-	-	-	150	2	320	5
0700	-	-	-	-	150	2	315	6
0800	-	-	-	-	150	2	330	8
0900	-	-	60	2	35	4	360	9
1000	-	-	100	3	40	7	30	10
1100	-	-	125	4	40	8	40	9
1200	-	-	120	4	45	9	40	10
1300	-	-	120	3	40	9	35	9
1400	-	-	135	4	35	9	45	10
1500	-	-	125	4	40	10	40	9
1600	-	-	130	3	350	8	40	9
1700	-	-	140	3	350	8	35	8
1800	-	-	140	2	20	9	35	5
1900	-	-	140	2	350	9	20	5
2000	-	-	140	2	355	9	15	6
2100	-	-	140	2	355	9	15	6
2200	-	-	140	2	355	9	25	4
2300	-	-	140	2	350	11	350	5

Time	W/D	W/S	W/D	W/S	W/D	W/S	W/D	W/S
	0121		0122		0123		0124	
0000	335	5	340	5	325	5	285	3
0100	320	4	335	6	330	5	280	3
0200	310	3	315	5	345	4	270	3
0300	340	4	320	5	325	4	275	3
0400	335	4	335	7	305	4	275	3
0500	315	4	355	8	310	4	280	3
0600	315	4	360	6	300	3	275	3
0700	315	4	360	6	290	2	280	3
0800	340	5	355	7	310	3	285	3
0900	20	7	5	8	330	4	290	3
1000	40	8	5	9	40	6	325	4
1100	45	9	360	10	25	6	360	5
1200	45	9	15	9	35	7	25	6
1300	35	10	20	9	40	7	40	5
1400	30	9	20	10	45	7	45	5
1500	40	9	30	10	50	8	45	5
1600	40	8	10	10	45	7	35	3
1700	40	8	350	6	40	5	40	3
1800	25	6	330	5	25	3	40	2
1900	25	6	320	5	10	2	45	3
2000	20	5	305	4	310	3	260	2
2100	25	7	315	4	290	3	260	2
2200	20	7	320	4	280	3	260	2
2300	15	5	310	4	285	3	260	2

Time	W/D	W/S	W/D	W/S	W/D	W/S
					0126	0127
						0128
0000	285	2	360	2	150	225
0100	230	2	360	2	160	270
0200	235	2	180	2	160	345
0300	235	2	170	2	160	195
0400	235	2	90	2	165	225
0500	240	2	90	2	175	220
0600	235	2	220	2	170	170
0700	230	2	225	2	175	290
0800	230	2	165	2	180	275
0900	125	2	130	4	185	310
1000	130	3	135	4	190	45
1100	130	3	135	5	200	60
1200	135	4	135	5	210	70
1300	135	4	135	6	195	75
1400	140	4	135	7	195	80
1500	145	3	145	5	200	80
1600	95	2	150	5	185	85
1700	360	2	155	4	180	90
1800	360	2	150	4	185	90
1900	360	2	150	3	215	90
2000	360	2	160	2	220	85
2100	360	2	160	3	220	100
2200	360	2	150	4	215	50
2300	360	2	140	4	205	45

Time	W/D	W/S	W/D	W/S	W/D	W/S
					0130	0131
0000	40	5	275	2	-	-
0100	25	4	275	2	-	-
0200	355	3	275	2	-	-
0300	5	2	270	2	-	-
0400	310	2	265	2	-	-
0500	285	2	270	2	-	-
0600	280	2	270	2	-	-
0700	275	2	270	2	-	-
0800	265	2	270	2	-	-
0900	280	2	-	-	-	-
1000	300	3	300	-	-	-
1100	55	3	-	-	-	-
1200	120	4	-	-	-	-
1300	135	3	-	-	-	-
1400	130	4	-	-	-	-
1500	90	3	-	-	-	-
1600	45	3	-	-	-	-
1700	340	3	-	-	-	-
1800	285	4	-	-	-	-
1900	300	4	-	-	-	-
2000	290	3	-	-	-	-
2100	280	3	-	-	-	-
2200	275	2	-	-	-	-
2300	280	3	-	-	-	-

