2010 Innovations Awards Application

ID #: **10-MW-31SD**

State: South Dakota

Program Category: Government Operations and Technology - Information Systems

1. **Program Name** – Integrated Database and GIS/GPS System for Managing Aggregate Mining in South Dakota
2. **Administering Agency** – South Dakota Department of Environment & Natural Resources (SD DENR)
3. **Contact person** – Mike Erickson, Senior Scientist, SD DENR
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8. **Web site Address** - http://denr.sd.gov/
9. **Please provide a two sentence description of this program**. South Dakota law requires each aggregate mine operator in the state to obtain a mine license from DENR and private operators must post a reclamation bond based on the amount of acreage mined. The system, which includes a relational database integrated with a Geographic Information System (GIS) application and high accuracy, handheld Global Positioning System (GPS) units, was developed to more efficiently track mining and reclamation activities at over 1,800 mining sites in the state and to ensure adequate reclamation bonding is in place.
10. **How long has this program been operational (month and year)?** This program has been operating since June 2007.
11. **Why was this program created? (What problem(s) or issue(s) was it designed to address?**

    When the state laws regulating reclamation of sand, gravel and construction aggregate mines were enacted in 1983, there were three FTE dedicated to carrying out the program. During the first years of the program several hundred mine operations became licensed. Staff was able to keep up with inspections to ensure reclamation bonds were up to date and that reclamation was being done as required. However, through the years, hundreds of additional mine sites became licensed, and by 2006 there were over 1,800, while staffing levels remained the same. This basically overwhelmed the department's ability to keep up with inspections, which necessitated the use of operator annual reports to determine reclamation bond amounts for many sites. By law, annual reports consist of a map and information identifying the amount of land mined and reclaimed during the preceding year. However, it became evident through field verification that the maps and information provided by many operators were inaccurate, which often resulted in under-

bonded sites. Therefore, if the operator left the site unreclaimed, the state would not have adequate resources available to do the necessary reclamation.

12. Describe the specific activities and operations of the program in chronological order.

The activities in chronological order are:

- Electronic files (E-files), database, and GIS applications were developed to identify and track mining operations. Each operator's paper file was scanned into an E-file format. A database was developed that contains information about each mining operation, inspection photographs, and latitude and longitude for each mine site. The GIS application is linked to the database.

- Staff identified high priority sites that required inspection and mapping. Staff met with operators to determine and verify areas affected by their mining operations. Mine sites were mapped using high accuracy handheld GPS units to accurately determine affected acreage in the field.

- Operators are sent their annual reporting materials. Annual report information is generated from the database. Annual report maps are generated from an ArcMap application. Maps are printed at a 1:12,000 scale. The map consists of a current U.S. Department of Agriculture - Farm Services Agency color aerial photograph with one meter resolution that is overlain by a map layer showing the area of the mine, which in turn is overlain by a grid. Operators indicate on the map new areas mined and areas reclaimed. The operators return the annual reports and maps to the department. This information is then scanned and digitized to the operator's E-file.

- Staff updates the E-file and database with information provided by the operator. The ArcMap application is updated with the new mined and reclaimed areas. Staff then evaluates the information to determine reclamation bond requirements and notify the operators if more bonding is required.

- Staff downloads the E-files, database, and GIS information onto notebooks and GPS units prior to field inspections. During the inspection the E-file is available to review if any questions arise. Previous inspections and photographs can be reviewed on site to answer questions. Mine sites are then mapped using GPS units to define the current condition of the site, which is then used to update the database.

13. Why is this program a new and creative approach or method? The system is a new and creative approach to the management of aggregate mining in South Dakota. Operators are able to accurately report areas mined and areas reclaimed each year, which allows the department to accurately determine reclamation bond requirements. E-file eliminated the need for paper files. The database and GIS application allow staff to provide information to the public, department managers, and other governmental agencies in a more accurate and timely manner. Inspectors are able to bring the entire E-file, database, and GIS application into the field and review the information with operators or concerned citizens.

14. **What was the program's start up costs? (Provide detail about specific purchases for this program, staffing needs and other financial expenditures, as well as existing materials, technology and staff already in place.)** Start-up costs were minimal. SD DENR used existing staff and notebook computers. Two mobile GIS software packages were purchased at a cost of $500 per license. Two high accuracy handheld GPS units were purchased at a unit cost of $5,125. High resolution aerial photography suitable for the GIS application was already available through the state's own digital database.

15. **What are the program's annual operational costs?** The system has been fully integrated into the day-to-day work processes of the aggregate mining management program, so it has basically become the way staff does their jobs. Therefore, the estimated annual cost, which is based on the 3 FTE that run the program along with operating expenses, is approximately $200,000. It should be noted this is not an additional cost above what was required before this system was implemented.

16. **How is this program funded?** Staff time and operating expenses are funded through a combination of state general funds and mine licensing fees.

17. **Did this program require the passage of legislation, executive order or regulations? If YES, please indicate the citation number.** No.

18. **What equipment, technology and software are used to operate and administer this program?** Primarily workstation and notebook computers running a FoxPro database and ArcGIS software, and Trimble GeoXH handheld GPS units.

19. **To the best of your knowledge, did this program originate in your state? If YES, please indicate the innovator's name, present address, telephone number and email address.** Yes. Mike Erickson, Tom Cline, Chet Johnson and Patty McQuay are the innovators, South Dakota DENR, 523 E. Capitol, Pierre, SD 57501-3812. Phone: 605.773.4201. Email Address: Michael.Erickson@state.sd.us, Tom.Cline@state.sd.us, Chet.Johnson@state.sd.us and Patty.McQuay@state.sd.us.

20. **Are you aware of similar programs in other states? If YES, which ones and how does this program differ?** No, SD DENR is not aware of any similar program in other states.

21. **Has this program been fully implemented? If NO, what actions remain to be taken?** Yes, the program is in place.

22. **Briefly evaluate (pro and con) the program's effectiveness in addressing the defined problem(s) or issue(s). Provide tangible examples.**

    Pros

    - Greater accuracy in determining areas mined and reclaimed at mine sites and reclamation bond requirements. During the first year, over $600,000 in reclamation bonds were collected that would not have been collected under the old system.

- Better documentation of mine site history, which allows for sorting out reclamation liability at mine sites where more than one operator has mined.

- More efficient field inspections are conducted because inspectors are able to bring the entire E-file, database, and GIS application into the field. This also allows for better communication with operators or concerned citizens because site specific information can be reviewed on site.

- Eliminates the need to maintain paper files and is more efficient for staff because they have all the information they need to do their jobs at their finger tips.

- Mine operators are more accepting of reclamation bond requirements because they are aware of the accuracy of the areas mapped using GIS/ GPS.

- Operator annual reports and maps are more accurate and verifiable.

Cons

- Time required to develop and test a working application.

- Time required to convert paper files to electronic files.

23. How has the program grown and/or changed since its inception? The system continues to be refined as new issues are encountered. Portions of the system are being adapted for use by other groups within the department to optimize their ever growing workloads.

24. **What limitations or obstacles might other states expect to encounter if they attempt to adopt this program?** Each state would need to take the time to correctly analyze their current status, needs, and goals. A significant commitment of staff time will be required to convert paper files to electronic files. Adequate aerial photography will need to be acquired if not already available. Conveying requirements to programmers and GIS developers will be the biggest obstacle.