INNOVATIVE METHODOLOGY FOR DETECTION
OF
FRACTURE-CONTROLLED SWEET SPOTS
IN THE
NORTHERN APPALACHIAN BASIN
SEMI-ANNUAL TECHNICAL PROGRESS REPORT

June 1, 2001-Dec. 31, 2001

Dr. Robert Jacobi, Principal Author

January 30, 2002

DE-AC26-00NT40698

CONTRACTOR:
Research Foundation of State University of New York
P. O. Box 9
Albany, New York 12201
on behalf of:
University at Buffalo
The State University of New York
Suite 211, The UB Commons
520 Lee Entrance
Amherst, New York 14228

Dr. Robert Jacobi, Project Director
Dr. John Fountain, Co-Principal Investigator

Mr. Stuart Loewenstein, President, Subcontractor
Quest Energy, Inc.
63 Kenmore Ave.
Amherst, NY 14226

Dr. Edward deRidder
Pearson, deRidder and Johnson, Inc.
12640 West Cedar Drive, Suite 100
Lakewood, CO 80228

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any other agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ABSTRACT

In the structure task, we completed reducing the data we had collected from a N-S transect on the east of Seneca Lake. We have calculated the fracture frequency for all the fracture sets at each site, and constructed modified rose diagrams that summarize the fracture attributes at each site. These data indicate a N-striking fault near the southeastern shore of Seneca Lake, and also indicate NE and ENE-trending FIDs and faults north of Valois. The orientation and existence of the ENE-striking FIDs and faults are thought to be guided by faults in the Precambrian basement; these basement faults apparently were sufficiently reactivated to cause faulting in the Paleozoic section. Other faults are thrust ramps above the Silurian salt section that were controlled by a far-field Alleghanian stress field.

Structure contour maps and isopach maps have been revised based on additional well log analyses. Except for the Glodes Corners Field, the well spacing generally is insufficient to definitively identify faults. However, relatively sharp elevational changes east of Keuka Lake support the contention that faults occur along the east side of Keuka Lake. Outcrop stratigraphy along the east side of Seneca Lake indicates that faults and gentle folds can be inferred from the some exposures along Seneca Lake, but the lensing nature of the individual sandstones can preclude long-distance definitive correlations and structure identification. Soil gas data collected during the 2000 field season was reduced and displayed in the previous semiannual report.

The seismic data that Quest licensed has been reprocessed. Several grabens observed in the Trenton reflector are consistent with surface structure, soil gas, and aeromagnetic anomalies. In this report we display an interpreted seismic line that crosses the Glodes Corners and Muck Farm fields. The final report from the subcontractor concerning the completed aeromagnetic survey is included. Prominent magnetic anomalies suggest that faults in the Precambrian basement are located beneath regions where grabens in the Trenton are located. The trend and location of these faults based on aeromagnetism agrees with the location based on FIDs.

These data indicate that integration of aeromagnetic and topographic lineaments, surface structure, soil gas with seismic and well logs allows us to extrapolate Trenton-Black River trends away from confirmatory seismic lines.

TABLE OF CONTENTS

	page
DISCLAIMER	1
ABSTRACT	2
LIST OF GRAPHICAL MATERIALS	4
INTRODUCTION	5
EXPERIMENTAL	7
FRACTURE ANALYSES SUBTASK	7
STRATIGRAPHY/WELL LOG ANALYSES SUBTASK	7
LINEAMENTS SUBTASK	8
SOIL GAS ANALYSES	8
SEISMIC DATA ACQUISITION, REPROCESSING, AND INTERPRETATION	9
ADVANCED SEISMIC ANALYSES	9
AEROMAGNETIC SURVEY AND ANALYSES	9
RESULTS AND DISCUSSION	10
FRACTURE ANALYSES SUBTASK	10
STRATIGRAPHY/WELL LOG ANALYSES SUBTASK	12
LINEAMENTS SUBTASK	12
SOIL GAS ANALYSES	13
SEISMIC DATA ACQUISITION, REPROCESSING, AND INTERPRETATION	13
ADVANCED SEISMIC ANALYSES	13
AEROMAGNETIC SURVEY AND ANALYSES	15
CONCLUSIONS	15
FIGURE CAPTIONS	16
APPENDICES	
APPENDIX 1. Cayuga Field Season (2001) Data Part 1	
APPENDIX 2. Cayuga Field Season (2001) Data Part 2	
APPENDIX 3. Seneca Lake Site Log (Field Season 2001 and 2002)	
APPENDIX 4. Seneca Lake Field Season 2001 Data	

LIST OF GRAPHICAL MATERIALS

- FIGURE 1. Location Map of Study Area, including the 2001 Field Campaign
- FIGURE 2. Site Location Maps for the Year 2001 Field Campaign.
- FIGURE 2a. Site Location Map of the Ithaca West 7.5' Topographic Quadrangle. Location of quadrangle shown in Figure 1.
- FIGURE 2b. Site Location Map of the Ludlowville 7.5' Topographic Quadrangle. Location of quadrangle shown in Figure 1.
- FIGURE 2c. Site Location Map of the Trumansburg 7.5' Topographic Quadrangle. Location of quadrangle shown in Figure 1.
- FIGURE 2d. Site Location Map of the Sheldrake 7.5' Topographic Quadrangle. Location of quadrangle shown in Figure 1.
- FIGURE 3. Explanation of Modified Rose Diagrams Used in This Report.
- FIGURE 4. Site Location Map for the Year 2000 Field Season with Rose Diagram Enlargements.
- FIGURE 5. Correlation Between Fracture Intensification Domains and Soil Gas Peaks
- FIGURE 6. Relationship Among Aeromagnetic Anomalies, ENE-fracture Frequency and Soil Gas Data Sets.
- FIGURE 7. Index Map of Southern Seneca Lake for Figures 8, 9, 10, 11, 12, 13 and 14.
- FIGURE 8. Photograph of an ENE-striking FID at Site # 26, Shaw Rd
- FIGURE 9. Photograph of an ENE-striking FID at Site # 34, Rhodes Rd.
- FIGURE 10. Photograph of an ENE-striking FID at Site # 52, Sixteen Falls Creek.
- FIGURE 11. Photograph of a NNW-striking FID at Site #452 near Sawmill Creek.
- FIGURE 12. Photograph of a NNW-striking FID at Site #68 Sixteen Falls Creek.
- FIGURE 13. Photograph of a Northerly-striking Fracture with Demonstrable Slip at Site #56a, Sixteen Falls Creek.
- FIGURE 14. Photograph of a Typical Fracture Pattern Without FIDs, Site #5, Middle Rd.
- FIGURE 15. Aspect of Topographic Slopes from DEMs
- FIGURE 16. Soil Gas Traverses for Years 2000 and 2001
- FIGURE 17. Soil Gas Anomalies Along Traverses Shown in Figure 16.
- FIGURE 18. Seismic Amplitude Display Showing Interpreted Faults and Horizons.
- FIGURE 19. Reflection Strength ("Instantaneous Amplitude) Display Showing Changes in Reflection Strength Within Some of the Fault Blocks.
- FIGURE 20. Instantaneous Phase Display Showing Subtle Changes in Phase Character Between Fault Blocks and Surrounding Rocks.

INTRODUCTION

3-D seismic analysis is unquestionably one of the premier methods for obtaining information concerning deep structure, including predictions of enhanced fracture porosity in reservoirs. However, the high cost of 3-D seismic makes it economically unfeasible in many basins with *perceived* marginal gas reserves. However, without some advanced technology like 3-D seismic, the deep structure in many basins (like the Appalachian Basin of New York State) cannot be critically evaluated because available seismic reflection profiles and deep well logs provide insufficient control.

This research project demonstrates a cost-effective alternative to 3-D seismic. The project demonstration is a combination of low-cost, innovative technologies that, when integrated, yield near-3-D quality on a regional scale for identification of fractured reservoir prospects. The study area covers about 760 sq. miles, an area that would cost about \$22 million for 3-D seismic coverage alone; our proposal is a fraction of that cost.

The basic premise is that highly productive zones in tight reservoirs are associated with discrete zones of intense fracturing, termed “fracture intensification domains” (FIDs, Jacobi and Fountain, 1996, Jacobi and Xu, 1998). These zones can be identified by integration of surface geology, lineaments, well log data, seismic data and soil gas anomalies. FIDs in the northern Appalachian Basin have been shown to be indicative of fault zones at depth (Jacobi and Fountain, 1996, Jacobi and Xu, 1998). Thus, by identifying and tracing FIDs, we can predict the location of zones of increased fractures in the subsurface.

Because large gas discoveries (estimated 3 bcf/well) have been made recently along fault zones in the New York State portion of the Appalachian Basin, it is important to be able to recognize FIDs. Because of vegetation and surficial deposits, the FIDs cannot be traced continuously in outcrop. In order to trace the FIDs, we have developed an integrated program that involves:

1. surface structure,
2. soil gas analyses,
3. remotely-sensed lineaments,
4. existing (2-D) seismics, and
5. aeromagnetism.

Structural studies on outcrops allow identification of FIDs; then lineaments from aeromagnetic and remotely-sensed data are used to trace the FIDs between outcrops. Soil gas anomalies can confirm that the lineaments are associated with fracturing. Existing well log and seismic data are used to confirm the interpretations. Many of the fault systems in the northern Appalachian basin can be traced with aeromagnetism because the surface faults are reactivated deep faults that are located in the Precambrian basement.

The study area is located in the northern Appalachian Basin in the Finger Lakes region of central New York State, primarily between Seneca and Cayuga lakes (Figure 1). The target is the

Ordovician Trenton/Black River groups, although fractured tight sands above the Trenton also occur in this area. The most prolific gas play in New York State today is the Glodes Corners Road Field, an Ordovician Trenton/Black River play that is located west of Keuka Lake. This field was developed by Columbia Natural Resources (CNR), who estimates that the yield/well is 1.3 bcf. The east-northeast trend of the Glodes Corners Road Field suggests that the Glodes Corners Road Field is located along faults that are reactivated structures related to the older Cambrian Rome Trough, which is assumed to trend approximately east-northeast in regions south of the play (Jacobi et al., 1999). Well logs from the Glodes Corners Road Field indicate a narrow fault zone that increases in stratigraphic offset upsection, increasing to 6 m in the Trenton.

On seismic reflection profiles, The Trenton plays occur along fault zones that appear as narrow (~ 2000') grabens with small regional offset. These grabens are thought to be a result of a combination of

- ◆ solution collapse,
- ◆ reverse flower structures (along strike-slip faults), and
- ◆ seismic pull-down from the lower velocities associated with dissolution and fault brecciation.

In order to procure and analyze the data necessary for the demonstration project, the integrated research project was divided into seven tasks. These tasks include:

- ◆ Traditional and innovative analyses of fractures (Jacobi),
- ◆ Stratigraphy/well log analyses (Jacobi and Loewenstein),
- ◆ Lineaments (Jacobi),
- ◆ Soil Gas Analyses (Fountain),
- ◆ Seismic Data Acquisition and Interpretation (Loewenstein and Jacobi),
- ◆ Advanced Seismic Analyses (Hart), and
- ◆ Aeromagnetic Survey and Analyses (deRidder).

During the third reporting period, we made significant progress, as outlined in the “Results and Discussion” section.

EXPERIMENTAL

FRACTURE ANALYSES SUBTASK

Jacobi and graduate students (Lugert and Wehn) used an abbreviated methodology to collect outcrop structural data during the second field season. In the abbreviated methodology, Jacobi and assistants identified the fracture sets in the outcrop, and measured the spacing among a minimum of three fractures for each systematic fracture set. They also measured the strike and dip of the fractures, and collected information concerning the abutting relationships, length/height, character of fracture trace (e.g., straight, curvy), and offset along the fracture. They constructed a sketch map in their field notebooks that showed the location of the outcrop and a sketch map of the fracture traces on the outcrop. They indicated the general site location in the field by tying an annotated ribbon to an overhead tree. The sketch map of the site also includes sufficient geographical markers to be able to identify the site location on the topographic base. They annotated the site of the outcrop on the enlarged topographic map base.

Jacobi and graduate students (Lugert and Wehn) entered all the site data and the fractures data in Excel data spreadsheets (Appendix 1 for sites, Appendix 2 for fracture data). For each site, the next step is to calculate the fracture frequency for each set. As most fractures are very steeply dipping ($80^{\circ}+$), modified rose diagrams can be used to portray the results. In these rose diagrams, fracture frequency is displayed in the top half of the diagram. We generally show three orders of magnitude on the diagram as successively larger concentric circles, with the inner circle representing 0.01 fractures/m, the middle ring representing 0.1 fracture/m, and the outer ring representing 1 fracture/m. Thus, long petals indicate a relatively high number of fractures, as did the old rose diagrams. The advantage of this modified diagram is that it is compatible with scanline data that we collected the first year. We use the lower half of the rose diagram to indicate other features of the fracture sets, commonly either abutting relationships, or length (which is a proxy for abutting relationships). The longest petals in the lower half indicate the master set; the next longest petals indicate the set that abuts the master set, but that is itself master to another fracture set, which is portrayed by even shorter petals.

Advanced analysis techniques, including fractal analysis and geostatistics (see Jacobi et al., 2001, for a review) will be carried out where these techniques will add to the understanding of the fracture development and significance of fractures for identifying deep structure. However, from the first two field seasons, the fracture data look to be very robust, so these techniques may not be necessary. The extent of outcrop was far greater than we had expected, and so the need for these special techniques that we developed especially for areas with limited outcrop, may not be necessary.

STRATIGRAPHY/WELL LOG ANALYSES SUBTASK

Jacobi and Loewenstein will provide the project with 1) structure contours on bedrock marker beds that outcrop in the study area, and 2) subsurface structure contour maps based on distinctive units identified in well logs. Such maps shall aid in determining fault locations and offset. The construction of these maps is funded by an ongoing NYSERDA project. The contouring will be

accomplished by a subroutine package in Geographix. The stratigraphic tops picked from well

logs will follow the industry practice for recognizing each unit top; van Tyne and Foster's (1979) study illustrates such picks.

Jacobi and assistants will provide geological cross-sections across prominent surface structure where outcrops of marker units allow such constructions. The elevations of the marker units will be determined from topographic maps, and/or from altimeters, and/or from surveying from a known elevation.

LINEAMENTS SUBTASK

Jacobi and Loewenstein will combine lineaments recognized in Landsat images and in 7.5' topographic quadrangle maps. They will integrate Earthsat's (1997) pick of Landsat lineaments in the demonstration area with a reanalyzed Landsat data set. They will also analyze 7.5' topographic maps for lineaments following Jacobi and Fountain's (1996) methodology.

Jacobi will contribute an analysis of digital elevation data available from USGS for the study area. This analysis will include edited topography, a high-pass of the topography, and a horizontal gradient of the high-pass of the topography. We will compare lineaments observed in these gradient maps to those lineaments observed on the Landsat and 7.5' quadrangle maps.

The resulting series of maps of the demonstration area will include 1) Earthsat's Landsat lineament map, 2) our interpretation of lineaments from the Landsat data, 3) lineaments from 7.5' topographic quadrangle maps, 4) lineaments from gradient maps of Pearson, deRidder and Johnson, Inc. and 5) a map integrating all 4 data sets. We will compare the lineaments with the preliminary FID map. Where coincidence occurs between lineaments and FIDs observed in outcrop, we will extend the observed FID along the lineament. After the first iteration, we will compare the lineament/FID map with the soil gas analyses discussed below.

SOIL GAS ANALYSES

Soil gas surveys will be conducted along primarily north-south profiles, following existing seismic lines, and the general techniques and rationale of Jacobi and Fountain (1996) and Fountain and Jacobi (2000). In this research plan, traverses are conducted along the edge of roads and samples are collected at a distance of 3 to 10 meters from the road, depending on road construction, to avoid the roadbed fill material.

Samples are obtained by driving a stainless steel probe to a depth of 60 cm using a hand-held sledge hammer. Twenty cubic centimeters of air, slightly more than one probe volume, is withdrawn from the probe and discarded with an air tight syringe to purge atmospheric air from the probe. An additional 60 cc of air is then withdrawn with the syringe and injected directly into a gas chromatograph (GC) equipped with a flame ionization detector for analysis (a Century OVA 128 GC). Gas enters the probe through an array of holes approximately 5 cm above the tip; the holes are covered by a loose sliding collar that minimizes plugging during insertion.

Samples are collected at 10 m intervals. This distance is somewhat arbitrary; however, the results of over 10,000 analyses established that most anomalies are more than 10 m wide (Fountain and Jacobi, 2000), confirming that a 10 m spacing will detect most anomalies.

Linear response of the gas chromatograph is determined by analysis of standard gasses at the start of each day, after four hours of analyses, and at the end of each day. Samples are analyzed in duplicate every 10 samples.

All samples with 10 ppm or greater total organic vapor content are returned to the laboratory for analysis on a laboratory gas chromatograph to determine ethane/methane ratios. The GC is calibrated daily for response and elution times using standard gas mixtures.

