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August 25, 1986

Report on Field Site Inspection, Puna Reservoir

INTRODUCTION

At Thermal Power's request, Zonge Engineering geophysicist Larry Hughes was dispatched to the island of Hawaii to evaluate the feasibility and logistics of a proposed tensor CSAMT field survey. The evaluation took place August 21-22, 1986, supervised by Joe Iovenitti and assisted by other Thermal Power employees and local consultants.

RESULTS OF THE EVALUATION

1. Transmitter Site

A suitable transmitter site was located. This site satisfies all the logistical and geophysical criteria needed for a successful current source. Using a 50 foot test dipole with a total of two pieces of short conduit, an electrode contact resistance of 8 ohms was found. This should allow a maximum transmitted current of 30 amperes or better, which would provide good signal for the survey. Sometimes such electrodes will not allow full current dump due to increased resistance for high powered transmission; however, the source should still be adequate for this survey.

I doubt it.

The transmitter site also is quite adequate from the logistics standpoint. Sugar cane roads will provide access to the electrodes and the truck location, permitting faster set-up time. The site also satisfies geologic constraints: it is not grounded to known east-west rift zones or major faults, and it is located such that the two orthogonal measurement orientations will be only about 20 degrees from principal strike directions for the area. Further, the site will allow far-field data acquisition for most frequencies obtained on the survey, according to rough homogeneous-earth calculations. Some of the data will be in the transition zone, but none should be in the near-field zone, where data collection would be useless.

The one shortcoming of the site is that some stations will lie outside the 25 degree cone where all ten tensor components can be adequately measured. The stations over the reservoir will be within the cone; some of the background stations will be outside it, where signal levels are too low. However, it should be noted that, even at stations outside the cone, at least one orthogonal pair of E- and H- field components and a vertical H-field component can be obtained (providing a total of five field components). Hence, full-tensor measurements can be obtained within the cone, and vector measurements can be obtained outside the cone. This should provide adequate data coverage for all planned measurement sites.

2. Receiver Sites

Many of the proposed receiver sites were located on the scouting trip. Some locations will need to be adjusted in order to avoid unwanted influences from power lines. A few may be adjusted in order to provide easier access to the site. All adjustments will of course be cleared through Thermal Power.

Measurements were made of the noise levels using a 50 foot dipole. Measurements were made with a portable oscilloscope and a digital spectrum analyzer. The noise consists almost exclusively of 60 cycle (and odd harmonics) powerline signal. Noise levels were generally less than 30 millivolts for the 60 cycle signal. Filters in the GDP-12 receivers to be used in the survey are designed to virtually eliminate the influence from this noise source. Other noise sources such as atmospherics and low-frequency tellurics will certainly be detected in the survey. However, given the strong signal expected from the transmitter site, we envision no significant problems in acquiring data with better than 10 percent precision. The lower few frequencies may be slightly noisier due to drop-off in antenna response and the lower cycle rate, but again we envision that no significant problems will occur in acquiring the data, given enough stacking-and-averaging.

Based upon considerations of data density and lateral resolution, an electric field dipole spacing of about 200 to 300 feet was selected.

Other than slowing operations (sometimes significantly), no problems are anticipated due to terrain and vegetation.

Intermittent rains should not seriously hamper data collection. Heavy, all-day downpours will shut down operations, but local inhabitants indicated this would be unusual for October.

3. Other Considerations

Thermal Power personnel were very helpful in providing practical advice for working in this area. I took a number of notes and will be heeding this advice in preparing the job.

FOLLOW-UP NEEDED

Zonge Engineering will need several things from Thermal Power:

1) A map showing final site locations and showing how far we can adjust station locations (to accommodate logistics problems) while still meeting Thermal Power's project objectives. We will need ten copies of this map.

2) An exact start date for the survey. We will need this date four weeks in advance of the start of the field work.

3) A list of names, addresses, and phone numbers of persons working directly on this project.

4) A statement as to what we'll tell curious onlookers when they ask what we're doing.

5) Some sample TEM soundings owned by Thermal Power, so that we can better anticipate any unseen geophysical complications.

Zonge Engineering will be providing several things for Thermal Power:

1) This report.

2) A cost estimate for airfreighting the gear rather than

shipping by boat, as previously planned (see May 5, 1986 letter to Diamond Shamrock from Zonge).

3) Progress reports on expanding our interpretive capability to tensor measurements.

4) A contract, to be issued upon notification of the start date for the job.

5) A statement of goals and objectives, limitations, and provisions, including a project plan. This will be issued after a start date is announced.

Joint projects will include:

1) Written notification to local inhabitants of potential danger in the transmitting wires and electrodes.

2) Decide on a firm electric field dipole spacing.

CONCLUSIONS

The results of this scouting trip provided extremely useful information on the requirements and logistical procedures for the CSAMT survey. Tests indicate that, barring unforseen elements, high-quality data can be obtained over most (if not all) of the sites desired by Thermal Power. Finally, the trip provided a basis for making the final plans prior to crew mobilization.

Larry Hughes
Geophysicist