

House Bill 1056
Senate Energy and Natural Resources Committee

February 18, 2021

Testimony of Ed Murphy, State Geologist, NDIC – DMR – Geological Survey

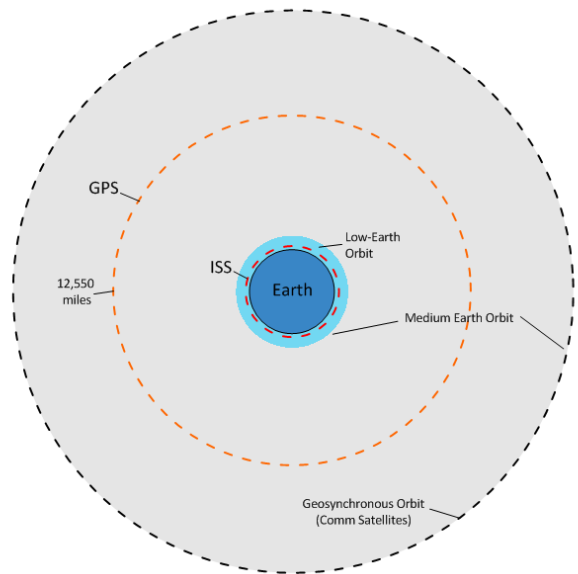
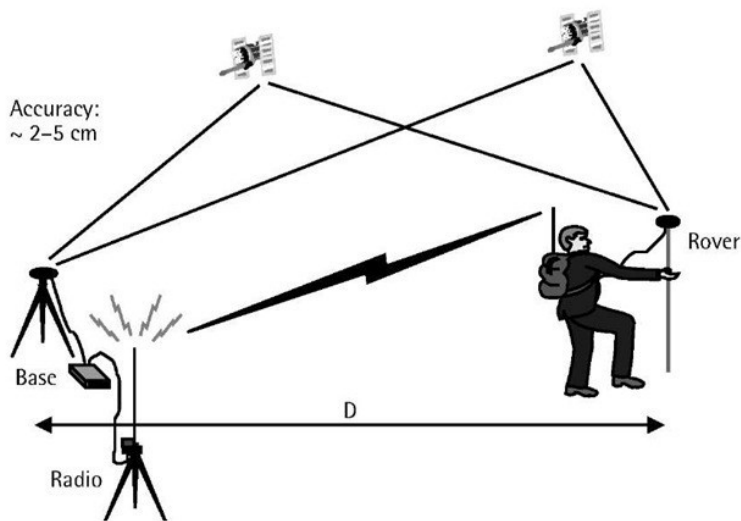
In 1993, a global positioning system (GPS) community base station was established at Bismarck State College. The base station consists of antennae on the rooftop of Schafer Hall and a receiver and radio that are stored in an IT closet located on the third floor. The station was established with the financial assistance of six state agencies (Geological Survey, Oil and Gas Division, Department of Agriculture, Department of Transportation, Health Department, and Water Commission) and the US Geological Survey.



The GPS base station antennae (a short, cylindrical GPS satellite receiver antenna and a tall, GPS radio signal broadcast antenna) are located on the roof of Schaefer Hall at Bismarck State College.



GPS base station items from left to right: battery backup, ac/dc converter, Trimble TDL 450H GPS data radio, and the new Trimble Alloy GPS receiver.



Left: A schematic of a GPS survey. Right: The GPS base station receives positional signals from two of the main GPS satellite constellations which fly in Medium Earth Orbit, the U.S. GPS satellite constellation (32 satellites) which orbits the Earth twice per day and at an altitude of approximately 12,550 miles, and the Russian GLONASS satellite constellation (24 satellites) which orbit the Earth at an altitude of approximately 11,868 miles.

The base station collects and shares GPS derived surveying grade positional information from the U.S. Global Positioning Satellite System (32 satellites operated by the US Air Force) and the Russian Global Navigation Satellite System (GLONASS with 24 satellites) which is then used for differential correction of GPS collected land surveying data. Differential correction techniques are used to enhance the quality of location data gathered using GPS receivers and to provide for the attainment of one-centimeter level accuracy horizontally and two centimeters vertically. The station has a 20-mile radius and is heavily relied upon by the local professional land surveying community, the engineering departments of the cities of Bismarck and Mandan, as well as the Burleigh and Morton County engineering departments.

The base station provides real-time corrections by way of surveying radio broadcast. In addition, post-survey collection corrections are updated each hour to the base station receiver in five second sampling rate intervals. These positional data files are harvested from the station and made public by the National Oceanic and Atmospheric Administration's (NOAA) Continuously Operating Reference Stations network which enables users to post-process their survey data to centimeter level positioning accuracy through NOAA's online positioning user service. The station's data packets also contain meteorological data including temperature, pressure, and relative humidity used in the calculation of time-series (hourly and daily) precipitable water vapor data, used for weather forecasting and atmospheric research by the University Corporation for Atmospheric Research in Boulder, Colorado.

In 1995, the legislature directed the Geological Survey to “cooperate with other agencies in maintaining a global positioning community-base station” (NDCC 54-17.4-02) and established the Global Positioning System Community-Base Station Fund or the GPS Fund (NDCC 54-17.4-12) to be used to maintain the GPS base station. For years, a Survey geologist and DMR IT staff monitored the base station operation remotely from the DMR office in Bismarck. In the winter and spring of 2019, we had a number of problems with the aging GPS receiver and one of our geologists spent hundreds of hours trying to rectify the issues. This time drain caused us to reassess our role in maintaining the GPS base station and we concluded that it no longer fit within our mission statement. We contacted the other five state agencies that were originally involved with the station along with the US Geological Survey, but no one was interested in assuming this duty. We then met with the Missouri River Chapter of the North Dakota Society of Professional Land Surveyors to make sure there was still local interest in maintaining the GPS base station. There was, and one of the main users of the system turned out to be the City of Bismarck. We then began conversations with the city regarding ultimately transferring responsibility for the GPS base station over to them.