SEISMIC DATA ACQUISITION, REPROCESSING, AND INTERPRETATION

Loewenstein will purchase available seismic lines and subcontract with seismic processors to reprocess the records where necessary. He will evaluate the reprocessing effort and be especially cognizant of statics problems. If such problems appear to exist, he will request that the processor reprocess any section that may exhibit such problems. Loewenstein and Jacobi will interpret the seismic lines for prominent stratigraphic reflectors and faults. Where recognizable, they will pick the reflectors that represent the Tully, Onondaga, Trenton, Black River and Precambrian/Cambrian contacts. They will use accepted industry practices for the reflector recognition (e.g., Jacobi and Fountain, 1996; Jacobi et al., 2000). The interpretation of the 2-D seismic will be displayed along the seismic line in depth (time) sections that show potential faults. These depth displays will be integrated with the surficial FID/soil gas/lineament maps in two ways: 1) the location of surficial FIDs/soil gas anomalies and lineaments will be shown above the depth section for ease in spatial correlation, and 2) the locations of deep structure (faults) as interpreted from the seismic line, will be entered in Geographix so that their locations can be compared in map view with the locations of the surficial FIDs/soil gas anomalies and lineaments.

ADVANCED SEISMIC ANALYSES

The seismic expression of faults is a function of several variables, including the fault offset and the frequency content of the seismic data. On migrated seismic lines, faults are most easily recognized by reflection offsets, changes in dip, changes in amplitude, etc. Subtle faults are most easily detected in 3-D seismic volumes by deriving and analyzing “horizon” attributes, such as dip, edge detection and azimuth, or “coherency” attributes (e.g., Hart et al., 1996). Additionally, complex trace attributes (e.g., instantaneous frequency, reflection strength) can be useful for fault detection. In the manner described above, Hart will analyze critical sections of the seismic profiles procured in the preceding subtask.

AEROMAGNETIC SURVEY AND ANALYSES

Aeromagnetic prospecting is a powerful methodology that can define the basement fault block patterns with detail on a basinal scale. Pearson, deRidder and Johnson, Inc. will acquire, process, and interpret an aeromagnetic survey of the study area. Using both widely available techniques and proprietary methods, Pearson, deRidder and Johnson, Inc. and Jacobi will delineate basement-related structural elements that serve as bounding structures on intra-basement lithology blocks, supra-basement structural relief, and zones of strike-slip faulting that may be associated with fracture swarm development. In addition, the proprietary profile data interpretation tool, STARMAG, licensed by Texaco exclusively to Pearson, deRidder and Johnson, Inc., will be amended, using local constraints, to allow for improved models of magnetic lineaments related to fracture swarms.

Specifications shall be as follows:

Survey area:	710 square miles
Line spacing:	1/3- mile N-S x 1-mile E-W
Line mileage:	3,600 line miles
Ground clearance:	500' above ground level, or as to be decided
Acquisition subcontractor:	Airmag Surveys, Inc., Philadelphia, PA

The data will be processed using an equivalent source method, which compensates for elevation differences at line intersections, taking into account anomalous vertical magnetic gradients. Both profile and grid based interpretation methodologies will be employed to derive the maximum information content of the data set. The resulting maps can be used to infer lineaments related to faults in the basement, and can, in some cases, be used to determine approximate amount of offset on basement. Jacobi and Loewenstein will integrate the aeromagnetic lineaments with the FID/lineament/soil gas maps and seismic attribute studies. Spatial coincidence among aeromagnetic lineaments and the FID/lineament/soil gas/seismic line fractures (seismic attribute) maps will be taken as defining probable fault systems that affected the entire sedimentary section, including the Ordovician targets.

RESULTS AND DISCUSSION

FRACTURE ANALYSES SUBTASK

We had three objectives for this reporting period: 1) collect fracture data along a NNW transect that borders the southwestern side of Cayuga Lake (Fig. 1), 2) fill in gaps in the N-S transect that we constructed in the summer of 2000 along the east side of Seneca Lake, and 3) complete the analyses of the summer 2000 data. We met all three goals. For the first two objectives Jacobi and graduate students (Lugert and Wehn) measured characteristics of over 3000 fractures at 276 sites this past field season. The site maps for the year 2001 field season are shown in Figure 2. Fracture characteristics for the various fractures at each site are displayed in Appendices 1 and 2. The average fracture frequency for each set at each site is calculated for many of the sites.

The base maps for the site maps along Cayuga Lake constructed in ARC/INFO. Streams were

from the CUGIR website, and were found to match the streams on USGS 7.5' topographic maps generally quite well (with less than a [topo-sheet] line-width error anywhere in the quadrangle when displayed at full scale). In contrast, the roads from the county transportation maps at the same website were very poorly digitized. We have modified the more severe problems. After digitizing the sites in ARC/INFO, we transferred the maps to Adobe Illustrator in order to paste on rose diagrams that we will construct in the next reporting period.

We also realized the third goal, to complete analyses of the N-S transect along the east side of Seneca Lake. For the Seneca Lake transect, the year 2001 sites were integrated with the year 2000 sites (Appendix 3). The fracture characteristics at the year 2001 sites are displayed in Appendix 4. Analyses of the fracture data were displayed at the National Geological Society of America meeting in November, 2001 (Lugert et al., 2001) and at the Fall IOGA meeting in Buffalo, NY. The complete map displaying modified rose diagrams (Figures 3) of fractures along the Seneca Lake transect is shown in Figure 4. As discussed in earlier progress reports, Jacobi and graduate students (Lugert and Wehn) found that the eastern shore of Seneca Lake can be divided into two regions that display different fracture attributes. Although both regions share most fractures sets, the two regions have different prominent fractures in terms of length, frequency and abutting characteristics. The area south of Hector (Figure 4) exhibits primarily NNW and N to NNE-striking master fractures and FIDs. For example, inspection of the rose diagrams in the Burdett Enlarged Area "B" (Figure 4) reveals that at each site in Area "B", the northerly striking fractures have a higher frequency than the ENE and WNW striking fractures. At both sites RDJ 74 and RDJ 74A+B, the fracture frequency of the northerly-striking fracture sets is about an order of magnitude greater than that of the ENE-striking set. Similarly, in Burdett Enlarged Area "D" (Figure 4), the northerly-striking fractures have nearly an order of magnitude greater frequency than the easterly striking fractures at site 1B. At site 4 (Figure 4), the northerly-striking fractures are the masters, although the fracture frequencies of the N-striking and easterly striking sets are comparable. In contrast, in the region of Hector/Valois and to the north, master fractures and FIDs commonly strike ENE or WNW. For example, in Dundee Enlarged Area "B", the easterly striking fractures at sites 8 and 9 have an order of magnitude greater frequency than do the northerly striking fractures, even though the master set is northerly striking. This contrast suggests that along the eastern shore of Seneca Lake, the ENE-trending structures, such as the Iapetan reactivated faults, occur in the region near Hector/Valois (and sporadically northward). In the region south of Hector, N- to NNW-striking CSD-related faulting is probable along the shore of Seneca Lake.

Figure 5 summarizes the relationship between soil gas anomalies and N-striking fractures in the south and ENE-striking fractures/FIDs north of Hector. In this figure, we display the frequency of ENE-striking fractures averaged over a kilometer window (of sites) on a NNW-striking transect. Most sites are included on the transect; the position of those sites that were off the transect were projected onto the NNW-striking transect (i.e., the transect is orientated orthogonal to the ENE-striking fractures). The two structural domains are readily apparent. South of Hector, the frequency of ENE-striking fractures averaged over a kilometer is generally less than 1 fracture/meter, and many sites essentially have a fracture frequency of zero. In contrast,

regions north of Hector have much higher maximum frequencies, as much as 34 fractures/m, and commonly 4-6 fractures per meter. As shown in Figure 5, the northern structural domain with the higher frequency of ENE-striking fractures also corresponds to a distinct increase in number of soil gas “spikes” per km. In the southern structural domain, the number of soil gas anomalies averages <5/km, whereas in the northern structural domain, the soil gas spikes averages over 5 spikes /km, and as many as 15 spikes /km. Furthermore, regions in the northern structural domain that do not have high frequencies of ENE-striking fractures also have a low in soil gas spikes (between Valois and Hector, Figure 5).

The northern zone of high soil gas spikes and the frequency of ENE-striking fractures also correspond in a general way to an ENE-striking aeromagnetic low (see profiles across the aeromagnetic low in Figure 6). Thus, the fractures and soil gas anomalies at the surface most likely reflect deep structure that affects the Precambrian basement. Our seismic reflection profiles confirm that faults do occur in the Precambrian basement in this area.

Examples of ENE-striking FIDs are shown in figures 8, 9, and 10 (site locations for the fracture photographs are shown in Figure 7). Examples of NNW-striking FIDs are shown in figures 11, and 12 (site locations for the fracture photograph are shown in Figure 7). The NNW-striking FID in Figure 12 is located in the northern structural domain (where the heavy preponderance of ENE-striking FIDs occurs). Thus, Figure 12 demonstrates that in the area north of Hector NNW-striking cross-strike master fractures and FIDs are observed, in addition to the ENE-striking master fractures. The NNW- and N-striking sets are not ubiquitous; rather they are found only in discrete zones. At several of the sites, the northerly-striking fractures exhibited strike slip motion, displacing the ENE-striking fractures a few cm (Figure 13). It is thus probable that in this area, northerly-striking faults, as well as easterly-striking faults occur at depth. Figure 14 shows the typical fracture patterns where no FIDs occur.

STRATIGRAPHY/WELL LOG ANALYSES SUBTASK

The subcontractor, Quest Energy, submitted a database for deep well logs in the Finger Lakes region in the previous progress report. In that report Quest Energy also constructed several proprietary structure contour and isopach maps. Discussion of these maps is contained in the previous progress report.

LINEAMENTS SUBTASK

Jacobi and graduate students (Lugert and Wehn) have refined the calculation of the aspect of topographic slopes from DEMs (Figure 15). These figures show the prominent approximately N-striking lineaments in the southern part of the study area east of Seneca Lake, where we have a relative preponderance of N-striking fractures and FIDs. Similarly, in the central part of the study area on the east side of Seneca lake, a zone of ENE and NE-striking topographic elements corresponds to the zone where we found a concentration of ENE and NE-striking fractures and FIDs.

SOIL GAS ANALYSES

Fountain and his assistants acquired 5836 soil gas samples, comprising more than 32 km of traverse (Figure 16). The traverses completed the planned north-south range from Ovid to Watkins Glen. In addition a number of additional lines were run including completion of a box around a recently drilled gas well and offsetting of the main line near Ovid and near Lodi where extensive contamination from dense housing had made the main road non-viable. The results (Figure 17) show a spectacular coincidence of soil gas anomalies and ENE trending lineaments (Figure 5). This confirms our contention that the soil gas anomalies correspond with structural features. Note that the detailed locations provided by soil gas anomalies provide far more precise information than lineament analysis, but the two together are the most powerful. Of particular significance to this project is the progress in methodology made during the last year. Based on the summer of 2000 work, our procedure was modified to use an electric impact hammer rather than hand-sledges and we constructed special extraction tools to automate probe extraction. In addition we modified the assignments of all personnel to provide more efficient surveys. As a result we were able to exceed the maximum number of samples ever achieved in a single day previously, on a routine basis this summer. One of the primary benefits is the reduction in breakage of the probes and the vast reduction in physical effort for the crew. As a result we can not only work faster, but can work many more hours before the crew becomes too tired to work effectively. We will modify our acquisition plan next summer to allow more hours in the field per day which should increase the number of samples even further. The plan is to use the extra ability to run multiple boxes and NS lines across FIDs already located to determine if soil gas can be used to trace the FIDs. We expect that they are offset by crosscutting structures, and we further expect that soil gas will allow extrapolation of the structures, including location of offsets, greatly improving the chance of success when successful wells are offset along structure.

SEISMIC DATA ACQUISITION, REPROCESSING, AND INTERPRETATION

The subcontractor, Quest, and Jacobi presented preliminary interpretations of three seismic lines in the previous progress report.

ADVANCED SEISMIC ANALYSES

Work in the first half of year two has focused on using seismic attribute displays to refine structural and stratigraphic interpretations. The seismic lines are being interpreted using Geographix' SeisVision software.

Seven seismic markers have been picked and validated on four seismic lines:

- ◆ Top Onondaga (Devonian)
- ◆ Top Salina (Silurian)
- ◆ Top Lockport (Silurian)
- ◆ Top Trenton (Ordovician)
- ◆ Top Black River (Ordovician)

- ◆ Knox Unconformity
- ◆ Top Basement

The Trenton seismic horizon has a regional strong amplitude character while other markers manifested wide seismic amplitude variations in time and space. The validation of stratigraphy has been implemented via seismic signature correlation for above basement sequences and correlation polygon confirmation.

The interpretation has focused on the interval Top Trenton-Basement and defined a series of major horsts and grabens, 13 blocks on the line EGI004, 15 blocks on the line SCNYRS1C, 6 blocks on the line SCNYRS6, and 3 on the line SCNYRS7. The majority of these faults show vertical to highly dipping faults to north and south directions. Most of these faults can be extended to the basement with few extending upward to shallow near surface depths. Almost all the tectonic failure surfaces are intimately related to basement tectonics; however, seismic data quality and resolution limitation do not permit to interpret basement faults in depth.

The interpretation shows that Trenton-Black River carbonate sequence has undergone heavy faulting and fault associated fracturing. Interesting rollover folds defining possible low amplitude structural closures have been observed at 8 locations on the line EGI004; one of them is associated with the Glodes Corners Road Pool. The east-west oriented positive closures have been interpreted at top Trenton level and can be detected on the lower series as well. Eastward, a major fault-bounded rollover structure has been interpreted at the northern part of the line SCNYRS1C. Intensive faulting with rollovers as well as a Northward sedimentary series thinning has been interpreted on the line too.

The interpretation of the lines SCNYRS6 and the line SCNYRS7 has indicated a much lower tectonic deformation level. The basement dip is considerably lower and the sedimentary series show less deformation. However, an interesting fault associated closed structure has been identified at the central part of the line SCNYRSC6. The tectonic frame-work in the east of the region defines a lower frequency step like faulting.

Further processing related to complex seismic trace attribute analyses is providing better understanding and providing criteria for fracture and other possible seismic anomaly associations within the area. The following complex trace attributes have been derived for the four seismic sections:

- ✓ Instantaneous Amplitude
- ✓ Instantaneous Frequency
- ✓ Instantaneous Phase

Visible instantaneous amplitude variations have been observed on top Trenton marker near fault zones. Amplitude dimming has characterized the collapsed and fault bounded blocks. This can be attributed to a possible change in petrophysical characteristics of Trenton carbonates due to faulting, fracturing and probably further diagenetic modifications. This criterion should be

confirmed later by seismic inversion. Other intermediate marker between top Trenton and top Black River has also shown strong amplitude variations and in some areas complete dimming.

Instantaneous frequency is lower within fault-collapsed zones as well as in rollover sectors. This can be attributed to stronger seismic wavelet attenuation within these areas. Instantaneous phase shows visible changes and inversion in fault bounded graben areas. Seismic phase changes can be considered as evidence of fracture-dominated zones.

Selected images showing seismic attribute displays and the relationships between attributes and structure are shown in Figures 18 to 20.

We are currently loading the seismic data into Hampson-Russell's *Strata* software application for eventual seismic inversion work. The objective is to see whether it is possible to distinguish between limestones (tight) and dolomites (fractured, porous) in the inversion result. We are awaiting the arrival of digital logs for wells on line EGI004, the only seismic line that has wells more-or-less directly on the line. This inversion work will be completed in the second half of year two.

AEROMAGNETIC SURVEY AND ANALYSES

Pearson, deRidder and Johnson, Inc. completed their task, and the final results were reported in a previous progress report.

CONCLUSIONS

During the third reporting period, we collected data necessary to keep the project on schedule. In structure, we completed a N-S transect west of Cayuga Lake that indicates NE and ENE-trending FIDs and faults approximately on strike with the ENE-striking FIDs along the east shore of Seneca lake (north of Valois). The NE-striking FIDs and faults are thought to be controlled by basement faults. Soil gas data displayed a number of ethane-charged soil gas "spikes" on a N-S transect from Ovid south to near Valois. The soil gas team found a larger number of spikes in the northern half of the survey, suggesting more open fractures (and faults) in the northern half of the survey. Seismic data have been purchased and reprocessed. Several grabens observed in the Trenton reflector are consistent with surface structure, soil gas, and aeromagnetic anomalies. The aeromagnetic survey is completed and the data are processed. Prominent magnetic anomalies suggest that faults in the Precambrian basement are located beneath regions where grabens in the Trenton are located.

FIGURE CAPTIONS

FIGURE 1. Location map of Year 2001 study area.

FIGURE 2. Site location map for the Year 2001 field campaign.

