Applied geophysics in the community
Spring, 2007

Description: As a culminating project in Applied Geophysics, students plan, design, deploy and analyze independent geophysical field surveys at the university or within the town. These surveys may be on campus (i.e. using GPR or seismic refraction to investigate the likelihood of landsliding near a campus road), or within the greater community. In many cases, potential projects are brought to the class by community groups such as the local Department of Public Works or environmental firms. Recent projects include looking for evidence of an underground storage tank beneath a downtown sidewalk, using GPR to identify debris flows on a nearby alluvial fan, and documentation of ancient tribal gravesites in a local cemetery). Students work in small (2-4 person) groups and where appropriate collaborate with community members to plan the survey and ensure that the appropriate data are collected. Students first submit a project proposal, which gives them experience in developing a hypothesis and justifying their proposed work. Following data collection and analysis, the students write a summary report of the project, a copy of which is given to the community member or organization (in an unofficial context). Students present their work to the class in a short Powerpoint presentation.

Goals: To provides students with real-world geophysics experience, a connection to the greater community, and contacts within the community, including potential employers. Students gain writing skills as well as skills in designing geophysical surveys and analyzing real world data.

Jackie Caplan-Auerbach
Western Washington University
516 High St., MS 9080
Bellingham, WA 98225
jackie@geol.wwu.edu

GEO 442/452, Applied Geophysics
Term Project: Geophysics within the community

At this stage in the course you have gained experience in several geophysical methods including seismic refraction, ground penetrating radar, magnetism and electrical resistivity. You have learned how to design a geophysical survey to investigate the subsurface beneath the grassy semi-ellipse and you gained experience in the collection and analysis of quality data. Now it's your turn to plan, design and deploy an experiment that will be relevant to you and others within the larger community.

Your project will be performed in small (2-4 person) groups and may be selected from a list of possible projects in the Bellingham area (several are listed below). Some of these projects will be performed in collaboration with geologists at the County department of Public Works (River and Flood division) or other community members. These projects are more than just a class exercise: your data can be of significant value to these organizations and may contribute to hazard assessments, public works projects, or community development.

Please note that these projects require a great deal of organization and independence. You will be required to use time out of class to collect data, and you will need to be proactive about collecting your data in a timely manner (something as simple as inclement weather can change your plans in a hurry). Your data will be collected in groups, so you will need to plan with your team members to find times that are conducive to group fieldwork. I will be available for guidance on all of these projects and will be present for all field work.

1. Project selection: You and your group should choose a project that interests you and is feasible. Some of the projects listed below are far from town and will require significant planning. Please make sure that you select a project that you're able to do…a small project done well is far more important and valuable than a large project for which you are unable to collect good data. There is no shame in doing a quality project on campus if you know you won't have time to drive several hours to another field site.

2. Collaboration: Where appropriate, you and your group must meet with local community organizations involved in the project. You should plan to meet with them prior to writing your proposal and once following data collection.

3. Method selection: Once you have established the goals of your project, determine which geophysical method would be best. Consider things such as the depth of any features you hope to image. Do you expect interference from magnetic features? Is the region accessible? How far do you have to carry gear? Do you need the high resolution available through GPR or the depths accessible through refraction?

4. Proposal: Your team will submit a project proposal, describing (a) the problem you wish to solve or feature you wish to identify; (b) the plans for your survey including

number and locations of transect lines or data points; (c) your plan for data analysis (see syllabus for due date).

5. Data collection: Once your proposal is approved, you and your team can collect data. I need to be there for all field endeavors, so please schedule with me well in advance so that you can ensure your data will be collected.

6. Analysis: As you did with your data from the semi-ellipse, analyze your data to answer the questions addressed in your proposal. If you do GPR or refraction, present cross sections and discuss their relevance to the local geology. If you do magnetics, model subsurface features capable of generating the observed magnetic anomaly. If appropriate, consider discussing your initial findings with your community contacts to see if more data are required.

7. The report: You will submit a report of your project to me and to your community contacts (if relevant). Your report should include a description of the problem, a summary of your survey, a description of the data and data collection, a detailed discussion of your analysis and a conclusion addressing the initial questions. *This should be written as a professional document*. It should be typed, spell-checked, and well-written. Figures should be easy to read and clearly labeled (include directions on GPR and refraction lines! Include north arrows on maps!). If you used external references you MUST cite them and include a bibliography. See syllabus for due date.

Some possible projects:

- Canyon Creek bedrock analysis: At one point along Canyon Creek (see map presented in class), the stream is contained by bedrock and bottlenecks to form a small waterfall. At high water, this bottleneck makes it difficult for salmon, so Public Works is interested in diverting the creek. However, they do not know the dip or depth of bedrock in the proposed area and would like someone to map the subsurface in the region.

- Jones Creek Alluvial Fan: A number of debris flows have swept down Jones Creek near the town of Acme. Public Works has trenched the fan to investigate the size and frequency of these events, but their trenching has been limited to a small region. They are hoping someone will use GPR to ground-truth their trench data so that future studies can be accomplished without digging.

- Baker lahars: the size and number of lahars that have come down the Nooksack river from Mt. Baker is poorly constrained. Individual events may be identifiable in GPR data.

- Buried log jams: A salmon restoration project is planned for the middle fork of the Nooksack river. However, planners want to know where old log jams may be buried beneath stream deposits and are hoping we may be able to identify them.

- Lynden cemetery: For several years students in this class have used magnetics and GPR to help map land use portions of the Lynden cemetery that have not been well mapped over the past hundred years.

- The university planning website includes a description of some future building projects on campus. Knowing that large portions of the university were built on old swamp, you may wish to investigate these sites to determine the depth to bedrock and the thickness of fill.