ExpertGPS Software
Pilot Project

Final Report

November 5, 2003

Executive Summary

ExpertGPS is a software package that creates waypoints, routes and tracks using aerial photos and topographic maps, and uploads and downloads that information to GPS units. The product is a low end/low cost ($30/copy) GIS tool that is intended primarily for field (non-office environments) activities.

The primary intent of pilot project was to analyze a tool to help offset some of the 2004-2005 budget reductions. The test consisted of 45 participants, using the software over approximately a three-month period. The participants applied the software inconsistently, some using it in their day-to-day activities and others making little or no use of the product during the test period.

Programs utilizing the software included Solid Waste Management, Public Water Supply, Mine Waste Cleanup, Industrial & Energy Minerals, Environmental Management, etc. (See detail efficiency gain numbers and program utilization examples in the attached Cost/Benefit Analysis).

In spite of the inconsistent use, the <u>net</u> efficiencies more than offset the costs. For the 45 pilot project participants, the estimated yearly net efficiency gain is approximately $52,000. Based on enterprise-wide implementation projections of 200+ copies of ExpertGPS, the estimated yearly DEQ <u>net efficiency gain</u> could offset over $250,000 per year of the 2004-2005 Biennium budget reductions.

However, it is misleading to express the value of ExpertGPS just in the term of dollars. The true value is in staff efficiency, accuracy and productivity. With the new software the time it takes to prepare site maps and diagrams is drastically reduced, while the accuracy of the final product is improved tremendously. By utilizing the up-to-date orthophotos, the actual facility or structure locations can be more easily identified and labeled. Besides the increased professionalism of staff-produced documents, the timesavings can be re-invested as technical assistance and training for the regulated community and direct assistance to the public.

Though specific program application of ExpertGPS and the total soft-dollar efficiency gains in each program area are difficult to calculate, the overall impact on the business processes of the department has been clearly and significantly demonstrated.

Therefore, the recommendation is to immediately begin the enterprise-wide implementation of ExpertGPS. Further, that the results of the pilot project be transmitted to ITSD for their consideration of the software as a State standard/accepted product.

Cost Benefit Analysis for ExpertGPS

Efficiencies

The following is a general description of some of the savings realized from using ExpertGPS during the pilot project.

Example 1	**Print Maps for Inspections – Solid Waste Management**	
Narrative	Individuals perform site inspections at locations that have never visited before. Activity involves pulling file, finding location, pulling corresponding map from paper files and making a copy. Copies are sometimes illegible. Use ExpertGPS to locate site and print both maps of site. Activity is 205 sites per year.	
Cost w/o ExpertGPS	.75 hours X 205 sites X $25.00 /hour = 3,843	
Cost w/ ExpertGPS	.25 hours X 205 sites X $25.00 / hour = 1,281	
Efficiency Difference	.50 hours X 205 sites X $25.00/hour = 2,562	
Efficiency Gain	67% ~ $2,562	
Source	CB6975 & CB5403 – Michele Fitcher & Pat Crowley	Group

Example 2	**Preparing Orthophotos for Inspection Trips – Solid Waste Management**	
Narrative	Individual prepares prints orthophotos for field inspection trips. Old method involved downloading ortho photo (Topofinder or Topofinder II); creating slide using PowerPoint; labeling slide; printing slide off of manual file. Old method took approximately 2 hours per task. With ExpertGPS individual brings up orthophoto, sites are already labeled on orthophoto; prints orthophoto for manual file. With ExpertGPS the task takes approximately ½ hour. Individuals perform this task 260 times per year.	
Cost w/o ExpertGPS	2 hours x 260 tasks X $25.00 /hour = 13,000	
Cost w/ ExpertGPS	.5 hours x 260 tasks X $25.00 / hour = 3,250	
Efficiency Difference	1.5 hours x 260 tasks X $25.00 /hour = 9,750	
Efficiency Gain	75% - $9,750	
Source	CB6975 & CB5403 – Michele Fitcher & Pat Crowley	Group

Example 3	**Initial Data Collection - Public Water Supply Surveys**	
Narrative	There are approximately 2800 Public Water Supplies in Montana that are regulated by DEQ. Each of these sites may have between the three and ten facilities requiring location information. Thus, there are upwards of 5,900 water system facilities (well, pressure control, treatment plant, storage tanks, intakes and other items) needing location information. Site assessments, reviews, surveys and other data are collected from each of these periodically. Contractors perform some of these and DEQ staff and/or county personnel do the rest.