FIGURE 3. Explanation of modified rose diagrams used in this report. The upper portion of the diagram represents the fracture Frequency, while the bottom portion illustrates the master and abutting relationship.

FIGURE 4. Site Location Map for the Year 2000 Field Season with Rose Diagram Enlargements. The details for transect A-A' are in Figure 5.

FIGURE 5. Correlation between Fracture Frequency of ENE-striking Fractures and Soil Gas Anomalies.

FIGURE 6. Relationship among aeromagnetic anomalies, ENE-fracture frequency and soil gas data sets. N-S transects indicate that the ENE aeromagnetic low coincides with high ENE fracture frequencies. Fracture frequency and soil gas data follow transect A-A' from Figure 5.

FIGURE 7. Index Map of Southern Seneca Lake for Figures 8, 9, 10, 11, 12, 13 and 14. Red stars correspond to the location of pictures in indicated figures.

FIGURE 8. Photograph of an ENE-striking FID at Site # 26, Shaw Rd

FIGURE 9. Photograph of an ENE-striking FID at Site # 34, Rhodes Rd.

FIGURE 10. Photograph of an ENE-striking FID at Site # 52, Sixteen Falls Creek.

FIGURE 11. Photograph of a NNW-striking FID at Site #452 near Sawmill Creek.

FIGURE 12. Photograph of a NNW-striking FID at Site #68 Sixteen Falls Creek.

FIGURE 13. Photograph of a Northerly-striking Fracture with Demonstrable Slip at Site #56a, Sixteen Falls Creek. The right lateral slip was observed across many offset NNW-striking fractures (of which this is an example).

FIGURE 14. Photograph of a Typical Fracture Pattern Without FIDs, Site #5, Middle Rd. Both the NNW and ENE sets (displayed in blue) illustrate fracture frequency where there is no FID.

FIGURE 15. Aspect of Topographic Slopes from DEMs. Pixel resolution is 10m.

FIGURE 16. Soil Gas Traverses for Years 2000 and 2001

FIGURE 17. Soil Gas Anomalies Along Traverses Shown in Figure 16. Bars indicate locations where the measured soil gas was above the background rate.

FIGURE 18. Seismic Amplitude Display Showing Interpreted Faults and Horizons.

FIGURE 19. Reflection Strength (“Instantaneous Amplitude) Display Showing Changes in Reflection Strength Within Some of the Fault Blocks. High reflection strength shown in red, low reflection strength in blue.

FIGURE 20. Instantaneous Phase Display Showing Subtle Changes in Phase Character Between Fault Blocks and Surrounding Rocks.

Regional Study Area, 2000 - 2001

7.5' Topographic Quadrangles for Field Campaign 2001

Area of Study

Figure 1

7.5' Topographic Quadrangle, Ithaca West

☒ - Site

Figure 2a

7.5' Topographic Quadrangle, Ludlowville

☒ - Site

Figure 2b

7.5' Topographic Quadrangle, Trumansburg

☒ - Site

Figure 2c

7.5' Topographic Quadrangle, Sheldrake

☒ - Site

Figure 2d

FIGURE 3. Legend for Modified Rose Diagrams. The upper portion represents the fracture frequency, while the bottom portion illustrates the master and abutting relationship.

5 km

FIGURE 4. Site Location Map with Rose Diagram Enlargements. The details for transect A-A' are in Figure 5.

FIGURE 5. North-South Transect (A-A') showing the correlation between Fracture Intensification Domains and Soil Gas Peaks.

Figure 6. Relationship among aeromagnetic anomalies, ENE-fracture frequency and soil gas data sets. N-S transects indicate that the ENE aeromagnetic low coincides with high ENE fracture frequencies. Fracture frequency and soil gas data follow transect A-A' from figure 5.

FIGURE 7. Map of southern Seneca Lake. The numbered red stars correspond to the location of pictures in Figures: 8, 9, 10, 11, 12, 13 and 14.

FIGURE 8. Site # 26 Shaw Rd.
Picture of an ENE-Striking FID

FIGURE 9. Site # 34 Rhodes Rd.
Picture of an ENE-Striking FID.

FIGURE 10. Site # 52 Sixteen Falls Creek.
Picture of an ENE-Striking FID.

FIGURE 11. Site #452 near Sawmill Creek. Picture showing a NNW-Striking FID

FIGURE 12. Site #68 Sixteen Falls Creek
Picture showing a NNW-Striking FID.

FIGURE 13. Site #56a Sixteen Falls Creek. A NS-striking fracture displaying right lateral motion. This Fracture offsets many NNW-striking fractures (of which this is an example).

FIGURE 14. Site #5 Middle Rd. Both the NNW and ENE sets (displayed in **blue**) illustrate fracture frequency where there is no FID.

Aspect of Seneca

5 miles

5 km

FIGURE 15

FIGURE 16

FIGURE 17

FIGURE 18

FIGURE 19

FIGURE 20

Appendix 1

Cayuga Field Season (2001) Data Part 1

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
7-05-01-3										
1	kw		85	Taughannock	88N					
2	kw	174	82							
3	kw	1	86							
4	kw	683	93							
5	kw	170	86.5	56N						
6	kw	56	85	89.9N						
7	kw	127	89	58N						
8	kw	53	76	90						
9	kw		334	89E						
10	kw	112	336	90						
11	kw	72	336							
12	kw	65	339	90						
13	kw	61	335							
14	kw	95	340	89E				M-7		
14b	kw		355							
15	kw	62	335	89E						
16	kw	62	336	89E						
17	kw	65	338	90						
18	kw	152	338							
19	kw	62	336							
7-05-01-205										
Trumansburg, F-9										
1	KW		345							
2	KW	2.5	346					I		p
3	KW	85	346					M		p
4	KW	36	342					I		
5	KW	6	342							
6	KW	5	342					C into 4		
7	KW	9	341							
7a	KW	268	345					C into 7b		
7b	KW	11	344							p
7c	KW	46	346							
8	KW	6	345					C into 7c		
9	KW	32	345							
10	KW	210	348							
11	KW	13	345					I		
12	KW		100							
13	KW	10	90					C into 13		p
14	KW	80	110					I-13		
15	KW	17	79					C-Pi into 13		
16	KW	84	82					A-7a		p
17	KW	68	73							cl,p

CLW twist hackling

small CLW twist hackle
small CLW twist hackle

restricted to lower ss
peters out into the shale

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
18 KW			80					A-2	cl,p	
7-10-01-206 Trumansburg F-9 Q&D										
1 KW			340					M-345	p	
2 KW		37	345					C into 1		
3 KW		30	345							
4 KW		54	345					A-1		
5 KW		59	345							
6 KW		47	344							
7 KW		50	344							
8 KW		50	344							
9 KW			340					M-344,345		
10 KW			345					C into 340-		
11 KW			335					C into 12		
12 KW		50	340							
13 KW			344					A-340		
14 KW		97	346					don't A fract		
15 KW		14	346							15 & 16 just "peter out"
16 KW		20	347							
17 KW		15	345							
18 KW		12	346							
19 KW		11	345							mostly linear
20 KW		10	345					C-pl into 19		
21 KW		43	345							
22 KW		7	345							
23 KW		40	345							
24 KW		55	345					C-pl into 340		
25 KW		67	345							
7-10-01-207 Ludlowville, G-7 Q&D										
1 KW			340					NEITHER	P	
2 KW		21	342						P	
3 KW		54	343							
4 KW		13	345					M-20cm 70		
5 KW		15	344							
6 KW		2	341					M-20cm 70		
7 KW		2	341							
8 KW		16	341							
9 KW		36	344					M- small 70		
10 KW		39	342							
11 KW		15	342							
12 KW		2	342							
13 KW		2	341							
14 KW		2	342							

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
15	KW	3	343							
16	KW	4	340							
17	KW		70					A- 2 "340's"		and there are many more....
18	KW	250	70							These 70's are like steps
19	KW	158	72							
20	KW	87	70							
7-11-01-208 Ludlowville, G-7 Q & D										
1	KW		347					peters out		
2	KW	52	339					cuts most		
3	KW	27	339					I-2 & 3		
4	KW	23	352					C-into 6		
5	KW	18	347					C-into 6		
6	KW	8	343							
7	KW	56	349					6 & 7		
8	KW	28	355							peters out in upper shale
9	KW	28	347							CL w twist hackling
10	KW	9	347							
11	KW	89	346							
12	KW	20	345							
13	KW	125	352							
14	KW	15	346							
15	KW	45	346		360+cm					
16	KW		86							
17	KW	25	97							POSSIBLE x-JOINTS
18	KW	6	77					C-pl into 16		16-30; set of steps A either side of 346
19	KW	5	82							
20	KW	51	80							
21	KW	3	80							
22	KW	10	77					C-pl into 20		
23	KW	11	77							
24	KW	23	77							
25	KW	4	80							
26	KW	14	80							
27	KW	88	78							
28	KW	6	78							
29	KW	30	70							
30	KW	44	72							
7-11-01-209										
1	KW		70					I-320 diag.		p
2	KW	27	68							p
3	KW	171	69							p
4	KW	91	70					I-320 diag.		p

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
5	KW	152	69						p	
6	KW	59	68						p	
7	KW	30	68						p	
8	KW	265	70						p	
9	KW	81	70					I-340	p	
10	KW	126	70					I-325	p	
11	KW	78	70						p	X-joint between 11 & 12 that is a 345
12	KW	292	72						p	NE are 7 more 70's that control the stream direction
7-11-01-210 Taughannock Cr. Q & D										
1	RM		300						cl	
2	RM		315					c-1	p	
3	RM	182	310							
4	RM	30	310					C-a 310@5		
5	RM	26	309					C-a 310		
6	RM	314	309					C-7		
7	RM	25	320							6 curves pl into 7 (drawn)
8	RM	69	320							
9	RM		320					C-10	cl	
10	RM	12	320							
11	RM	98	319					A- a20		
12	RM	24	312							
13	RM	21	312							
7-11-01-211 All 310's offset by 20's at the bend in the Cr.										
7-11-01-212 Ludlowville, G-7										
1	RM		300						P	
2	RM	11	298						P	xx-joints between 2 & 4
3	RM	30	115						P	
4	RM	15	310						P	
5	RM	10	314						P	
6	RM	50	314						P	
7	RM		335					C-6	P	
8	RM	55	308						P	
9	RM	20	308						P	
10	RM	43	312						P	
11	RM	162	300						P	
12	RM		90						cl	peters out
13	RM	210 (11 & 13)	298						P	
7-11-01-213 Ludlowville, G-7										
1	R		0							
2	R		335							

page 53. 8 more 335's downstream of the sketch

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
3	R	6	335							
4	R	30	335							
7-11-01-214 Ludlowville, G-7										
1	RM		335						P	
2	RM	35	335						P	CLW twist hackles
3	RM	20	334						P	no master-abutting rlt'n's notec
4	RM	69	334						P	
5	RM	10	334						P	
7-11-01-215 Ludlowville, G-7										
1	KW		337						P	forms wall
2	KW	210	333						P	forms wall
3	KW	20	334							
4	KW	155	335							
4a	KW	30	338					I-330's	P	forms wall
5	KW		67						P	forms wall
6	KW	200	68							
7	KW		310							
7-11-01-216 Ludlowville, G-7 see page 55										
7-11-01-217 "Oakharbour Stream East end of Conduit under 86 Top of the Falls										
1	KW		329						P	
2	KW	27	330					M-270, 75	P	good drawing on page 57
3	KW	12	330						P	
4	KW	23	325						P	
5	KW	31	336						P	
6	K		290					A-330		
7	K	137	290							
8			75							
7-12-01-218 Camp Barton at the falls (spectacular)										
1	KW		355					M	P	forms wall
2	KW	131	345						P	
3	KW	58	339					C-2,4	CL,P	
4	KW	200 (1-4)	356						P	Came first
5	KW		344						P	
6	KW		10/305					mutually A	CL,P	all in black shale
7	KW		10						P	drawing, page 60
8	KW		80							
9	KW		0					C-pl into M	CL	drawing, page 60
10	KW		340						CL	
11	KW		322							

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
7-12-01-219 Thayers' Creek, near Camp Barton										
1	KW		70					M	p	giant 70 "rules" stream flw
2	KW		344					A-70	p	
3	KW		290					A-70,5	p	
4	KW	38(btw 2,4)	5					m-3, l-70	p	ALL IN BLACK SHALE
5	KW	162	354					A-70	p	
6	KW	2	354					A-70	p	
7	KW	120	350					A-70	p	
8	KW		310					A-70	p	
9	KW	82	350					A-70	p	continue into hill, north bank
10	KW	12	354					A-70	p	
11	KW	6	338					A-70	p	
12	KW	8	340					A-70	p	
13	KW	27 0-1						l-70	p	
14	KW	60	342					l-70	p	
7-12-01-221 at the base of 217's falls										
1	KW		333					na	p	
2	KW	24	333						p	
3	KW	3	333						p	
4	KW		333					l	p	
5	KW		70					l-333	p	
6	KW	103	70/72					can't tell	p	
7	KW	50	325							
8	KW	57	227					l		
9	KW	50	332							same as # 2
7-12-01-222 Bend in Oakharbour cr.										
1	KW		70							Drawing, page 67
2	KW	33	70							IN BLACK SHALE
3	KW	79	70							
4	KW	42	71							See also pages 83-84
5	KW	117	90							
6	KW	10	102						cl	
7	KW	?	80							joins 5 at the top and 6 @
7-12-01-223 at the stream mouth										
1	KW		340					l-a 68	p	Drawing, pg 69
2	KW	147	326					na	p	in black shale
3	KW	73	334					C-4	cl,p	
4	KW	25	324					l-w/offset, 68	cl,p	
5	KW		68						p	
6	KW	35 from #4	324					A-5	cl,p	
7	KW		340					l-5	p	
7-12-01-224 Camp barton										
drawing, page 71										

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
1	KW		70					M-345,I-342	P	
2	KW		345					A-1	P	
3	KW	41	345					A-1	P	
4	KW	25	352					A-1	CL	
5	KW	52 (1 TO 5)	70						P	
6	KW	99, 114 erosi.	95					A-2	CL	shows erosion
7	KW	45	75					A-2	P	shows erosion
8	KW	5	75					A-2	P	shows erosion
9	KW	150	70							
10	KW	59-72	65						CL	
11	KW	150	68						CL	
12	KW	40	70						P	
13	KW		332					I-12	CL	Int.
7-12-01-225 Camp Barton Falls										
1	KW		338					all intersecting	P	Gray shale
2	KW	152	338					all intersecting	P	
3	KW	110	335					all intersecting	P	
4	KW	100	340					all intersecting	P	
5	KW	12	334					all intersecting	P	
6	KW	3	335					all intersecting	P	
7	KW	12	336					all intersecting	P	
8	KW		70					I-1&2	P	
9	KW		68					I-1,2,3,4	P	
10	KW		70					I-2,3	P	
11	KW		80					no offset noted	P	
7-13-01-226 Covert Quarry Creek, Below the falls										
1	RM		4					M		drawing, pg 73
2	RM	21	9					C-pl		
3	RM	7	10							
4	RM	5	12							
5	RM	22	4					C-3,south		
6	RM	22	4					M-355, south		
7	RM		78					M-335,332	P	see drawing, page 76
8	RM	23	76					A-6 (4 degrees)	P	all of the following A-6
9	RM	60	70					A-6	P	
10	RM	24	70					A-6	P	peters out
11	RM	25	65					A-6	P	
12	RM	25	72					A-6	P	
13	RM	25	70					A-6	P	
14	RM	5	68					A-6	P	
15	RM	12	73					A-6	P	
16	RM	20	71					A-6	P	

#	PM	distance, cm	strike	dip	length,m	height, m	thicknss	frac-abut	fract char.	beds
17	RM	86	70					A-6	P	
18	RM	50	70					A-6	P	forms wall, controls flw
19	RM	first	48					A-1	p	
20	RM	5	47					A-1	p	
21	RM	17	51					A-1	p	The 50's are what we called
22	RM	14	53					A-1	p	"chevrons" the first time we
23	RM	8	52					A-3	p	saw them
24	RM	11	54					A-4-C's into 2	p	Drawing on page 78
25	RM	8	51					A-1	p	
26	RM	9	51						p	
27	RM	8	56					A-2	p	
28	RM	9	55						p	
29	RM	8	56					M-small 7	p	
30	RM	first	335					can't tell	p	
31	RM	4	335						p	
32	RM	2	335					ends pp	p	
33	RM	13	335						p	
34	RM	15	330					I-4	p	
35	RM	10	335					I-4	p	
36	RM	10	335						p	
37	RM	18	340						p	
7-13-01-227 Trumansburg Creek drawing, page 80										
1	RM	FIRST	335			3 m		M to a 70	p-cl	
2	RM	221	337			1.5m			p	
3	RM	123	336						p	in massive LS
4	RM	214-123	335						p	
5	RM	193	340						p	
6	RM	645	335					M to a 90	p	
7	RM	120	335					M to a 90	p	
8	RM	630	336						p	cuts through all strata
9	RM	45	336						p	
10	RM	130	336						p	
11	RM	FIRST	90						p	
12	RM		92						p	
13	RM	50	90					A	p	
14	RM	64	90					A	p	it says to see the drawing
7-17-01-228 Taughannock Creek drawing, 85-86										
a1	KW		342	90	3+ m	17+		M	p	CW twist hackles
a2	KW	12	345	87E	.15+	1+		na	p	
a3	KW	205	344	82E	.17+	1.02+		na	p	
a4	KW	54	343	90	3+	17+		M	p	
a5	KW	9	344	87E	1+	15+			p	

