

Quarterly Report to the Harry Reid Center
NSHE-DOE Cooperative Agreement

Task ORD-FY04-006: Seismic Monitoring
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Progress:

During this reporting period (July 1 – September 30, 2006), we have maintained seismic operations with 40 real-time SGBDSN stations under QA procedures established through HRC. Data is managed and archived in an Antelope data management system. Network uptime has been at greater than 99% over the three months. In addition, we have maintained QA data collection from 9 accelerometers in 3 boreholes on the ESF pad and from 3 accelerometer/seismometer installations in the ESF itself. Due to the low levels of seismicity in the Yucca Mountain area as well as throughout the State of Nevada, reviewed locations are current. Supplement 1 (below) summarizes the regional seismicity for the Quarter.

Installation of instrumentation and stations under the upgrade of the seismic network to an IP communications environment continues. A problem that occurred in the previous Quarter regarding the input impedance of high-gain channels on RefTek RT-130 seismic dataloggers has been resolved through the vendor. Field modifications resulted in correcting the situation and system check pulse analysis confirmed the modification. Affected RT-130 instruments were modified in the field by the technician staff and all instruments are performing as intended. There was no impact to operations or data quality. This was a vendor issue.

NCR 06-016 was submitted by NSL to address a deficiency in response to an ‘out-of-tolerance’ condition recognized at seismic station CAF. The free-period of the instrument was out of tolerance by +0.1 Hz with respect to a required range of 1.1 and 0.9 Hz. The free period was adjusted in the field and a subsequent system check passed requirements as stated in IPR-001. The NCR was resolved.

The system check process for the new RefTek RT-130 dataloggers has been completed and initial system checks for these instruments have been submitted to the RPC. This required a modification to system check software application CALIB that was completed in the previous Quarter. In accordance with IPR-001, closeout systems checks for the replacement 72A08 dataloggers were completed and submitted. Following delays due to RT-130 datalogger impedance problems, all instruments passed systems check tolerances as specified in IPR-001.

Software application db2hypo.pl was written and tested. The application translates arrival time information from an Antelope database for processing by QA software application HYPOINVERSE for IPR-002. The LLR was completed along with technical and QA reviews. Delays in the FY2005 seismicity report and submittal of earthquake locations has been

contingent on completion of the db2hypo.pl LLR. FY2005 locations have been completed and magnitudes calculations are underway. We anticipate submittal of the 2005 locations in the 1st Quarter of FY07 and the 2005 seismicity report in the 2nd Quarter of FY07. With acceptance of the LLR, FY06 seismicity analysis can begin.

Software application EQ2ORB translates live data from the PC-104 digitizer at UZ-16 to a local Antelope data management system. The LLR for EQ2ORB was completed along with technical reviews. The QA review to complete the software qualification process is underway.

Software application CALIB 3.1 was modified to address system check requirements for the UZ-16 system. The LLR was completed along with technical and QA reviews.

Submittal of raw seismic data is current. Issues regarding DVD formats and tar data format submittals have been resolved. This has apparently eliminated the need for re-submittals of DVD's that has occurred on a regular basis over the past year. HRC conducted a surveillance at UNR to confirm that in-house backup of raw seismic data is robust; the surveillance confirmed that all in-house DVD raw data backups could be read and data could be recovered. The surveillance was initiated due to a pattern of read problems on submitted DVD's; this issue has been resolved.

Event sheet review forms, timing check forms, and polarity check forms were submitted according to IPR-001. Yearly multi-meter and GPS checks were performed according to IPR-001 and documented in SN UCCSN-UNR-053.

Informal reviews were submitted to DOE regarding proposed TWP document TWP-MRG-000003 REV 00A dated August 2006; "Technical Work Plan for: Seismic Monitoring". At this time it is unclear what impact this document may have on the qualification status of existing seismic processing software or what additional Q software applications may be required.