DEQ receives it primary funding through the PPA agreement with the EPA. One of the conditions of that agreement is to provide accurate location data. The goal is to visit each water supply once every three years. Currently DEQ has data on approximately 50% to 60 % of the water system facilities. In the past it was very time consuming to acquire the data while in the field. Location information was obtained by one of two methods; neither provided a very specific (30 foot accuracy is the current standard) location. They had to be calculated manually from topographic maps or taken with GPS units that did not provide very accurate data. Using one of these two methods, it is generally estimated that it took approximately 1 hour to collect the location information on each facility.

ExpertGPS allows the work group to obtain the location data much more rapidly. In cases where personnel are familiar with various water supplies, they can pinpoint the actual location of each facility without the need for traveling to the site. In cases where an actual visit is necessary, they can collect the information with a GPS, download it into ExpertGPS and correct any inaccuracy. Using these methods it is estimated that it will take an average of 5 minutes per facility. | |
Cost w/o ExpertGPS	(50% X 5900 facilities X 1 hour X $25.00 /hr) /3 = $24,583	
Cost w/ ExpertGPS	(50% X 5900 facilities X .083 hours X $25.00 /hr) /3 = $2,040	
Efficiency Gain	92% ~ $22,543 / year	
Source	CB0138 – Steve Kilbreath	Group

Example 4	**SDWIS Error Correction - Public Water Supply Surveys**
Narrative	There are approximately 2800 Public Water Supplies in Montana that are regulated by DEQ. Each of these 2800 sites may have between the three and ten facilities requiring location information. Thus, there are upwards of 30000 water system facilities (well, pressure control, treatment plant, storage tanks, intakes and other items) needing location information. Site assessments, reviews, surveys and other data are collected from each of these periodically. Contractors perform some of these and DEQ staff and/or county personnel do the rest. 200 public water system surveys are conducted annually by a private contractor under contract to DEQ at an average cost of $600 per inspection. 300 surveys conducted by DEQ staff and contracted county personnel at an average cost of $350 per survey. Without ExpertGPS the location errors were undetectable. ExpertGPS was introduced as part of the survey standards for all new contracts with both private and county contractors. All DEQ staff doing the same surveys are also using it. When these surveys are checked against the SDWIS database there are approximately 10-15% of the locations that are at least several miles off. Each of these systems would have to have someone go out in the field and check the locations to make sure which one is correct. If someone is going out to check locations, a full blown inspection would be conducted since the big cost is the travel to the water supply. All of the errors were entered into the system prior to the introduction of ExpertGPS into the process.
Cost w/o ExpertGPS	200 Contractor Site Inspections Annually X $600.00 per inspection = $120,000 ~ 10% error rate = 20 re-inspections X $600.00 = $12,000 250 DEQ or county contracted Site Inspections Annually X $350.00 per inspection = $87,500 ~ 10% error rate = 25 re-inspections X $350 = $8750 Annual cost of re-inspection for correction = $20,750
Cost w/ ExpertGPS	
Efficiency Gain	It is noted that the cost of these re-inspections is not truly a savings other than the fact that bad data would continue to exist had ExpertGPS not been introduced.
Source	CB0138 – Steve Kilbreath	Group

Example 5	**Enforcement Complaints - Solid Waste Management Section**
Narrative	Waste Management receives approximately 100 complaints per year of septic pumping and solid waste violations. When a complaint came in, an approximately location was obtained from the complainant. Normally it was general narrative without specific location. Waste Management would then spend some time trying to narrow down the location before providing it to Enforcement staff. With ExpertGPS they can establish a Lat/Long using the topo and ortho photos and print copies off for Enforcement saving approximately ½ hour per complaint.
Cost w/o ExpertGPS	.5 hours per complaint X 100 complaints per year X 25.00 per hour = $1250
Cost w/ ExpertGPS	.08 hours per complaint X 100 complaints/year X 25.00 /hr = $200
Efficiency Difference	42 hours / yr ~ $1,050
Efficiency Gain	84% - $1,050
Source	CB5403 – Patrick Crowley	Individual