On August 26, 2019, the Geological Survey replaced the nine-year-old GPS receiver with new equipment (Trimble Alloy GNSS Reference Receiver) using the balance of the GPS fund (\$5,045) and \$8,500 in donations from the local surveying and engineering community. The next day, we signed a Joint Powers Agreement with the City of Bismarck whereas they agreed to take responsibility for the care and maintenance of the GPS base station. In addition, the City of Bismarck agreed to continue to make the data gathered by the base station free to the general public and to continue to operate the station as a part of NOAA’s Continually Operating Reference Station network through July 31, 2021.

On September 24, 2019, the Geological Survey and Bismarck State College signed a MOA wherein BSC agreed to allow the GPS base station to remain at BSC and to continue to have their staff routinely perform routine maintenance tasks on the station through June 30, 2021. In the agreement, it was noted that the Geological Survey was hoping to transfer the GPS Station over to the City of Bismarck at the end of the current biennium. Please see the attached letter of support from Bismarck State College.

The Geological Survey signed the JPA and MOA more than a year ago so we could demonstrate to the legislature that the GPS station could be maintained into the future without our involvement. In compliance with the existing statutes, the Geological Survey has continued to monitor the station on a weekly basis and is in contact with the City of Bismarck when the need arises.

Since 1993, there have been a series of upgrades to the GPS base station equipment (2001, 2004, 2010, and 2019). State agency funds were only used in the original equipment purchase. Since that time, the system upgrades were paid for by the users of the system (initially through user fees and then through donations when those user fees were discontinued in 2001). Even though no general funds were used to purchase the equipment that is now in use (shown in the photographs on page 1), that equipment is included on the Geological Survey’s inventory and has an approximate value of

\$18,100 (the \$13,545 purchase price was minus the \$4,455 trade in for the old receiver). If this bill passes into law, ownership of the GPS Station equipment can be transferred to the City of Bismarck.

During our testimony on this bill before the House Energy and Natural Resources Committee, the committee expressed concern that our agreements did not extend out far enough and that surveyors in the Bismarck-Mandan area would be left in a bind if the City of Bismarck decided to suddenly shut down the base station. We pointed out that the City of Bismarck's own surveying crews use the station as do some of their consultants and surveyors doing work on construction projects throughout the city. Shutting down the base station without giving surveyors sufficient time to find an alternative, would not be in the best interests of the City of Bismarck. The Bismarck City Engineer noted in his letter of support for this bill (attached) that the City intends to manage the GPS Station for the next 6-9 years (through the life of the equipment) and then re-evaluate the situation.

In addition, there has been a viable alternative to the GPS base station at BSC since 2015. MidStates VRS (now Trimble VRS) operates a fee-based virtual reference station in Bismarck as part of their statewide network. As we learned in 2019, many of the surveyors in the Bismarck-Mandan area routinely utilize both base stations and some have switched over to the Trimble VRS base station all together.

There is at least one city owned GPS base station currently operating in North Dakota. The City of Fargo has owned and operated two GPS base stations since 2000. Both of those stations are utilized by local surveyors.



Engineering Department

February 8, 2021

Attn: Energy and Natural Resources Committee

Subject: House Bill 1056
NDCC 54-17.4-02

Dear Chairman,

This letter is written in support of the House Bill 1056 relating to the collection of global positioning system data. Access to the global positioning system (GPS) base station located on the campus of Bismarck State College has been made available to the Bismarck-Mandan surveying industry at no charge. Access to this station has allowed for reduced costs and improved efficiency for Bismarck-Mandan area surveyors, both public and private.

A joint powers Agreement was signed by both the North Dakota Department of Mineral Resource – Geological Survey and the City of Bismarck on August 29, 2019 establishing maintenance responsibilities of the GPS station to the City of Bismarck from June of 2021. The City of Bismarck would intend to manage the GPS base station through the life of the equipment (typically 6-9 years) and then reevaluate from that point. Our reevaluation process would include coordination with the Missouri River Chapter of the ND Society of Professional Land Surveyors to ensure that is still in the collective best interest to maintain the station at that time. If any changes did occur, advanced notice would be given to the affected surveying industry partners. Changes to surveying technology are constantly evolving and it would be difficult to predict what the surveying industry needs may look like too far in the future.

Thank you for your time.

Sincerely,

A handwritten signature in blue ink that reads "Gabe Schell". The signature is written in a cursive, flowing style.

Gabe Schell, PE
City Engineer

Gabriel J. Schell, PE, City Engineer

Phone: 701-355-1505 • TDD: 711 • Fax: 701-222-6593 • 221 N. Fifth St. • PO Box 5503 • Bismarck, ND 58506-5503
Email: bisengd@bismarcknd.gov • www.bismarcknd.gov



December 31, 2020

State of North Dakota
Sixty-seventh Legislative Assembly

To Whom It May Concern:

This letter is to inform the North Dakota State Legislature that Bismarck State College supports the transfer of ownership for the global position system (GPS) station located in Schafer Hall from the North Dakota Geological Survey to the City of Bismarck on or before June 30, 2021.

The station consists of the antennae, receiver and radio. BSC will continue to follow the MoA signed in the fall of 2019. At the time of transfer of ownership, a new MoA will be created.

Sincerely,

A handwritten signature in black ink that reads 'Rebecca Collins'. The signature is written in a cursive style with a small dot above the 'i' in 'Collins'.

Rebecca Collins
Vice President for Operations/CFO