A draft Software Activity Plan was submitted to begin qualification of software components of the Antelope 4.8 seismic recording and analysis system. Components will include three data acquisition modules, two components for analysis and location, and another that computes local magnitude. The qualified software elements will replace several individual low and high-level software activities and consolidate operations onto one version of Antelope. The Antelope 4.8 SAP should be completed in early October. We anticipate some delay in this qualification activity based on the new QARD and potential impact of TWP-MRG-000003

Antelope 4.8 operations for automatic earthquake locations and magnitudes have been configured and have been operating in a "shake-down" mode since late August. Test configurations include dense grids for high-quality automatic solutions around Yucca Mountain. We will be refining the configuration and examining results in terms of location and magnitude quality compared with reviewed solutions. This is a configuration testing activity and does not impact any Q tasks.

Network Operations Procedures

A meeting was held on September 27, at UNR with HRC staff to discuss consolidation of procedures for seismic monitoring and implications of new software requirements. Operational

procedures will need to be adapted to new data acquisition systems and technical improvements in the seismic network.

Kappa

The kappaAH v1.0 SIR was compiled and has completed final technical and QA reviews. The final comment and review cycle improved the consistency and presentation of the SIR.

Ground Motion Site Input Workshop

UNR presented monitoring and research results at the Ground Motion Site Input Workshop July 17 and 18, 2006 in Las Vegas. The audience included representatives with Bechtel-SAIC, URS, DOE, and other organizations. The presentation summarized refraction micro-tremor findings as compared with borehole velocity logging; UZ-16 recordings of earthquakes and wave-field deformation; quick-look UZ-16 velocity estimates; a review of ESF borehole monitoring; and brief treatments of ESF back-wall coherency modeling and crustal tomography results. There was considerable interest in the refraction micro-tremor work in general, and in the method as a possible means to fill in areas of the repository footprint. Some portions of the footprint currently have no surface measurements because of the difficulty of access for active source methods. UNR is presently monitoring four boreholes, three on the ESF Pad, that measure wavefield response of interest from the $V_s=1900$ m/s “rock” to the surface.

RT-130 Equipment Status

We received delivery of 11 RT-130 dataloggers in mid-August. These are FY07 instruments and were ordered late in the fiscal year due to funding delays. Construction of site backplane boards is underway to adapt current 72A-08 datalogger stations with the next group of RT-130 upgrade units.

Borehole UZ-16 Multi-channel data collection

Data from the UZ-16 borehole (64 channels) continues to be received in real-time and managed in an Antelope system at NSL. Based on system check results, damping resistors were installed on 3 surface geophones that were added to the UZ-16 configuration in the 3rd Quarter. Geophone recording set configuration was confirmed. The system has been in continuous operation since May 2005. The waveform data from the borehole is reviewed by hand and event data is extracted and archived. Digitizer system checks were performed and documented in SN UCCSN-UNR-064 in August for qualification of software EQ2ORB. The application accepts data from the UZ-16 system and translates it to the Antelope seismic data management environment for integration into network operations. A voltage was input to the field digitizer and recovered via EQ2ORB under a combination of Antelope compiled software versions and Solaris O/S's. Based on these tests EQ2ORB ‘test cases’ were constructed for completing the EQ2ORB LLR. Technical reviews and comment resolution is complete and QA review is in progress. The LLR to modify Q software CALIB 3.0 (STN NSHE-3.0-012-1) has been completed along with technical and QA reviews.

Problems:

No significant problems encountered during the Quarter.

Status of Funds:

There will be an anticipated underrun of funds from FY06 into the next fiscal year. This is due to the delays in hiring a professional position and field technician dictated by late arrival of FY06 funds. The overrun will serve to mitigate, to some degree, anticipated delays in FY07 funds. Delays in FY07 funding will in turn delay equipment purchases for upgrade activities.

Plans and Notes:

We will be developing test suites and low-level reports in support of conversion to the 4.8 version of the Antelope Real-Time System. Testing will demonstrate suitability of this commercial application for Project uses. The Harris microwave radio link from Skull Mountain to Angel Peak will be completed. 2005 locations and magnitudes will be submitted during 1st Quarter of FY07. We plan to begin the process of rewriting all operational technical procedures, consolidating activities under IPR-001 where relevant.