Example 6	**Remediation - Mine Waste Cleanup**	
Narrative	It saves time and money by not having to request maps and data from our consultants. For example, a simple map takes me just a few minutes to produce, while our consultants would charge us at least a half hour @ about $75/hr. Supplemental Information – Approximately 5 minutes per map with ExpertGPS. Approximately 20 maps per year.	
Cost w/o ExpertGPS	,5 hr x 20 maps X $75.00 / hours = $750	
Cost w/ ExpertGPS	.0167 x 20 maps X $25.00 = $8.35	
Efficiency Gain	98.8% ~ $742	
Source	CB5441 – Tim Reilly	Individual

Example 7	**Environmental Assessments - Solid Waste Management**	
Narrative	Using NRIS mapping it used to take eight to twenty-four hours to produce the maps needed for an EA. With expert GPS I've cut that time to 2 hours or less.	
Cost w/o ExpertGPS	12 Environmental Assessments / yr X 16 hours x $25.00 /hr = $4,800.00	
Cost w/ ExpertGPS	12 Environmental Assessments / yr X 2 hours x $25.00 / hr = $600.00	
Efficiency Gain	87.5% ~ $4,200	
Source	CB5684 – Mike DaSilva	Individual

Example 8	**Gravel Mining Permits – Industrial & Energy Minerals**
Narrative	I use this program as much as 2 to 3 hours each day. It is always up on my computer and I access it many times during the day. The main use is to **locate** existing or proposed opencut mines on aerial photos or topographic maps, and to locate citizen complaints about illegal mining, dumping, etc. The main purpose for using this software is for **drawing mine maps** for several purposes including documenting violations, assisting operators generate decent maps and for detailing changes to mine areas for bond calculations. I also **research** crushers as they move around the state to make sure they are operating in permitted gravel pits. I have discovered several illegal operations using this software. This program allows me to **generate maps to scale**, with waypoints, routes and tracks uploaded from my GPS that accurately display disturbance perimeters and points of critical interest such as spills, buried objects, erosional features and others. With ExpertGPS I cut steps and eliminate having to combine use of several other programs. I have discovered several other uses for this product that enhance my effectiveness within the Opencut program. I am able to **bring up on-screen**, an aerial and a topo map of areas while talking to the regulated public like never before. I use the program on my **laptop in the field** to solve problems or to locate myself real-time in the backwoods where no current maps are available. I have found myself driving in the forest at night and was able to make the right turns at unmarked forks in the road by **seeing myself from above** on an air photo. Other programs don't give me the option of seeing myself from the air on either aerial photos OR on topographic maps. This is critical in the field because sometimes the aerial is unavailable from the USGS, and sometimes the topo quad data is so old it doesn't show new roads. I **produce PowerPoint presentations** for mining companies that demonstrate problems or recommendations for alternate mine plans. Since I have begun using ExpertGPS, I have saved approximately 5 hours of work per week just in doing typical map and aerial searches, and another hour or two by importing directly into AutoCAD the scaled images I need for map production. I am able to bring up on-screen, an aerial and a topo map of areas while talking to the regulated public like never before. It is so quick, it saves me hours of time holding on the phone while I go pull the paper quads or dig through files to get maps like I used to do. I probably spend several hours each week doing this kind of public response work. I used to use Mapsource, Topo Finder, MrSID and All Topo Maps, neither of which combines all the features of ExpertGPS into a single package. That saves time, and time is money. **Exporting raster map images** directly into AutoCADD has saved hours each week of searching for and transferring map and aerial photos (to scale) into a useable format. It is so quick, it saves me hours of time holding on the phone while I go pull the paper quads or dig through files to get maps. I probably spend several hours each week doing this kind of public response work. My total time savings using ExpertGPS is already at least 11 hours per week over the past six months. **Losing access to this program will not save money, it will simply reduce the volume of service to the public. Lost time doing work the old way detracts from the quality and responsiveness of the program.**
Cost w/o ExpertGPS	Maps generated per week – 10 x 1 hours = 10 hrs Research locations per week – 10 x .2 hours = 2 hrs Field data posted onto maps per week – 6 x .5 hour = 3 hrs Locating mines in the field on topo maps per week – 6 x .5 = 3 hrs Total weekly time spent = 18 hrs
Cost w/ ExpertGPS	Maps generated per week – 10 x .5 hours = 5 hrs Research locations per week – 10 x .1 hours = 1 hr Field data posted onto maps per week – 6 x .25 hour = 1.5 hrs Locating mines in the field on topo maps per week – 6 x .25 = 1.5 hrs Total weekly time spent = 9 hrs
Efficiency Gain	18 hrs – 9 hrs = 9 hrs X $25/hour X 48 workweeks = 432 hours X $25/hour = $10,800 50% ~ $10,800
Source	CB6502 – Rod Samdahl	Individual