#	PM	distance, cm	strike	dip	length,m	height, m	thicknss	frac-abut	fract char.	beds
a6	KW	16	344							
a7	KW	11	343	87W				M		in shale from a7
a8	KW	909	345	90	1+	9+		M-6		
a9	KW	111	342	88E	2	9+		A-set b	p	
b1	KW	262	90	77S	.36+	6		M-set b	p	
b2	KW	95	82		.36+	9.5		A-a7	cl	
b3	KW	195	90		9.5				cl	
b4	KW	648	90					M-a8	cl	FID 17 meters to the W
								A-a7	cl	
7-17-01-228 Taughannock Creek, heading west										
1	DJ	first	346	86E						pages 87, 88
2	DJ	7.5	346							total width,28cm thick
3	DJ	14.4	346							
4	DJ		346							
5	DJ	5	341	85E						
6	DJ	4.5	341							
7	DJ	8	341							
8	DJ	1.5	341							
9	DJ	7.2	341							
10	DJ	8.5	341							
11	DJ	0.05	341							
12	DJ	0.08	341							
13	DJ	1.6	341							
14	DJ	5.7	341							
1	DJ	12	341	82E						
2	DJ	17.5	341							
3	DJ	9.5	342	90						
4	DJ	14	342							
5	DJ	18	342							
6	DJ	4	342							
7	DJ	1.7	342							
8	DJ	25.5	342							
9	DJ	6.8	342							
7-18-01-229 Taughannock Creek										
SET A										
1	KW		340	90	3.5	0.2			P	all in the black shale
2	KW	38	342	90	5.0+	1			P	
3	KW	173	343	90	12+	1+			P	
3a	KW	1.5	340	?	LITTLE					
3b	KW	1	340		FID=8CM					
3c	KW	1	343		WIDE					
3d	KW	4	344							
4	KW	330	346	90	14+	3+			P	

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
SET B										
1		first	50	84NW	19+	4+		I-a4 A-a3; M-105	p	
2		109	44	88NW	24+	4+		M-115	p	
SET C										
1 KW		only	90	?	5.5+	flat		I-FID, A-a2		FID between 127-229 in upper black shale 40 cm wide
2 KW		14	344							
3 KW		2.5	342							
4 KW		4.5	345							
5 KW		4	347							
6 KW		1	336							
7 KW		1	342							
8 KW		1	342							
9 KW		12	345							
7-18-01-230										
set A										
1 KW			340'S							
2 KW		25	343	88W	2+	0.7		I-75	P	
3 KW		321	344	89W	8+	0.7		I-75	P	
4 KW		3	343	?	0.65	0.04				peters out
5 KW		3	344	85E	5+	0.44		I-85		
6 KW		1305	341	89W	5+	0.4		I-85		
7 KW		10	345	90	2+	0.29		A-90	P	
set b										
1 KW			81	?	4.77	0.17		I-a1,a2;	P,CL	
2 KW		31	77	?	1+	0.17		I-a1,a2;	CL	
3 KW		27	89	89S	7+	0.12		I-340'S	P,CL	
FID KW										
1		2.5	88	4S						28 cm for entire length of FID
2		2	88	4S						pencil cleavage drawing on page 94
3		1.25	88	4S						
4		1.5	88	4S						
5		2	88	4S						
6		2	88	4S						
7		3.2	88	4S						
8		2.5	88	4S						
9		3	88	4S						
10		2	88	4S						
11		1.23	88	4S						
12		2	88	4S						
13		2.75	88	4S						
7-18-01-231										

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
set A										
1	KW	first	341	89E	23+	3		M-cl 74	p	
2	KW	450	338	?	2.49	pavement			p	
3	KW	13	338	89E	23+	3.75+			p	
4	KW	215	337	90	3	0.15		C-5		
5	KW	16	337	?	9+	1.5				
6	KW	96	344	?	10.75	2+				
7	KW	47	340	90	19+	0.1		I- cl 75		CW twist hackling
8	KW	59	337	?	9	2		A-6		
9	KW	360	338	90	10.75	3+				
10	KW	275	338		10.75	3+				
11	KW	238	338		10.75	3+				CW twist hackling
12	KW	180	338		10.75	3+				
set B										
1	KW	first	349	?	3	pavement		I-70		
2	KW	300	0	?	6+	0.18		I-70		
3	KW	100	1	?	2+	0.14		I-70		
4	KW	500	10	?	11.5	0.08		I-70		
5	KW	225	3	82E	2.75	0.05		A-70		
6	KW	115	359		2.72	0.03		A-70, offset		
7	KW	85	355	?	3.05	0.03		A-70, NO offset	I-S70	
8	KW	160	355					A- N70	I-S70	
SET c?		first	70		2.25			C-6		
		500	75		3			A-10	CL	
7-18-01-232 Frontenac Creek, above the falls										
1	KW		338		0.75	0.75		NO MASTER-ABUTTING RELATIONSHIPS		
2	KW	125	338		4.5+	0.5				
3	KW	24	336		0.24	0.75				
4	KW	29	334		0.29	0.75				
5	KW	3	334		0.75	0.75				
6	KW	7	338		181	0.75				
7	KW	11	337		115	0.75				
8	KW	4	336		115	0.75				
9	KW	24	337		115	0.75				
10	KW	6	349		115	0.75				
1	KW		338					A-352		
2	KW	10	338							
3	KW	9	343							
4	KW	13	344							
5	KW	11	344							
6	KW	36	341							CW twist hackling
7-18-01-233 Little Point at halls Corners; Trumansburg, F5										
						233				

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
a1	RM		3	87E						
a2	RM	2.57m	359	84E				b's curve ll to a's		
b1	RM	27	350	90	big; 44cm					
b2	RM	27	353	90	small; 4.5cm					
b3	RM	15.5	328	90						
b4	RM	25	327	90						
b5	RM	2.7	327	90						
b6	RM	1.7	327	90						
b7	RM	4	327	90						
b8	RM	2.7	327	90						
b9	RM	3.3	327	90						
b10	RM	2.5	327	90						
b11	RM	6	327	90						
b12	RM	2	327	90						
c1	RM	-69.5	65	86S				l- 0's		
c2	RM	69.5	68	90						
c3	RM	42	67	85S						
c4	RM	170	65							
c5	RM	143	65							
c6	RM	158	65							
234 @ Little point Creek										
a1	KW	125	350	78E					P-CL	
a2	KW	75	347	88E					p	
a3	KW	71	350	88E					p	
a4	KW	122	350						p	
a5	KW	56	350						p	
a6	KW	35	350						p	
a7	KW	260	350						p	
a8	KW	49	350						p	
b1	KW	0	69	86S				l- set a	p	
b2	KW	55	66	86S					p	
b3	KW	401	69	86S					p	
c1	KW	0	60							
c2	KW	179	60							
c3	KW	200	60							
Site 235 @ Tulley LS @ Duffy's house										
a1	KW	0	335	90						
a2	KW	66	335	89W						
a3	KW	36	335	89W	6m+	1 m		#2 hooks into 1 #3 hooks into 4		
a4	KW	30	335							
a5	KW	67	335							
a6	KW	61	335							

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
b1	KW	0	85							
b2	KW	72	87							
b3	KW	57	85							
Site 236 @ Boothe's creek and Gorge p. 108, see drawings										
a1	KW	0	354	90				350's main FID		all in black shale
a2	KW	151	353	90						
a3	KW	32	353	90						
a4	KW	39	353	90						
a5	KW	153	353	90						
a6	KW	98	353	90						
a7	KW	51	353	90						
a8	KW	15	353	90						
a9	KW	421	353	90						
b1	KW	0	281	75S						
b2	KW	98	275	90						
b3	KW	173	275	90						
b3	KW	312	274							
c1	KW	0	70	90						
c2	KW	400+	73	85S						
A1	KW	0	2	87.5S				m TO 350'S		
d1	KW	0	316	73NE						
d2	KW	215	310							
237 is in Courtney's book										
238 @ Booth's Creek #####										
a1	KW	0	67	85S						
a2	KW	184	67	85S						
b1	KW	0	310							sigmoidal
b2	KW	102	311							
c1	KW	0	10							curves per-
d1	KW	0	335	85E						pendicular
d2	KW	268	335							to set b
7-24-01: Willow Creek at Spruce Row Camp										
					p. 113	239!!!				
1	KW	0	336	90	1.63	14+				p discontinuous in silt-stone bed
2	KW	150	338	?	0.05	1.6+		this is a "wall"		p
3	KW	22	335	88E	0.12	0.73				p
4	KW	94	338	?	0.12	2+				p
5	KW	100	339	?	0.06	1.5+				p
6	KW	120	342	90	0.12	0.75				p
7	KW	55	338	?	0.25	3.9+				p
7-2-7-24 239										
a1	KW	0	338	90						p

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
a2	KW	180	336	90					p	
b1	KW	0	279						cl-p	
b2	KW	250	231						cl-p	
b3	KW	35	289							
c1	KW	0	255							
Site 240; 7-24-01 FID										
1	KW	0	338	82E	0.12	0.21			p	
2	KW	40	341	89E	0.13	0.13			p	
3	KW	38	342	?	0.31	0.18			p	
4	KW	12	336	90	0.21	0.05			p	
5	KW	15	342	85E	0.22	0.17			p	siltstone
6	KW	58	343	83E	0.12	0.17			p	
7	KW	38	338	90	0.57	0.17			p	
8	KW	40	340		see above				p	
1	KW	6	340						p	all of these; shale under
2	KW	4	340						p	siltstone
3	KW	6	340						p	
4	KW	4	340						p	
5	KW	9	340						p	
6	KW	7	340						p	
7	KW	10	340						p	
8	KW	10	340						p	
Site 241; Courtney										
Site 242; See pg. 117										
Site 243; @ Willow point Falls										
a1	KW	0	72	90	10+	8+		M	p	gray shale
a2	KW	320	70	90	10+	8+		M	p	
a3	KW	325	70	90	10+	8+		M	p	
b1	KW	0	331	81E	3.2			A:a-set	p	face of falls
b2	KW	5+	330	?				A:a-set	p	c-clkw rotation
Site 244; p. 118										
1	RMr	0	320		3	2		M;2	p	
2	RMr		68		4	2+		A;1	p	
3	RMr		330		1			I;2	cl	
4	RMr		320		2			I;2	cl	
Site 246 Teeter's Creek p.119										
a1	KW	0	65	88S						
a2	KW	53	62	86N						
a3	KW	10	62							
a4	KW	10	62							
a5	KW	19	62							
a6	KW	70	62							

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
b1	KW	17	324	88W						
b2	KW	35	324							
b3	KW	203	324							
b4	KW	54	324							
Site 246A 280's w/ 1m spacing										
Site 247 Doc J's Book										
Site 156, Potter's Creek										
a1	KW	0	71	90	4	2+		M; set b		
a2	KW	245	70	?	10+	3+		mutually A		
b1	KW	75	315	75E	7+	3.5+				
b2	KW	75	318	76E	2	0.75		l; a		
b3	KW	160	321	76E	2	0.75		A;a		
c1	KW	0	283	76E	0	0.75		ll to b3		
c2	KW	200	284		2					
Site 248; Black Shale at Potter's Creek										
a1						p.123				
a2										
a3	KW	0	341	87E	1.13	0.06		A; set b	P	
a4	KW	63	336	86E				A (b), l;68	P	
a5	KW	43	330	86E	4.8	0.12		A(B)	P	
a6	KW	14	334	86E	10	0.12		curves ll 344, l(b)		
a7	KW	8	330							
a8	KW	40	330							
a9	KW	21	330							
a10	KW	12	330							
a11	KW	79	330							
b1	KW	0	9	90	6+	0.25		A,l ©	p	
b2	KW	194	9	90	4+	0.14		M (FID c's)	p	
b3	KW	164	8	90	3.35	0.14		l (a), A (a)	p	
b4	KW	73	8	89W	14+	0.5			p	
c1	KW	0	68	88N	2+	.02-.35		A (10'S)	P	
c2	KW	3	68	90				(ALL)	P	
c3	KW	4	70	88N					P	
c4	KW	15	70	89N					P	
c5	KW	15	70						P	
c6	KW	24	68						P	
c7	KW	24	68						P	
c8	KW	19	68						P	
c9	KW	13	68						P	
c10	KW	17	68						P	
c11	KW	24	68						P	
c12	KW	34	68						P	

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
c13	KW	37	68						P	
c14	KW	11	68						P	
c15	KW	12	68						P	
c16	KW	8	68					see above	P	
c17	KW	18	68						P	
c18	KW	9	68						P	
d1	KW	0	300	86SW	0.81	0.27		A; set b)	cl	gas leaks in a,b
d2	KW	68	309	86SW	102	0.2			cl	
d3	KW	50	305	?	121	0.16			cl	
Site 249; 7-25-01 p. 126 Trilbite&Cheryl's Space										
a1	KW	0	350	90	8+	0.35				
a2	KW	7	350	90	8+	0.35				
a3	KW	1	355	90	8+	0.35		a; 221		
a4	KW	5	353	77E	8+	0.35				
a5	KW	26	341	90	8+	0.35				
a6	KW	20	340	?	8+	0.35				
B1	KW	0	215	90	2+	0.35		M(342) crv II to it		
B2	KW	175	230	90	10+	0.35				
B3	KW	70	230	90	10+	0.35				
B4	KW	45	230	90	10+	0.35				
c1	KW	7	90	?				A; (a,b)	cl	
c2	KW	6	90	?					cl	
c3	KW	7	90	?					cl	
c4	KW	6	90	?					cl	
c5	KW	4,etc	90						cl	
Site 250; Top of Tully p. 129										
Site 252; Top of Tulley p. 129										
Site 252; GREAT FID p. 131										
a1	RJ	7								
2	RJ	12								
3	RJ	23	0	85W	q & d			A or curve II	p	
4	RJ	2.5	0	90					p	
5	RJ	7	356	88W					p	
6	RJ	0.75	356	90					p	
7	RJ	2	0						p	
8	RJ	3.25	0						p	
9	RJ	8.5	0						p	
10	RJ	4	0						p	
11	RJ	15	0						p	
12	RJ	1	0						p	
13	RJ	11.75	0						p	
14	RJ	32	0						p	

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
15	RJ	5	0						p	
16	RJ	5	0						p	
17	RJ	24	0						p	
18	RJ	1	0						p	
19	RJ	81	0						p	
20	RJ	11	0						p	
21	RJ	15	0						p	
22	RJ	11.25	0						p	
23	RJ	9.25	0						p	
24	RJ	2	0						p	
a1	1	1.5	0	88W				Drawing, p.132	p	
2	RJ	1.4	0						p	
3	RJ	1.8	0						p	
4	RJ	0.5	0						p	
5	RJ	2.6	0						p	
6	RJ	0.07	0						p	
7	RJ	2	0						p	
8	RJ	0.08	0						p	
9	RJ	1	0						p	
10	RJ	0.08	0						p	
11	RJ	1.9	0						p	
b1	RJ	49	340	88E						
b2	RJ	31	336	87E						
c1	RJ	5.75	318	90				c crvs II to b		
2	RJ	6.5	324	90						
3	RJ	1.5	320	90						
4	RJ	3	320	90						
5	RJ	3.2	320							
6	RJ	4	320							
7	RJ	4	320							
8	RJ	4	320							
d1	RJ	0	70	83N				I (c,a) A (a)		
d2	RJ	3	68							
d3	RJ	35	68							
d4	RJ	70	70							
7-26-01; Site 253 Nature center Creek at Falls 133 FID										
a1	KW	63	63	90				A (356)	p	
a2	KW	277	65	84					p	
a3	KW	24	65	67					p	
a4	KW	165	64	90					p	
b1	AH	50	3	87E						N-S all restricted to shale
b2	AH	20	0	90						

