MNDT Observation Schedule

MNDT is submitting this request for an NGS tracking number prior to scheduling the project observations. The observation schedule will conform to the follow specifications.

Observations

The observation guidelines under which this survey was conducted were a combination of NOS 58, OPUS Projects processing requirements, and MnDOT specifications. They included:

Equipment:

- Equipment must be well maintained and properly calibrated.
- Uniform receivers and antennas are required for all observations. That is to say, the same manufacturer and model of equipment must be used for all observations.
- Receivers must collect dual-frequency GPS(L1/L2) full-wavelength carrier observables.
- Only antennas with calibrations accepted by the National Geodetic Survey (NGS) may be used. See http://www.ngs.noaa.gov/ANTCAL/ for a list of accepted antennas.
- Fixed height tripods will be required.

Procedures:

- The antenna's north reference point (NRP) shall be aligned oriented toward the true north direction as defined by NGS. See http://www.ngs.noaa.gov/ANTCAL/FAQ.xhtml#faq5 for additional details.
- The antenna must remain unmoved throughout the observing session.
- Only GPS observables will be processed.
- Elevation cut-off or mask angle shall not be set greater than 10°.
- Recording rates, or epochs, shall be set to 15 seconds or less.
- Data shall be collected as static observations.
- The assigned and provided station SSA and SSN shall be used as the station identification for any field inputs prior to the commencement of the observation.
- A record of deviations from these instructions will be maintained and submitted to MnDOT at the conclusion of the project.

Session Parameters:

- Data will be collected in sessions. A minimum of four receivers will be required for every session. Each session will require a minimum of 3.5 hours of simultaneous observation (i.e., when all receivers are recording at the same time) and a minimum of 4.0 hours of individual observation (a specific receiver on a specific mark). If one surveyor is operating multiple receivers it is understood that there will be staggered start/stop times.

- One field surveyor may operate up to three receivers per session. Avoid using the same surveyor and equipment on redundant observations.
- Each station will be observed a minimum of three times. The observations associated with any one mark should be taken on different days. The time of at least one redundant observation must be different than the other two. MnDOT will be flexible on this point based on the size of the project, number of marks, and number of personnel with an eye toward minimizing the number of days in the field.
    - 1st observation of mark ONE taken on day 001, session A
    - 2nd observation of mark ONE taken on day 002, **session B**
    - 3rd observation of mark ONE taken on day 003, session A
- Sessions will be scheduled so that marks are observed in line, that is to say, connected to their nearest neighbor in the session with alternate sessions overlapping previous sessions to tie the project together.
- Field log sheets (format provided by MnDOT) will be required for each observation/occupation.
    - NGS mark designation will be used.
    - Cross out any incorrect entries and replace with the appropriate correction as one would do with traditional survey field notations.
    - Fixed height metric unit to the Antenna Reference Point (ARP) will be used as shown in this illustration from *Volume I – Global Navigation Satellite System Control, Chapter 4, page 4-19*, available at, http://www.ngs.noaa.gov/FGCS/BlueBook/pdf/Chapter%204%204_24_15.pdf
    - ARP height will be recorded in meters.
    - Record comments about potential issues such as inclement weather or potential obstructions nearby.

Available resources in terms of manpower, equipment, and time may result in slight deviations regarding the session attributes.

Monumentation

New monumentation set for this project will consisted of a ¾ inch diameter aluminum rod set to refusal or a reduced driving force of 17.7 Foot-Pounds as defined in the NGS guidelines Bench Mark Reset Procedures by Curtis Smith (2010), available at http://www.ngs.noaa.gov/PUBS_LIB/Benchmark_4_1_2011.pdf. When refusal is met the remaining rod will be cut to length, rounded off, and dimpled. A removable slip disk will be installed and stamped with the appropriate designation following NGS naming specifications. The rod will be protected at the surface with a PVC tube backfilled with pea rock and capped with a protective cover.

An example of a completed mark is shown in the images below.