Example 9	**Environmental Management**	
Narrative	On the prairies of eastern Montana where topographic features are few and far between use of the GPS has allowed more precise mapping of features of interest. Expert GPS has allowed very simple maps to be constructed without going to the trouble of importing the points collected in the field into GIS software. After a three-day field trip we would end up with about 50 to 75 points. We do about 6 to 8 of these trips a year. Staff pay scale would be about $15 - 20 /hr plus benefits. With about 30 to 45 minutes using expert GPS as a direct, no frills mapping tool saves about one to two hours of futzing with GIS software to get a reasonable map. If we do need to use GIS software, Expert GPS would save about an hour's worth of futzing with exporting data to a spreadsheet, modifying it, and building a coverage in GIS.	
Cost w/o ExpertGPS	8 trips X 2 hours X $25.00 = $400.00	
Cost w/ ExpertGPS	8 trips X .5 hours X $25.00 = $100.00	
Efficiency Gain	75% ~ $300	
Source	CB6952 – Tom Ring	Group

Costs

In introducing the ExpertGPS Pilot there were several "start-up" costs incurred. Below is an estimate of these costs for the time period of one month prior to the approval of the pilot through the end of September 2003.

Item	Cost
Research and Development - including preparation initial proposal, preparation of instruction materials, ordering of licenses.	5,000
Licenses costs (45 X $29.90)	1,345
Class time for 4-hour class for 30 persons (4 X $27.00 X 30)	3,240
Travel Costs (Samdahl trip and Hammer trip)	350
Support Costs – 20 hours of support by Hammer for all persons. ($30.00/hr)	600
Final Report Collection and Analysis	1,200
Total	$11,735

Summary

It is estimated that during the pilot of ExpertGPS, the Department of Environmental Quality realized yearly efficiency gains of an estimated $52,000. The efficiency-gain percentages range from a low of 50% up to 99%, depending on the activity. Based on the various ways ExpertGPS was utilized during the pilot and assuming full enterprise-wide deployment (200+ seats), it is estimated the department could realize efficiency gains helping to offset some of the 2004-2005 biennial budget cuts by approximately $250,000 per year. These soft-dollar savings would be realized in several ways:

- Increased productivity of staff.
- Reduction of error in data.
- Less requirement of the use of costly contractors.
- Less use of time-consuming GIS software.
- Increased rate at which data can be checked for Quality Control.
- Reduced travel.
- Reduced purchase of custom maps and printed maps.

Though specifics in each area are difficult to calculate, the overall impacts on the work of the department has been clearly and significantly demonstrated. It has been overwhelmingly received throughout the pilot group and many who are not in the pilot are anxiously waiting approval so that they may begin using ExpertGPS.

Recommendation

Proceed immediately with the enterprise-wide implementation of ExpertGPS. Further, that the results of the pilot project be transmitted to ITSD for their review.