#	PM	distance, cm	strike	dip	length, m	height, m	thicknes	frac-abut	fract char.	beds
b3	AH	26	3	89E						
b4	AH	22	0	90						
b5	AH	9	0	90						
b6	AH	23	0	90						
b7	AH	13	0							
b8	AH	10	0							
b9	AH	5	0							
b10	AH	4	0							
11	AH	5	0							
12	AH	8	0							
13	AH	6	0							
14	AH	3	0							
15	AH	12	0							
16	AH	12	0							
17	AH	14	0							
18	AH	4	0							
19	AH	13	0							
20	AH	10	0							
21	AH	6	0							
22	AH	3	0							
23	AH	10	0							
c1	AH	0	300	90						
c2	AH	815	285	68N						
d1	AH		88	90						
d2	AH		90	90						
d3	AH		87	90						
Site 255; 7-26-01 Kennedy's Back Wall p. 135										
a1	RJ	0	66	88S	1+	5.5+		M (a)	P	
a2	RJ	63	70	85S	1+	5.5+			P	
a3	RJ	222	70	85S	1+	5.5+			P	
a4	RJ	224	75	86S	1+	5.5+			P	
b1	RJ	0	344	83W	1+	5.5+			cl-p	
b2	RJ	61	347	84W	1+	5.5+			cl-p	
b11	RJ	0	5	61W	1.6	1.5+		A ©		
b12	RJ	43	25	80W	3+	4+				
c1	RJ		310	80W				M (b1-1); A (a)		black shale
c2	RJ	200	330	?						
Site 256; 7-30-01 Glenwood Point yacht Club p. 138										
a1	KW	0	340	87W	4+	0.92			cl-p	Black shale
2	KW	49	335	82	2	0.13		crv II 344	cl-p	
3	KW	26	344	89	3+	0.4			cl-p	
4	KW	26	344	?					cl-p	

A(0), crvs II
FID
photo by Allison

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
5	KW	55	344	?						
6	KW	11	340	?						cl-p
7	KW	11	342	?						cl-p
8	KW	19	346	?						cl-p
9	KW	4	345	?						cl-p
10	KW	2	338	?						cl-p
11	KW	70	355	?						cl-p
b1	KW	0	70	90				M,l (a set)	p	
2	KW	543	70	90				M,l (a set)	p	
c1	KW		292	?						
c2	KW		245	?				I, (352)	p	
A1	KW		350					M (340)	p	
A2	KW		350					M (335)	p	
Site 357; Glenwood Cliff p. 141										
a1	KW		355							
a2	KW		355					M (85)		
a3	KW		0					M (90)		
b1	KW		55							
Site 358; Maplewood St. p. 141										
a1	KW	0	70	90						
a2	KW	19	70							
a3	KW		70							
a4	KW	1.9	70							
b1	KW	0	333	89W						P
b2	KW	8.5	337							P
b3	KW	0	340		1.97	2.5				P
b4	KW	67	333							P
b5	KW	16	335							P
b6	KW	34	335							P
b7	KW	45	335							P
b8	KW	25	336							P
Site 259;										
1	KW		0							
2	KW		0					A (70), l (70)	p	
Site 260; "Falls" in Coates' yard p. 143										
a1	KW	40	344	84W						P
2	KW	?	336					CANNOT TELL		P
3	KW	?	343	90						P
4	KW	223	342	90						P
5	KW	110	338	89E						P
6	KW	34	352							P
7	KW		355							P

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
8	KW	175	342	90					P	
9	KW		344	90					P	
Downstream-call it the same										
a1	KW	0	340	q-d						
2	KW	91	348							
3	KW	200	350							
b1	KW	0	85							
2	KW	8	80							
3	KW	8	79							
c1	KW	0	300							
Site 262; Q-D p.144										
1	KW	0	340							
2	KW	10	340							
3	KW	26	342							
4	KW	50	344							
5	KW	33	340							
6	KW	45	342							
7	KW	55	340							
Site 263; Q-D 07/30/2001 p.145										
a1	KW	0	354	90						
a2	KW	51	342							
a3	KW	440	342	89E						
a4	KW	54	342	89E						
a5	KW	28	345	88E						
B1	KW	0	86							
B2	KW	250	84							
c1	KW		356							
Site 264; Buttermilk Falls										
a1	KW	0	339	90	10+	1+		M(b)	P	
2	KW	338	338	89E	10+	.69+		M(b)	P	
3	KW	300	338	90	10+	2+		M(b)	P	
4	KW	300	338	90	10+	2+		M(b)	P	
5	KW	325	336	90	10+	2+		M(b)	P	
b1	KW	0	71	90	1.9	0.2		M(b)	P	
2	KW	114	72	90	2	0.35		M(b)	P	
3	KW	130	70	90	3	0.5		M(b)	P	
SITE 265; 7-30-01; Buttermilk Falls p. 150										
a1	KW	0	341	90	7.88	3+		M(b)	P	
2	KW	53	342	88E	7.75	2+		M(b)	P	
3	KW	281	338	90	7.88	3+		A; 341	P	
4	KW	66	340	90	8.5	3+		M(b), A (b)	P	
5	KW	233	340	?	18+	3+			P	

#	PM	distance, cm	strike	dip	length,m	height, m	thicknes	frac-abut	fract char.	beds
6	KW	30	338	90	6	0.08			P	
b1	KW	0	90	?	3.21	0.16		A(a)	CL-P	
2	KW	47	88	?	3.21	0.16		X-JOINT?	CL-P	
3	KW	165		?	2.31	0.17			CL-P	
U1	KW		90	?				A(3)	CL-P	
U2	KW		65	?				crv II (1)	CL-P	
U3	KW		340	90				M(1,2,4,5)	CL-P	
U4	KW		88	89w	3+	0.35		crv II (4)	CL-P	
U5	KW		68	?						
FID @ 175A p. 151										
1	KW	9	91						cl	
2	KW	9	90.5						cl	
3	KW	6	80						cl	
4	KW	11	87						cl	
5	KW	5	87						cl	
6	KW	14	87						cl	
7	KW	8	87						cl	
Site 266; next gorge up mutually intersecting										
a1	KW	0	342						p	
2	KW	50	340						p	
3	KW	175	342						p	
4	KW	90	341						p	
b1	KW	0	90						p	
2	KW	75	90						p	
Site 267; 7-30-01 inside the park p. 153										
a1	KW	0	200	58E	0.3	0.92			cl	
2	KW	146	208	68E	0.3	0.92			cl	
3	KW	79	221	?	0.3	4			cl	
4	KW		210	?				M; set b	cl	
b1	KW	0	103	?					c	
2	KW	11	105	?						
3	KW	9	105	?						
4	KW	10	90	?						
5	KW	21	89	?						
6	KW	20	104	?						
7	KW	17	104	?						
8	KW	8	104	?						
9	KW	15	104	?						
10	KW	8	104	?						
11	KW	9	104	?						
c1	KW	0	60							
site 268; 7-31-01 p. 153										

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
a1	KW	10	67	?						
a2	KW	10	68	?						
a3	KW	10	70	?	3+	17+		A; a1		clockwise rotation
a4	KW	10	71	?	1+	10+				no others noted
b1	KW	0	32							
a1	KW	0	70		15	10+				
a2	KW	100	70		15	10+				
a3	KW	0.75	70		15	10+				
a4	KW	0.5	70		15	10+		M; 10, dip/75 can't tell		clockwise rotation
c1	KW	0	345	85W	2.5	0.18				
c2	KW	108	345	90	1.83	0.15				
c3	KW	63	345	90	1.83	0.15				
Site 269; Stone Quarry Road										
a1	KW	0	347	87W	1	0.16				
a2	KW	145	347	88W				M; 27, 30		
a3	KW	121	350	90	3	0.05		M		
a4	KW	94	345	90						
a5	KW	100	346	89W	4	0.6		M		
b1	KW	0	27	86W	1.2	0.08		A; a		clockwise rotation
b2	KW	6	30	-0.5	0.5			A; a		
Site 270;										
a1	KW	0	350		p. 157					face of cliff
b1	KW	0	70					A; n-s		
b2	KW	15	70					A; n-s		in shale only
Site 271;										
a1	KW	0	70	86S	6+	.20+		A; b		p
a2	KW	15	72	88S	10	.20+		I; c		p
a3	KW	102	71	82S	10+	.20+		A; b		p
a4	KW	85	70	?	6+	0.3		I; c		p
b1	KW	0	10	82E	1	0.15				cl
b2	KW	0	25	85E	0.75	0.005		A; a		cl
b3	KW	15	22	?	0.75	0.005		A; a		cl
b4	KW	20	22	?	0.75	0.005		A; a		cl
b5	KW	117	16	88N	4	0.2		I; (70's) A; #3		cl
b6	KW	15	14	?	1.53	0.1				p
b7	KW	14	14	?	1.21	0.1				p
b8	KW	16	13	?	1.41	0.1				p
b9	KW	8	15	?	1.61	0.1				p
b10	KW	22	18	?	1	0.1				p
b11	KW	12	18	?	1.1	0.1		A; 345		p
c1	KW	0	340	?	2.5	?		A; 70		cl
c2	KW	243	344	?	2.75	0.05		A; 70		cl

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
c3	KW	95	340	?	1	0.05		A; 70	cl	
c4	KW	121	340	?	1.15	0.18		A; 70	cl	
fid	KW	p.159								
Site 272; 08-01-01 top of Tully										
1	KW	0	332	75E	3	0.07			P	
2	KW	124	330	?	3+	0.15		M; 94	P	
3	KW	117	329	?	3	0.15		M;384	P	
4	KW	600	334	?	pavemnt				P	
5	KW	125	342	?	pavemnt			M; 85	P	
Site 273; Brigg's Creek #####										
a1	KW	0	332	78E	5+	0.72		I (B)	cl	
a2	KW	121	328	65E	2.5+	1+		I (B)	cl	
a3	KW	15	324	78E	1.5	1+		I (B)	cl	
a4	KW	14	330	65E	1	1+		I (B)	cl	
b1	KW	0	70	90	0.75	0.17		I (A)	p	
b2	KW	50	69	90	10+	?		I (A)	p	
b3	KW	146	70	?				I (A)	p	
b4	KW	161	66	89S				I (A)	p	
Site 275-8-1-01 access rd. to Biggs page 1										
a1	RM	0	100	80NE	1.41	0.008		b1 crvs ll into a1	p	
a2	RM	71	93					A; 1a		
a3	RM	6	94	83NE						
b1	RM	0	86	88S						
c1	RM	0	0	88E						
Site 276-8-1-01 Van Doren Beach page 1										
a1	KW	0	14	84e	3.5+	0.1			P	
a2	KW	28	13	89e	3.10+	0.1			P	
a3	KW	15	14	?	3.60+	0.1		A; 70	P	
a4	KW	64	6	90	3.5+	0.2			P	
a5	KW	160	359	?	3.5+	0.2			P	
b1	KW	0	80	74w	2.21	0.3		A; (a)	P	
b2	KW	130	70	89e	1.21	0.3			P	
b3	KW	130	70	86e	4.25	0.4		A (2)	P	
B4	KW	31	4	?					P	"FEATHER" STRUCTURES
Site 277-8-1-01 Van Doren Beach page 3										
a1	KW	0	72	90	7+	0.05			p	
a2	KW	36	74	?	7+	0.05			p	
a3	KW	11	74	?	7+	0.05			p	
a4	KW	114	74	?	7+	0.05			p	
b1	KW	0	10	?				A(70)		
b2	KW	27	10	?				A(70)		
b3	KW	11	10	?				A(70)		

#	PM	distance, cm	strike	dip	length,m	height, m	thicknes	frac-abut	fract char.	beds
b4	KW	10	11	?				A(70)		
b5	KW	12	4	?				A(70)		CURVS II into 11 degree
c1	KW	0	20	?				A(70)		CURVS II into 10 degree
c2	KW	30	4	?				I(70)		
c3	KW	18	4	?				I(70)		
c4	KW	23	8	?				I(70)		
c5	KW	20	8	?				I(70)		
c6	KW	28	340	?						curvs II into 5 degree
Site 278-8-1-01 Gold Springs, North Fork page 5										
a1	KW	0	75	75SE	10+	0.15		A(B)west,east I(B)	P	
a2	KW	23	74	?	3+			A(b1),I(b2)	P	
a3	KW	30	74	?	4+	0.2		A(b1),I(b2)	P	
a4	KW	16	74	?	5+	0.2		A(b1),I(b2)	P	
a5	KW	14.5	75	75SE	3	0.2		A(b1),I(b2)	P	
a6	KW	12	78	?	3	0.2		A(b1),I(b2)	P	
a7	KW	20	75	?	3	0.2		A(b1),I(b2)	P	
b1	KW	0	8	?	0.69	0.2		M(70)	P	
b2	KW	16	8	?	0.69	0.2		M(70)	P	
b3	KW	14	6	?	0.89					
Site 279-8-1-01 Gold Springs, North Fork page 7										
1a	KW	0	66	90	5+	0.2		I(B)	P	
2a	KW	42	66	?	5+	0.39			P	
3a	KW	41	65	?	5+				P	
4a	KW	44	66	?	5+				P	
5a	KW	16	65	?	5+				P	
6a	KW	32	64	?	5+				P	
7a	KW	69	65	?	5+				P	
b1	KW	0	350	E				A(a)	P	
b2	KW	145	0	?				A(a)	P	
b3	KW	21	355	?				A(a)	p	
b4	KW	13	0	?				A(a)	p	
b5	KW	15	352	?				A(a)	p	
b6	KW	26	0	?				A(a)	p	
b7	KW	21	0	?				A(a)	p	
Site 2808-1-01 Van Doren, North Fork Q&D page 9										
a1	RM	0	334	90				A intersects b	p	
a2	RM	12	335	90					p	
a3	RM	29	335	?					p	
a4	RM	30.5	337	?					p	
a5	RM	3	336	?					p	
a6	RM	44	340	?					p	
a7	RM	7	330	?					p	

#	PM	distance, cm	strike	dip	length,m	height, m	thicknes	frac-abut	fract char.	beds
b1	RM	0	71	?						
b2	RM	94	69	88S					p	
b3	RM	58	70	88S					p	
b4	RM	26	70	?					p	
b5	RM	30		?					p	
c1	RM	0	7	90	1m					
Site 281-8-1-01 top of Van Doren Gorge										
a1	RM	0	335	88S	2.5	0.15			p	
a2	RM	1.59	335	88S	4.75	0.03		curv II into 10	p	
a3	RM	1.25	336		2+	0.01		curv II into 70	p	
b1	RM	0	70	90	5.5+	0.25		I(a's)	p	
b2	RM	31	69	90	5.5+	.1+		I(a's)	p	
b3	RM	18	69	90	3.5+	0.25		I(a's)	p	
b4	RM	4	70	90	3.5+	0.25		A(70)	p	
b5	RM	105	70	90	2.37+	0.15		I(a's)	p	
c1	RM	0	10	89S	5+	0.12		I(70's)	p	
c2	RM	77	10	?	5+	0.12		I(b's)	p	
d1	RM	0	310	?	2.88	0.06		A(70), I ©	p	
Site 282-8-1-01 Van Doren Beach Road FID page 11										
a1	RM	0	70	84E	10	0.15				
a2	RM	11	70	90	1+	0.15				
a3	RM	9	70	86E		0.15				
a4	RM	5.5	70	86E						
a5	RM	8.5	70	89SE						
a6	RM	26	70	?						
a7	RM	49	71	90						
a8	RM	8	70	90						
B1	RM	0	6	90		0.8		some 70's Intersect		
B2	RM	107	5	?		0.8		A(70)		
B3	RM	115	5	?		0.8				
C1	RM	0	332	88E				A(a6)		
Site 283-8-1-01 page 13										
a1	KW	0	328	85E	3	2+			p	
a2	KW	10	325	?	3	2+			p	
a3	KW	33	329	90	3	2+			p	
a4	KW	9	330	90	3	2+		M(b1)	p	
b1	KW	0	74	90	3	0.15		A(a4)	p	
b2	KW	190	70	?	1.4	3+		A(a3)	p	
b3	KW	94	70	90	7+	3+		I (330's)	p	
Site 284-8-1-01 Van Doren Beach Rd. page 15										
a1	KW	0	340					all I "wall" of 70's	p	
a2	KW	100	340						p	

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
---	----	--------------	--------	-----	----------	-----------	-----------	-----------	-------------	------

a3	KW	20	338							
----	----	----	-----	--	--	--	--	--	--	--

a4	KW	20	340							p
----	----	----	-----	--	--	--	--	--	--	---

a5	KW	27	340							p
----	----	----	-----	--	--	--	--	--	--	---

b1	KW	0			2.75+			I(340's)		p
----	----	---	--	--	-------	--	--	----------	--	---