Supplement 1, *Seismicity: July 1 through September 30, 2006 (FY2006 4th Quarter).*

No earthquakes larger than magnitude 2 occurred within 65 km of the ESF during the Quarter. The largest event occurred on July 2nd with magnitude 1.83. The activity approximately 60 km WNW of the northwest border of NTS, in the aftershock zone of the 1999 M 5.6 Scottys Junction earthquake, is the only recognizable cluster of activity within the region. Figure 1 includes all located and reviewed earthquake locations within the southern Nevada region during the 4th Quarter of FY06.

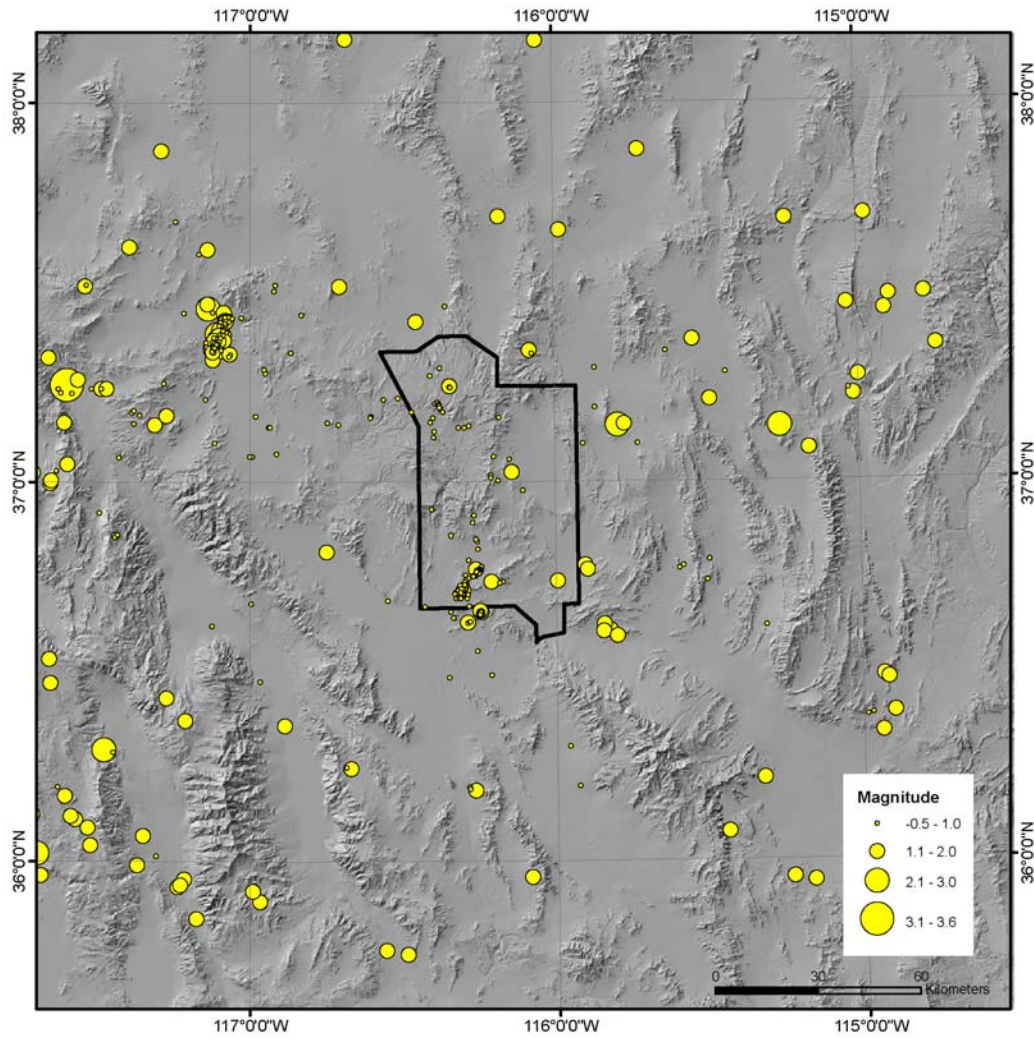


Figure 1. Earthquakes located during the 4th Quarter of FY06.