Site 285-8-1-01 Green Acres South page 15

a1	KW	0	5	?	4+	0.3+		?		p
----	----	---	---	---	----	------	--	---	--	---

a2	KW	6	5	?	3+	.3+		?		p
----	----	---	---	---	----	-----	--	---	--	---

a3	KW	34	7	90	3+	.3+		M(65's)		p
----	----	----	---	----	----	-----	--	---------	--	---

a4	KW	21	8.5	?	2.75+	.3+		I(65)		p
----	----	----	-----	---	-------	-----	--	-------	--	---

a5	KW	22	5	?	2+	.3+		A,I(65)		p
----	----	----	---	---	----	-----	--	---------	--	---

a6	KW	28	10	89E	1.50+	.3+		I(65)		p
----	----	----	----	-----	-------	-----	--	-------	--	---

a7	KW	47	3	86W	1.21+	.3+		A(65), I(65x2)		p
----	----	----	---	-----	-------	-----	--	----------------	--	---

a8	KW	110	5	89E	1	.3+		I(65)		p
----	----	-----	---	-----	---	-----	--	-------	--	---

b1	KW	0	69	90	2	.35+		a(A)		P
----	----	---	----	----	---	------	--	------	--	---

b2	KW	33	73	74N	2	.35+		a(A)		P
----	----	----	----	-----	---	------	--	------	--	---

b3	KW	15	70	82N	2	.35+		a(A)		P
----	----	----	----	-----	---	------	--	------	--	---

b4	KW	20	69.5	79N	2	.35+		I(a)		P
----	----	----	------	-----	---	------	--	------	--	---

b5	KW	21	70					I(a)		P
----	----	----	----	--	--	--	--	------	--	---

b6	KW	22	70					I(a)		P
----	----	----	----	--	--	--	--	------	--	---

b7	KW	16	70							
----	----	----	----	--	--	--	--	--	--	--

b8	KW	15	70							
----	----	----	----	--	--	--	--	--	--	--

b9	KW	18	70							
----	----	----	----	--	--	--	--	--	--	--

C1	KW	0	300			1		a(70)		CL
----	----	---	-----	--	--	---	--	-------	--	----

C2	KW	161	300			1.75				CL
----	----	-----	-----	--	--	------	--	--	--	----

FID	KW		70							
-----	----	--	----	--	--	--	--	--	--	--

KW		18M in all	70							
----	--	------------	----	--	--	--	--	--	--	--

KW			69							
----	--	--	----	--	--	--	--	--	--	--

KW			69							
----	--	--	----	--	--	--	--	--	--	--

KW			69							
----	--	--	----	--	--	--	--	--	--	--

Site 286-8-2-01 Green Acres South page 18

a1	KW	0	69	90	15+	3+		I(b)		cl, p
----	----	---	----	----	-----	----	--	------	--	-------

a2	KW	46	68	90	15+	3+		I(b)		p
----	----	----	----	----	-----	----	--	------	--	---

a3	KW	127	70	88N	5+	3+		I(b)		p
----	----	-----	----	-----	----	----	--	------	--	---

b1	KW	0	342	90	4+	1+				p
----	----	---	-----	----	----	----	--	--	--	---

b2	KW	171	346.5	90	4+	1+				p
----	----	-----	-------	----	----	----	--	--	--	---

b3	KW	181	353	87N	3+	1+		A(a2)		p
----	----	-----	-----	-----	----	----	--	-------	--	---

b4	KW	112	344		3+	1+		I(a), A(a3)		p,cl
----	----	-----	-----	--	----	----	--	-------------	--	------

c1	KW	0	336	?	3+	1+				
----	----	---	-----	---	----	----	--	--	--	--

c2	KW	200	314	?	4+			A(a3),		
----	----	-----	-----	---	----	--	--	--------	--	--

Site 287-8-2-01 Top of Green Acres page 19

a1	KW	0	334	86E	2+	0.3		M		p
----	----	---	-----	-----	----	-----	--	---	--	---

a2	KW	0.12	335	86E	1	0.15				p
----	----	------	-----	-----	---	------	--	--	--	---

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
a3	KW	185	335	?	3	0.45		can't tell	p	
b1	KW	0	80	?	2	0.45		l(a)	p	
b2	KW	85	86	?	1	0.35		l(a)	p	
Site 288-8-7-01 Indian Creek										
1	KW	0	346	84E	2.25	.28+		can't tell on any	p	
2	KW	7	346	82E	0.96	0.08			p	
3	KW	26	346	90	0.57	0.12			p	limited to upper LS
4	KW	20	348	90	1.32	0.3			p	
5	KW	103	345	87E	0.28	0.12			p	
6	KW	81	345	90	3+	0.35			p	just one set of 345's
7	KW	14	345	?	3+	0.35			p	
Site 289-8-7-01 Indian creek FID page23										
1	KW	0	347	90	5+	2+		fault?	p	
2	KW	25	337	?	2	0.17		m(2)		
3	KW	18	342	?	0.75			A(1)	cc rotation	
4	KW	40	335	84E	2.4	0.05			p,cl	
5	KW	24	334	?	2.75	0.08			p	
6	KW	22	343	?	2	0.08			p	
7	KW	7	344	88W	5+	2			p	
8	KW	38	344	88W	5+	2			p	
9	KW	27	344	88W	5+	2			p	
10	KW	38	338	90	5	2			p	
11	KW	27	340	89W	1.1	0.06			p	
12	KW	24	342	87W	2.54	1.6			p	
13	KW	31	340	90	18+	2+			p	
14	KW	21	342	90	18+	5+			p	
15	KW	25	344	85W	5+	0.11			p	
16	KW	150	345	90	5+	0.11			p	
Site 290-8-8-01 Old Stone heap at Tavern Culvert page 25										
1	KW	0	346	74W	5.6+	0.2		only one set	p	
2	KW	47	343	90	2.5	0.2			p	
3	KW	24	345	90	4+	0.2			p	
4	KW	46	345	90	6+	0.3			p	
5	KW	7	345	?	3+	0.2			p	
6	KW	161	344	?					p	
Site 291-8-8-01										
1	KW	0	341	82E						
2	KW	5	347	?				A(1)		
3	KW	3	346	?						
4	KW	5	342	?						
5	KW	24	344	82E				hooks into 6		
6	KW	6	346	90						

#	PM	distance, cm	strike	dip	length,m	height, m	thicknes	frac-abut	fract char.	beds
7	KW	13	340	?				A(4)		
8	KW	7	349	?						
9	KW	75	344	87E				M(82 x-jnt)		
1b	KW	x-joint	82	88N						
Site 292-8-8-01 North Fork of Williams Cr. page29										
a1	KW	0	347	85E	3+	1.7+			p	
a2	KW	12	347	85E					p	
a3	KW	50	347	85E					p	
a4	KW	17	347	85E					p	
a5	KW	88	339	?					p	
a6	KW	275	342	89W	4+	0.5		clw twist	p	
a7	KW	72	344	90	4.75+	0.55		A(74 x-joint)	p	
a8	KW	59	344	90					p	
Site 292a-8-8-01 upstream from site 292										
a1	KW	0	340	?				I(87)	p	
b1	KW	0	85	90	3+	1.1			p	
b2	KW	78	90	?					p	
Site 293-FID										
1	KW	0	338	88w	4.5+	0.15			p	
2	KW	10	338	88w	4.5+	0.15			p	
3	KW	2	338	88w	4.5+	0.15			p	
4	KW	3	338	88w	4.5+	0.15			p	
5	KW	3.5	338	88w	4.5+	0.15			p	
6	KW	5	338	88w	4.5+	0.15			p	
7	KW	13	338	88w	4.5+	0.15			p	
8	KW	17	338	88w	4.5+	0.15			p	
9	KW	8	338	88w	4.5+	0.15			p	
Site 294-8-8-01										
1	KW	0	338	?				A(3)	p	
2	KW	7	339	?				A(3)	p	
3	KW	6.5	342	?	3.25+				p	
4	KW	166	345	?	1.82	0.13				
5	KW	407	339	?	5+	0.5				
Site 295-8-8-01										
a1	KW	0	335		6+	0.15			P	
a2	KW	393	335	83E		0.15			P	in blak shales
b1	KW	0	73	83N					P	
c1	KW	0	80						CL	in blak shales
c2	KW	7.5	80							"little guys"
c3	KW	4.5	80							
c4	KW	4.5	80							
c5	KW	4.5	80							

#	PM	distance, cm	strike	dip	length, m	height, m	thicknes	frac-abut	fract char.	beds
c6	KW	3.5	80							
c7	KW	8	80							
Site 296-8-8-01										
a1	KW	0	336		4+					see book.
a2	KW	164.5	337							
Site 297-8-8-01										
a1	KW	0	339	82E	4.2+	0.33		M(70), M(0)	p	
a2	KW	116	348	90	1.21	0.35		associated w/ fid	p	
a3	KW		337	89W	3.78	0.47		l(72)	p	
b1	KW	0	73	?	9+	3		A(a1)	p	
b2	KW	71	73.5	90	1	0.3		A(340)	p	
b3	KW	12	73	?	0.95	0.09		A(a's)	p	
b4	KW	10	73	?	1.87	0.25		A(a's)	p	
fid	KW	6	353							controls flow of creek FID between a1-a3
2	KW	10	353							
3	KW	10	353							
4	KW	10	354							
5	KW	4	354							
6	KW	4	359							
7	KW	2	359							
8	KW	2	354							
9	KW	5	354	more						
Site 298-8-8-01										
Willow Creek										
a1	KW	0	345	86E	25+	0.75		M(b)	p	
a2	KW	187	343	?	1	0.05		M(b)	p	
a3	KW	150	344	?				M(b)	p	
a4	KW	180	341	?				M(b)	p	
a5	KW	200	344	88W	5	2		M(b)	p	
b1	KW	0	290	?	2+	0.1			p	
b2	KW	150	293	?	3+	0.1		A(a)	p	
b3	KW	172	291	?					p	
b4	KW	295	295	?					p	
c1	KW	0	278					A(a1)	p	
c2	KW	29	280					A(a1)	p	
c3	KW	20	280					A(a1)	p	
d1	KW	0	70					A(a1)	p	
d2	KW	61	72					A(a1)	p	
Site 299-8-9-01										
a1	KW	0	334					A's are master	p	
a2	KW	113	334						p	
a3	KW	121	336						p	
a4	KW	256	334						p	

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
a5	KW	540	341						p	
a6	KW	341	337						p	
b1	KW	173	15					A (335)	p	
b2	KW	0	20						p	
b3	KW	82	20						p	
b4	KW	80	15						p	
c1	KW	0	70						p	
a1	KW	0	338					M(15)		
a2	KW	322	337					M(b1)		
b1	KW	0	15					A (340)		
b2	KW	diag	15							
Site 300-8-9-01 Buttermilk Falls page 40										
a1	KW	0	338					M		ccw twist
a2	KW	96	336							
a3	KW	47	339							
a4	KW	ar	335							
b1	KW	0	16					A		
b2	KW	352	18							
b3	KW	164	18							
Site 301-8-9-01 Stew's Creek page 41										
a1	KW	0	84		4.2+	.15+		M(b)	p	
b1	KW	0	335					A(1)	p	
b2	KW	224	331		6+	0.25		A(1)	p	
c1	KW	0	86					A(330)	p	
c2	KW	67	85					A(a3)	p	
c3	KW	58	86						p	
c4	KW	70	84						p	
c5	KW	132	90					M(4)	p	
Site 301-8-9-01										
a1	rm	0	334						p	
a2	rm	135	335						p	
a3	rm	9	332					A(b)	p	
a4	rm	10	332						p	
a5	rm	6	332						p	
a6	rm	4	332						p	
b1	rm	0	68	86S						
b2	rm	215	68							
b3	rm	191	68							
a1	rm	0	90							see page 44
a2	rm	410	90							
b1	rm	0	10							
b2	rm	705	10							

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
Site 302-8-14-01										
a1	KW	0	330	86E	2	0.45		CRVSI(330)	p	
a2	KW	14	336	88E	10+	10+		I(70)	p	
a3	KW	47	336	90	1.5	0.06		I(70)	p	
a4	KW	15	336	90	10+	5		A(70)	p	
a5	KW	150	336	90	15+	10+		A(70)	p	
a6	KW	20	337	89E	15+	10+		M,I(70)	p	
a7	KW	65	338		20+	10+		I(60)	p	
a8	KW	50	336		20+	10+		I(60)	p	
b1	KW	0	71	86N						
b2	KW	92	70	90						
b3	KW	463	60	69W						
b4	KW	97	59	90						
b5	KW	15	60	90						
C1	KW	0	32							
D1	KW	0	320							
FID	KW	0	335							
	KW	30	335							total width
	KW	13	335							
	KW	18	335							
	KW	11	335							
	KW	15	335							
	KW	52	335							
	KW	6	335							
	KW	8	335							
	KW	71	335							
SITE 304-8-14-01 "Big Bend" at Sheldrake										
a1	KW	0	69	88N	10+	0.5		M	P	
a2	KW	27	70	90	10+	0.5			P	
a3	KW	27	70	90	10+	0.5			P	
B1	KW	0	338		7+	0.45		I(70,300)		
B2	KW	33	338	89E					p	
B3	KW	37	336	90				A(b2)	p	
B4	KW	40	335	88E				A(300)	p	
c1	KW	0	83	61S				I(335)	p	
c2	KW	19	84	60S				A(70)	p	
c3	KW	164	80	90					p	
c4	KW		86	68S				I(330)	p	
D1	KW	0	296		4.41				p	
D2	KW	16	294		1.21				p	
e1	KW	0	66	88W				I(330)	p	
Site 305-8-14-01 Sheldrake Winery										

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut	fract char.	beds
a1	KW	0	339	89E				A(a4)	p	
a2	KW	6	336	89E				A(a4)	p	
a3	KW	7	337	87E				A(a4)	p	
a4	KW	16	332	89E				M(a1-3)	p	
a5	KW	44	330	90					p	
a6	KW	21	332	82E				A(a7)	p	
a7	KW	14	338	90				all intersect w/a's	p	
a8	KW	12	335	90						
a9	KW	6	335	89E						
b1	KW	0	59	90					p	
b2	KW	142	60	89S					p	
c1	KW	0	85	84S				I(small NS)		
c2	KW	6	85	84S				I(small NS)	p	
c3	KW	3	86	84S				I(small NS)	p	
c4	KW	29	91	84S				I(small NS)	p	
d1	KW	0	357	pavement				I(c's)	p	
d2	KW	100	355	pavement					p	
e1	KW	0	290	78S				A(60)	p	
Site 306-8-15-01 Sheldrake page 50										
a1	KW	0	340	85E	4+	0.15		I(55,70)	P	
a2	KW	17	336	85E	4+	0.15		I(55,70)	P	
a3	KW	74	332	84E	4+	0.15		I(55,70)	P	
a4	KW	100	336	86E	4+	0.15		I(55,70)	P	
b1	KW	0	54	89S				m(65)	P	
b2	KW	366	54	86S				m(67), I(a's)	P	
c1	KW	0	70	89N	7+	0.15		I(A)	P	
c2	KW	53	70	90	3+	0.15		I(A)	P	
c3	KW	38	70	90				A(b2)	P	
c4	KW	28	75	85S				A(b2)	P	
d1	KW	0	280							
Site 307-8-15-01 Top o' Falls @ Sheldrake										
a1	KW	0	55					I(b)	P	
a2	KW	110	56						P	
a3	KW	113	55						P	
b1	KW	0	335					I(a)	P	
b2	KW	75	335						P	
Site 307-8-15-01 Bottom of the falls										
a1	KW	0	350	62W					P	
a2	KW	63	350	61W					P	
a3	KW	59	346					I(65's)	P	
a4	KW	15	350	89W					P	
a5	KW	186	350						P	

#	PM	distance, cm	strike	dip	length,m	height, m	thickness	frac-abut l(two 350's)	fract char.	beds
b1	KW	0	90						P	
c1	KW	0	65	90					P	
c2	KW	5.5	65					M(300)	P	
c3	KW	22	66						P	
d1	KW	0	296	65S				a(65)	P	
d2	KW	100	298	65S				a(E2)		
e1	KW	0	55							
e2	KW	170	55					m(D2)		
Site 308-8-15-01 South cliff of "Landing strip" page 53										
a1	KW	0	334	90					P	
2	KW	19	333	90				m(70)	P	
3	KW	22	336	90					P	
4	KW	91	337	89E		10+			P	
5	KW	176	335	88E		2.5+			P	
6	KW	31	335			0.75			P	
7	KW	40	335	88E		2.5+			P	
8	KW	35	335	89E		2.5+			P	
9	KW	11	334	89E		2.5+			P	
10	KW	28	334	89E		2.5+			P	
11	KW	65	336	88E		2.5+			P	
b1	KW	0	69	68S					P	
2	KW	100	70	84S					P	
Site 309-8-15-01 Friary Creek										
1	KW	22	332							
2	KW	23	336							
3	KW	3	336							
4	KW	15	335	fid						
5	KW	12	335							
6	KW	16	335							
7	KW	25	335							
8	KW	4	335							
9	KW	4	335							
Site 310-8-15-01 Friary Creek										
a1	KW	0	334	90		3+				
2	KW	18	336	89E				m(74)		
3	KW	181	322	88E				m(74)		
4	KW	38	334			2+				
5	KW	72	324	89E						
6	KW	37	332	74E						
7	KW	19	342							
8	KW	13	330	88E						
b1	KW	0	74	87S	1.78	4+		l(335)		

#	PM	distance, cm	strike	dip	length, m	height, m	thickness	frac-abut	fract char.	beds
2	KW	142	65	84S						
3	KW	84	70	88S						
4	KW	13	73		0.52					
5	KW	7	72					small, but there		
6	KW	3	72							
Site 311-8-15-01 upstream from site 310										

Appendix 2

Cayuga Field Season (2001) Data Part 2

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-7-01-112 Taugh. Crk QD NS FID	1	245	89 e	2+	10+	FM (B)	shale			pl	cl		
	2	0.42	245										
	3	0.4	243 ?										
	4	1.5	244 ?										
	5	1.26											
	6	0.75											
	7	0.46											
	8	0.17											
	9	0.43											
Set B									open 2cm* drawing pg40	cl			
	1	49 ?	2+	15+		FA(A)							
	2	12 sos(B1)											
7-10-01-113 Taugh. Crk QD	1	0.088											
	2	0.112											
	3	0.013											
	4	0.007											
1-12 is the 1st FID	5	0.02	345	90	.03+	10+	I(all other sets)			pl			
	6	0.027											
	7	0.02											
	8	0.022											
	9	0.03											
	10	0.011											
	11	0.13											
	12	0.15											
	13	0.11											
14-28 is the 2nd FID	14	0.57 sos	sos	sos	sos	sos	sos			sos			
	15	0.055											
	16	0.21											
	17	0.06											
	18	0.04											
	19	0.27											
	20	0.065											
	21	0.105											
	22	0.04											
	23	0.025											
	24	0.02											
	25	0.1											
	26	0.17											
	27	0.3											
	28	0.4											
Set B	1	7	90	.02-.03+	15+	I(all other sets)				pl			
	2	0.15	5	90									
Set C	1	89	90			I(all other sets)				jagged			
	2	5 sos											
	3	5.2 sos											
7-10-01-114 Taugh. Crk	1	347	84 e	3+	15+					pl	CL		
	2	0.69	349										
	3	0.69											
Out side of FID	4	0.97											
	5	0.58											
	6	0.51											

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-10-01-115 Set a													
Taugh Crk	1												
	2	1.112			.5+	7+				pl		CL	
	3	1.65		82 e									
	4	2.1											
	5	1.49											
	6	1.05											
	7	1.79		85 e									
Set b													
	1												
	2	5.12		89 w	2+	10+			cntrdw twists	pl			
Set c													
	1	355											
Set D													
	2	356		86 e	.05+	7+				pl			
	3	350											
	4	353											
	5	354											
7-11-01-116 Set a													
Taugh Crk	1												
	2			84 n	.3+				curv. Parallel (335)	jagged		CL	
QD	1												
	2	0.48		346	90 .3+	7+				pl			
	3	0.3		347	90								
	4	0.03											
	5	0.03											
	6	0.53											
	7	0.15		348	90								
	8	0.04											
	9	0.05											
	10	0.48											
	11	0.16											
	12	0.34											
	13	0.14											
	14	0.41											
	15	0.13											
	16	0.4											
	17	0.08											
	18	0.05											
	19	0.71											
	20	0.36											
Set b	21	0.27											
	1			69	90	.5+	5+			pl			
	2	0.56		68	90								
	3	0.98		71	90								
	4	0.17											
	5	1.94											

Date-Site	Intersect #	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B Abut	Sed. Char.	Comments	Frac. Char.	Group
7-11-01-117 Taugh Crk SL	6	1.47											
	7	0.65											
	1	0.19	335 ?		.02+	7+	3 A(2) m(1)	SS...3M TH		jagged sos	CL		
	2	0.58	335 ?		.04+		3			pl			
	3	0.89	334 ?		.01+		10			pl			
	4	1.4	335 ?		.03+					sos			
5	1.7	334 ?			sos		m(7,335df fine			sos			
6	2.29	333 ?			sos								
7	3.02	333 ?			sos		M(8)A(6 curv,perp) A(7 curv. Perp) 2			jagged			
8	3.26	325 ?			sos					jagged			
9	3.5	319 ?			.03+					jagged			
10	3.7	330 ?			sos					jagged			
11	3.95												
12	4.45												
13	4.8												
14	5.4												
15	5.7												
16	6.03												
17	6.5												
18	7.1	335					I(17,16,15)m(19)			cl			
19	7.33	335					A(18)			pl			
20	7.66	335					M(21)			pl			
21	7.89	310					I(22)a(23, 20)			pl			
22	7.96	335					m(21)			pl			
23	8.26	335								pl			
24	8.69	335								pl			
25	9.35	335								pl			
7-11-0-118 2nd Crk N of park	1		350	86 e	2+	7+		Interbedded ss and sh, ss<= 0.8m clws twists		jagged			
	2	0.25	335										
	3	0.29	335										
	4	0.33	340	86 e									
	5	0.47	337	85 e									
7-11-01-119 sos 118	Set a	1	335				M					cl	
7-11-01-120	Set b	1.89	70				A						
1	335		89 e	.3+	1+	1+	m(350)	clws twists		pl			
2	0.24	340								pl			
Set b	1	350	89 e	.3+	1+	1+	A(335)			pl			
2	349									pl			
7-11-01-121 sos 118	Set a	1	285	84 ne	.18+		1 A(335)			pl		CL	
2	0.7	289		.3+			1 A(335)						
3	0.45	290		1.89+	6+	6+	I(335,70)						
Set b	1	337 ?		.3+	1.3+	1.3+				pl			
2	0.45	335	86 e	.4+			1.2 A(EW,70)			pl			
3	0.53	334	90	.04+			1 sos			pl			
Set c													
1	65		90		2+	7+	M(b2,b3)l(c a3)M(ew)	clws twists		pl			

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-11-01-122 2nd crk n of park	Set a	4m to 1 next											
	Set b												
	1	337	90	3+	15+	FM(335)*			*rt lateral	pl			
	2	328		3+	5+	FA(70)*			*rt lateral 2cm				
	3	329											
7-11-01-123 Thayer Creek	4	332											
	5	335											
	1	337	86 e	.5+	3.5+					pl			
	2	0.13	90										
	3	1.17	330 ?										
7-11-01-124 Thayer Creek	4	0.19	325										
	5	0.81	325										
	6	0.85	325							jagged pl			
	7	1.13	320										
	8	320		.1+		9&8 MA							
7-11-01-124 Thayer Creek	9	310											
	Set A												CL
	1	73	85 se	.5+	8+	I(NS.300)	sandy sh			pl			
	2	72											
	3	71											
Set B	4	72											
	5	67											
	6	66											
	Set C												
1	300 ?			.75+		I(70's)A(N 4.5 S)*			*curv. perp.	jagged			
Set A	1	0		.5+	2+	I(70's)				jagged pl			
	2	11								pl			
	3	19								pl			
	4	30				A(70's)				jagged			
	Set B												
7-12-01-125 2nd Crk N. of Park Rd. QD	Set A												
	Set B												
	1	275		1+	<1.5+	M(335's, NS)				jagged			
	2	277								"			
	3	276								"			
Set A	4	0.25											
	5	0.33								pl			
	6	0.44								pl			
	7	0.13	76 ne										
	Set B	291 sos											
Set A	1	330	76 e		0.3 .1+	A(EW)				cl			
	2	0.54	90			very short SOS(B1)				cl			
	3	0.65	332 sos(2)			very short SOS(B1)				cl			
	4	0.15	330 sos(2)			very short SOS(B1)				cl			
	Set C												
1	0 ?		?	1+		A(EW)			sigmoidal	cl			
7-12-01-126 2nd Crk N. of Park Rd. QD	Set A												
	Set B												
	4	65's 335's				m a							CL
	Set A												
	Set B												

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-12-01-127 Set A													
2nd Crk N. of Park Rd. QD	1								*Story is explained on pg 65				
	1	1.5	349	75 e			M(65's)*					pl	
	2		0 ?		.1+	4+	A(65's)					pl	
	3	1.39	355	90	sos	sos	I(65's)					pl	
	4	0.39	353 ?				I(65's)					pl	
Set B	5	0.56	0 ?				I(65's)					pl	
	1		69	90		0.75 6+	M(350)						
	2	0.27	70	86 s			M(350)						
	3	1.21	76 ?				A(350)						
7-12-01-128 Set A													
2nd Crk N. of Park Rd. QD Oak Harbor	1	0.27	350										CL
	2	0.26	349										
	3	0.25	355										
	4	0.61	350										
	5	0.48	350										
	6	0.55											
	7	0.21											
	8	0.45											
Set B													
	1	2.27	65										
	2	1.75	64										
	3	3.21											
	4	1.35											
7-12-01-129A 65 FID 0.43* Down stream from 128 QD 65 FID													
7-12-01-129b upstream			65										
		0.38											
		0.15											
		0.27											
7-12-01-129b NS FID													
		0.34	355				MA (65&NS)						
		0.18											
		0.25											
		0.22											
		0.07											
		0.15											
		0.13											
7-12-01-130 Larger Crk. on Boy Scout camp QD		0.28											
		0.03											
	1		65		.4+	3+	MA&I (350's)	SH		pl		CL	
	2	1.91	69										
	3	0.6	70										
	4	2.3	70										
	5	1.88	67										

*spacing outside FID is the spacing at site 128

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
Set B	6	0.65	65		.2+	.75+							
	7	0.56	65	78 se									
7-12-01-131 Smaller crk on Boy scout Camp QD	1	0.18	350		?	10+	MA & I (65's)			pl			
	2	0.34	355										
	3	0.15	357										
	4	0.26											
	5	0.27											
	6	0.15											
	7	0.5											
	8	0.18											
	9	0.25											
	10	0.34											
Set C	1		300	73 ne	.05+	2+	A(NS)			pl-cl			
	2	4.5	290										
	3	2.2	289										
	4	1.8	285										
	5	0.6	300										
7-12-01-132 Intermittent Strm on Boy Scout Camp QD	1	0.35	335	90						pl	CL		
	2	0.15											
	3	1.03											
	4	0.3											
	5	2.6											
	6	0.26											
	7	0.1											
	8	0.18											
	9	0.45											
7-12-01-133 Set A on Boy Scout Camp QD	1		66	90 .5+	7+		A(340's)(325)			pl			
	2	1.2	328 327				I(70's)			cl cl			
	3	0.67	330							pl			
	4		325							pl			
Set C	1		340				M(70)A(3 25's)			pl			
	2	1.53	342							pl			
7-13-01-133 Set A 2nd Crk N. of Park Rd. QD	1		73	85 s	.55+	3+	M(B1)(N S)			pl			
	2	2.95	74		0.5+	7+							
	3	2.09	73										
	4	1.2	75	90									
	5	1.09											
Set B	1		309 variable		2+		A(A1,C2)I (75's)A(2- 6 75's)			cl			
	2	1.11	320	90		0.75	2.5			pl			

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
Set C													
	1	355	90	4+	7+		I(75's)M(3 10's)		*clws twists	pl*			
	2	2.57	352	90						pl*			
	3	2.07	350 ?										
	4	3.09	350 ?										
7-13-01-132a Trumansbur g Crk QD	1	335	90	4+	10+		NA	int. bedded ss&sh		pl	CL		
	2	0.3	340							pl			
	3	1.86	335							pl			
	4	0.88	334							pl			
	5	0.13	336							pl			
	6	0.13	334						entrdlws twists	pl			
	7	1.54	333						entrdlws twists	pl			
	8	0.3	334							pl			
7-13-01-133a Set A Trumansbur g Crk QD	1	73	90	<=2+	10+		MA&I(B's) .15m	SS<=		pl	CL		
	2	3.69	69 ?										
	3	2.78	69 ?						open .08m				
	4	2.75	72 ~90						clws twists				
Set B													
	1	335	90	sos (a's)			MA&I(A's)			pl			
	2	2.5	340										
	3	4.2	330										
	4	6.5	335 ?										
	5	2.1	335	89 sw									
7-17-01-134 Set A Oak Harbor QD	1	65	87 nw	.8+	10+		M(B's)			pl	CL RM		
	2.5m	62	88 nw										
Set B													
	1	347 ?		.03+	2.5+		A(A1),cur v parallel		*w/hook	pl*			
	2	0.47	359	sos	sos		A(A1),cur v perp.			pl-jagged			
	3	2.59	353 ?		1.1 ?		curv par. W/(Set C)			pl			
	4	1.57	1	.1+			1.3 sosB1			cl			
	5	0.195	349	90	0.39		2.3 sosB1			pl-cl			
Set C													
	1	327 ?			0.04 1.96+		M(B3)			pl			
7-17-01-134a		0.07		82 w					calcite filled veins				
		0.03											
		0.04											
FID NS		0.02											
.35m wide		0.04											
		0.01											
		0.5											
		0.03											
		0.02											
7-17-01-134b													

drawings
on pg 81
of book 1

Date-Site		#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-17-01-135	Set A													
Taughn Crk QD	1		85	80 s		.14+	16+	M(345's)*	Sandy Sh					
	2	0.89	84			.03+		3 A(345's)*						
	3	4.4	79			sos(1)	sos(1)	A(345's)*						
	4	2	76			sos(1)	sos(1)	I(345's)*						
	Set B													
	1		343	90			0.1 5+	I(A1)						
	2	0.35	344	83 w		sos(1)	sos(1)	I(A1)						
	3	9.2	345 ?	?		?		2.3 A(A1)						
	4	2.3						A(A1)						
	5	0.19						A(A1)						
	6	2.9												
7-17-01-136 Set A														
Taughn Crk 45FID width= 8m	1		345	87 NE		.5+	7+	I(B)	Int. bedded ss&sh, ss<=.05m		pl		CL RM	
	45 FID													
	1	0.18	45.5+	7+				I(A)			cl			
	2	0.16	46											
	3	0.15	42											
	4	0.07	30											
	5	0.13												
	6	0.22												
	7	0.07												
	8	0.06												
	9	0.03												
	10	0.03												
	11	0.1												
7-18-01-137 Set A														
Taughn Crk. QD	1		342	86 e		1+	13+	I(B)			pl			
	2	5.16	340	88 w		sos	sos	"			pl			
	3	0.96	343	88 w		sos	sos	"			pl			
	4	6.71	342	90		sos	sos	"			pl			
Thrusts pencil cleavage	Set B													
	*look into spacing b/c of													
	1	doubles	45	70 se		1+	11+	I(A)		*1&2 form adouble	pl			
	2	0.09	40	90		sos(1)	sos(1)	sos(1)			pl			
	3	4.17	44	84 nw		sos(1)	sos(1)	sos(1)		*3&4 form a double	pl			
Thrusts	4	0.09	40 ?			.75+	2.5+	sos(1)			pl			
	5	3.5	39	70 nw		2+	11+	sos(1)		*no double	pl			
	MAX Structural Relief													
	Thrusts													
	RDJ, CL													

[illegible]

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B Abut	Sed. Char.	Comments	Frac. Char.	Group
Pencil Cleavage	1		65 ?										
	2		70 ?		0.5		A(A)			pl			
		0.035											
		0.04											
		0.08											
		0.095											
7-19-01-141 Set A													
Little Point QD	1		3 ?										
	2	1.78	343	87 e	.75+	6+	I(B)			PL eroded			
					sos(1)	sos(1)	I(B)			PL			
	3	3.7	2	90	sos(1)		I(B)M(B&C)						
	4	3.68	1	76 e	sos(1)		I(B)M(B')			PL			
Set B										PL eroded			
	1	65 ?			1+	13+	I(A)			pl			
	2	0.34	66				I(A)						
	3	0.73	69				I(A)						
	4	1.02	69	85 s			I(A)						
	5	0.71					I(A)						
	6	0.54					I(A)						
Set B'													
	1	70 ?			.3+		3.68 A(A3,A4)			pl			
	2	0.065	65 ?										
	3	0.27	70	89 s									
	4	0.34	67 ?										
	5	0.27	69 ?										
	6	0.5	65 ?										
	7	0.2	68 ?										
Set C													
	1	334	90 .1+			0.2	A(A3)			pl			
	2	0.07	333	90			sos(C1)						
	3	0.08	333	90			sos(C1)						
	4	0.09					sos(C1)						
	5	0.05					sos(C1)						
7-19-01-141a Set A													
Little Point QD	1		356	85 e	.2+	9+							
	2	0.85	2	84 e			see book			pl			
	3		4	75 e									
Set B													
	1	0.015	52	87 se									
	2	0.04	52	90									
	3	0.02											
	4	0.025											
1-17 are spacings right at Set A													
	5	0.021											
	6	0.027											
	7	0.028											
	8	0.05											
	9	0.023											
	10	0.032											
	11	0.015											
	12	0.08											
	13	0.01											
	14	0.025											
	15	0.01											
	16	0.045											

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-19-01-147 Booth W.F. QD	2	0.39	334	80 ne									
	3	0.15	339 ?										
	4	0.68											
	5	0.46											
7-19-01-148 Booth QD	1	0.48	353	89 e	.2+	8.5+	M(B)	Blk Sh w/ tuffa					
	2	0.7	349 ?		.17+	2.95	I(C)			pl			
	3		2 ?		.15+	4.5	A(C)			d junky pl-cl			
7-19-01-149 Booth @Tully	1	0.095	13 ?	0.07+	<1m			Blk Sh w/ tuffa					
	2	0.085	18	83									
	3	0.09	18	90									
		0.1											
7-19-01-147 Booth W.F. QD	1	0.015	87 ?		3+	6-8+	I(A, B)			pl			
	2	1.51	74	84 n									
	3	2.5	75 ?										
7-19-01-148 Booth QD	1	0.015	3	90			M						
	2	0.02	48	90									
	3		47 ?										
			49 ?										
7-19-01-149 Booth @Tully	1	0.01											
	2	0.015											
	3	0.02											
		0.035											
		0.04											
7-19-01-147 Booth W.F. QD	1	0.015											
	2												
	3												
7-19-01-149 Booth @Tully	1	0.11											
	2	0.1											
	3	0.07											
		0.06											
		0.085											

QD	Date-Site	#	Intersect (m)	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
end of ene zone	Set B	2	0.48										
		3	0.52										
		4	0.35	70 N									
				0 ?									
7-24-01-150	Set A												
Willow Crk		1											
E. of Spruce													
Row		2	0.67										
		3	0.68										
7-24-01-151 Willow Crk @ Intersection of Kraft & Willow Crk rds	Set A	1											
Set B													
7-24-01-152 Willow Crk @ Willow pnt. QD	Set A	1											
Set B													
7-24-01-153 Teeter Point QD	Set A	1											
Set B													

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments RM, CL	Frac. Char.	Group
7-24-01-154 Set A													
Teeter Point QD	1	0.82	311	85 sw	7+	5+	A&I(B)						cl
	2	0.68	308	86 sw									
	3	0.72	312	75 ne									
spac. ls tighter on cliff above site													
0.1													
0.2													
0.15													
0.3													
Set B	1	0.53	68	90	SOSA	SOSA	M&I(A)						pl
	2	0.99	69	87 n									
	3	0.49	69	90									
7-24-01-155 Set A													
280													
Tully LS Blk Sh below tully, Fossilifero us													
Blk Sh below tully, Fossilifero us													
Blk Sh below tully, Fossilifero us													
Blk Sh below tully, Fossilifero us													
I(70)													
I(345)													
Quarry near Set B													
345													
Willow Crk Pt QD poor out crop													
Set C													
0.29													
0.76													
7-24-01-156 Set A													
Poter's Creek The Kahn's													
Set B	1	0.46	69	90	2.5+	3+	MA&I(B)						pl
	2	0.21	67	89 n									
	3	0.56	66	90									
Set B													
Set B	1	305	305	79 sw	3+	9+							cl
	2	0.55	305	84 ne									
	3	1.13	300	72 ne		0.2 9+							
Set C	4	0.55	315	84 ne									
	5	0.29											
	6	0.87											
Set C													
MA&I(A)													
pl													
345													
346 ?													
327													
330													
RM, CL													

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A Blk Sh above Tully	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
7-25-01-157 Set A Poter's Creek	1		67	87 n	.10+	8+	M(B)			pl			
	2	1.14	66	85 s	sos	sos	M(B), I (B)			pl			
	3	0.85	70 ?	sos	sos	sos	SOS A2			pl			
The Kahn's QD		1											
		0.34											
		0.8											
upstream Set B		2.17											
	1	1.42	320	85 e			I(70°) A(A)						
							curving perpendic ular						
this is the norm->	2	3.32	305 ?										
	3		303 ?										
Set C	4		305	75 e			SOS SOS (b2), I(A)						
	5												
	1		335 ?						x-jnt				
Set D	2		340 ?										
		Shale vertical partings											
	1	0.025	85	85 n	?	0.33 A(305)				pl-cl			
7-25-01-157a Set A Poter's Creek		0.02											
		0.025											
		0.03											
Set B			7	87 w	?	9+	Came first						
		Spacing close to A= .02,.0175, .015,.01., 0325,.055 .02,.01 Spacing Far from A= .125,.95, 14,.105,0 875	332	89 e					RL offset	pl		CL	
The Kahn's QD													
7-25-01-158 Set A Poter's creek QD	1	0.15	72	89 n	<=2+	4-5+	A(B1)					CL	
	2	0.22	72	87 s									
	3	0.08	69	90									
		0.06											
		0.21											
		0.34											
		0.31											
		0.07											
		0.17											
		0.23											

[illegible]

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-25-01-160 Set A	5	0.5		90									
Willow Crk QD	1			69 ?				Sh					
	2	0.33		90	.3+	5.4+			pl				
	3	1.03		86 n									
	4	1.35		90									
	5	0.5		90									
7-25-01-161 Set A													
Nature Center QD	1			70 .3+									
	2	0.08		73	3.5+				pl				
	3	0.69		70									
	4	0.2		71									
Set B													
	1			0	.3+	6+							
	2	0.39		1	90								
	3	0.13		2	90								
		0.23											
		0.3											
		0.08											
		0.56											
		0.175											
		0.065											
		0.09											
		0.13											
7-25-01-162 Set A													
Nature Center Qd	1	2.12		69	.75+	8+							
	2	0.63		70									
	3	0.91		70									
Set B													
	1			3	89	5.5							
	2	0.41		4	90								
	3	0.21		3	90								
		0.19											
		0.25											
		0.14											
		0.03											
		0.22											
Set C													
7-26-01-163 Set A													
Nature Center Qd	1	0.19		354	66 w	.25+	5.5+						
	2	0.16		0	89 w	.4+	10+						
	3	0.1		5									
		0.14		3									
		0.1											
		0.19											
		0.59											
		0.2											
		0.41											
Set B													
	1			70	90	.5+	5.5+						
	2	1.6		69	90								
	3	1.92		68	90								
7-26-01-164 Set A													
Nature Center	1			10	88 w	.5+	8+						

Date-Site # Intersect (m) Dip Strike Dip Dir Height (m) Length (m) M/A T/ B abut Sed. Char. Comments Frac. Char. Group

Set C close to A

1 0.02 354 87 e 10+ 50 A(A)
2 0.04 347 87 e I(A)
3 0.025 349 88 e

Set D

1 2.89 69 85 n 1+ 10+ 2.2 A(344's)
2 0.76 66 87 n I(A,B)
3 70 90 1+ 10+ I&M(C)

just down stream spacings of 345's = .05,.0325,.065,.04,..01,.04,.17,.075,.05,.26,.10,.04 5,.01,.015 ,.105,.66

7-26-01-168 Set A

Maple Wood

pnt 1 0.34 67 81 n 2+ 20+ FA(B)*,I(B (SOS
QD 2 0.51 65 89 n) *LL offset=.025m pl
3 0.49 66 90

Set B

1 4.7 354 83 w .25+ 6+ FM(A)
2 2.64 354 83 w I(A)
3 1.7 sos

7-26-01-167 Set A

Maple Wood

pnt 1 0.17 345 84 w 8+ 1+ A(70's) BLK SH
QD 2 0.17 352 75 e d jagged
3 0.41 355 85* w *dips vary vertically

RDJ has notes and PICs

0.68
1.13

7-30-01-169 Set A

Glenwood

Creek 1 1.01 351 90 .3+ 1.5+ I(B), one
QD 2 0.38 0 80 w .35+ 4+ A(B) curv.
3 0.19 353 90 " Parallel

Set B

1 65 90 .5+ 10+ I(A) PL

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-30-01-170 Maplewood rd QD	2	1.6		64	90								
	1	341		88 e	2+	10+							
	2	339		90			A(B)		* w/cntrdws twist	pl*			
	3	334 ?											
	Set B												
	1			75	90 2+	2+							
							M(A), M(340) most of the time			pl			
	2	0.28		74	90	Story:	A&B I but in at least 2 cases the bset are the masters to a						
	3	1.2 sos 1.9											
								SS~.3m th					
7-30-01-171 Maplewood rd QD	1	0.93		279 variable?	.15+	3+	A(B)			cl			
	2	1.7 sos											
	3	0.8 sos											
	Set B												
	1	3.2		340	90	.15+	3+			pl			
	2	1.06 sos					M(A) M(C)						
	3	sos							has orange mossy stuff may be hydrocarbons	pl			
	Set C												
				300	90	.07+	4+						
							A(B)						
7-30-01-172 Glenwood Creek QD	1	1.3		339	90		M(B)			pl			
	2	0.8		341	90								
	3	1		344	88 e		I(B)						
		1.25											
		1.02											
	Set B x:jnts												
	1			83 ?			A&I(B)			pl			
	2			80 ?									
7-31-01-173 Buttermilk Falls St. Park QD	1			90 ?									
	2			89 ?									
	Set B												
					.5+	6+	I(B)			cl			
	1			355	90	.25+	4+						
	2	6		355	90	5+	7+						
				358 ?		.75+	2.5+						
	Set C												
	1			305	90 1+	3+	A(B)			pl			

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A siltstone w/partings at .05...02.0 6m	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
7-31-01-174 Set A Buttermilk Falls St. Park QD	1 2 3 4	335 334.5 4 sos 336	90.15+ 90 "	10+					*w/ cntcdws twists	pl*	cl		
there are also some x-jnts that strike b/t 75-95 they away s A(A)													
7-31-01-175 Set A													
Buttermilk Falls St. Park QD	1 2 3 4	336 336 338 337	89 e 90 90 90	7+	11+	NA	ss= .10,.08,.0 8.02m			pl			
7-31-01-176 Set A Buttermilk Falls St. Park QD	1 2 3 4	70 68 69 fid width=	85 n 90 86 s	7+	6+	M				pl	cl		
4 outside fid 5 3.3 6 1.9 7 1.6													
vertical outcrop	1 2	0.39 17 ?	90	sos(a)	sos(a)	A		interbedd ed sand and sh ss<=.15m th		pl-cl			
7-31-01-177 Set A Buttermilk Falls St. Park QD	1 2 3	0.35 0.65 sos 0.29	85 e			MA(B)				jagged	cl		
Set B	1 2	~1.5 8	85 nw	15+	20+	MA(A)				pl			
7-31-01-178 Set A Along rte 96 across from Kolar Mach. Inc. QD	1 2 3 4	358 350 356 1.61 sos	80 e 85 w 71 e	8+	5+	M(B)				pl			
can't reach ~65-80													
Set B						A(A)							
7-31-01-179 Set A 1 rd N. of Little Pt. QD	1 2	0.015 0.045	87 ne 82 ne	.1+	5+	M&I (B)		sh		pl	cl		

Date-Site		#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
story pg12 cl4	3	0.015	346	90										
		0.025												
		0.02												
		0.05												
		outside fid												
		0.43												
Set A'	1	outside fid												
		0.91	334	84 ne	sosA		sosA	M&I(B)			pl			
		0.23	333	84 ne										
		0.69	334	90										
Set B	1	0.73												
		0.36												
		0.23	56	90	2+	10+	A&I(A) a few curv. Perp. To A				pl			
		0.1	57	89 n										
8-1-01-180 sos179 QD	2	0.28	63	87 n										
		0.17												
		0.1												
		0.4												
Set A	1	0.2												
		0.66	70	86 s	.5+	5+	I(B)	sh			jagged-cl	cl		
		0.11	72	88 s										
		0.43	73	88 s	.11+		M(D), I(C), I(A)				pl			
Set C	1	0.35	310	58 sw			I(B)			related to A	pl			
		0.35	315 ?											
		x-jnts	345 ?	.05+	.75+		A(B)			x-jnts	cl			
		2 NA	340 ?											
8-1-01-181 Briggs Creek QD	3	0 ?												
		1.01	336	81 w					blk sh					
		0.68	336	86 w	.3+	5.5+	I(B)				pl			
		0.71	337	90										
Set B	1	0.43												
		1.35												
		0.71	71	90	.17+	10+	I(A)				pl			
		1.23	71	90										
8-1-01-182 Briggs Creek QD	3	0.61	71	90										
		0.79	70	90					blk sh					
		1.03	71	90	.15+	3+	M(B)				pl			
		0.48	69	90										
Set B	1	0.1	54 ?		.08+	1.5+	A(A)				cl			
		0.18	56 ?								en echelon			
		0.1	55 ?											
		0.16												
		0.18												

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A tuffa covered sh	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
8-1-01-183 Van Dorn Beach QD	Set A												
	1	0.22	71	86 s	5+	10+	I(B), A(B)			pl			
	2	0.61	69	90									
	3	0.53	71	79 s									
		0.91											
8-1-01-184 Van Dorn Beach QD	Set B x-jnts												
	1	339	339	90 .10+		0.75	I(A), A(A)			cl			
	2	0.47	345 var										
	3	0.88	335	90									
		width =											
8-1-01-185 Van Dorn Beach QD	Set A												
	75 fid	2.5m						blk sh					
	1	0.15	74	86 s	.5+	5.5+	M(&I(B)			pl			
	2	0.23	74	90									
	3	0.24	72	87 s									
8-1-01-186 Williams Creek	Set B x-jnts												
	1	0.34	355	50 e	.05+		0.35 A&I(A)			pl			
	2		0	70 e				siltstone					
	1	0.51	69 ?		.75+	15+	M&I(B)		1,2 are eroded	pl			
	2	0.27	65 ?										
8-1-01-187 Williams Creek	Set B x-jnts												
	3	0.46	66	89 n									
		0.58											
	1	345	345	90	.08+		2.1 A&I(A)			pl-cl			
	2	2.53	349 ?										
8-1-01-188 Williams Creek	Set A												
	w/in FID							sh just above critter					
	1	0.05	87	89 n	3+	7.5+	later	rich storm bed		pl-cl			
	2	0.15	87	90				"carbonat e rich					
	3	0.15	85	89 s			I(B,C)	hash"-rdj					
8-1-01-189 Williams Creek	Set B												
	1	0.25											
		outside fid											
8-1-01-190 Williams Creek	Set C												
	1	359	359	81 e	.75+	6+	I(A)			pl			
	2	1.53	339	90	6+		M&I(A)		twists@345 clws	pl			
	3	0.45	340	90									
		0.53											
8-1-01-191 Williams Creek	Set D												
	1	335	335	85 .3+	6+				rotated cntr clws	pl			
	2	0.09	333 ?										
	3	0.1	334	90									

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
8-7-01-187	Set A												
Williams Crk QD	1	0.18	337	84 w	.6+	5+	A&I(B) mostly l		cntr clws twist	pl			
	2	0.51	338	90									
	3	0.46	338	86 e									
	0.3												
Set B													
	1		74	87 s	.6+	10+	M&I(A) mostly l			pl			
	2 can't get	74	90										
	3	3.5	73	85 s									
8-7-01-188	Set A												
Williams Crk QD	1	0.24	340	85 e	.3+	.75+		sh		pl			
	2	0.36	339	90									
	3	0.5	335	85 e									
	0.33												
in N. gulch													
	4	1.06	331	88 w		8+	FA (B1) rl .02m		cntr cw twists	pl			
	5	3.77	340										
Set B													
	1	0.9	80	86 n					cntr clw twists @75°				
	2	2.45	76	89 s									
	3	0.62	77	87 s									
	fid												
	4	0.33	74	90	3+	4+							
	5	0.14	75	87 n									
	6	0.44	75	85 n									
8-7-01-189	Set A												
Williams Crk QD	1	0.68	346		.2+	5+	na			pl			
	2	0.32	341										
	3	0.53	342	85 e									
may not be on map		0.65											
		0.4											
8-9-01-190	Set A												
Creek on Quarry Rd QD	1	0.46	345	90		0.1 1.5+	A(B)		clws twist @350°	pl			
	2	0.15	344	90									
	3	0.4	345	88 e									
	0.75												
	0.27												
Set B													
	1		71	84 n	.15+	1.5+		ss = 22m th		pl			
8-9-01-191	Set A												
Buttermilk St.Prk QD	1	0.87	338 3+	45+						pl			
	2	1.68	337										
	3	1.18	339										
	2.58												
	1.67												
8-14-01-194	Set A												
Sheldrake Creek QD	1	0.58	336	87 e	6+	3+	I(B)			pl			
	2	1.68	334	84 e									

[illegible]

QD	Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
	Set B	2	0.5	66	82 n									
		3		64	90	.1+	15+							
			w/in Fld	fld width=.57m										
	Set B	1	0.26	333	89 e	.75+	2.5+	M(C), I(D&A			pl			
		2	0.095	335	90									
		3	0.23	334	90									
	Set C		outside fld											
			1.73											
			5											
8-14-01-197 Sheldrake Creek QD	Set A	1	0.48	304	84 w	.25+	3+	M(A), A(B), I(A&B)			cl			
		2	0.75	285	90									
		3		287	90									
bad bugs	Set D													
		1		40	64 se	.15+		I&A(B), 2 A@			pl			
			0.45	65				M&I(B)				CL		
	Set B		0.2											
			0.46											
			0.31											
	Set B		0.36											
			0.48											
			0.32											
	Set B		0.17	335				A&I(A)						
			0.09											
			0.33											
	Set A		0.15											
			0.1											
			0.35							calc. Sh.			CL	
8-14-01-198 Sheldrake Creek QD	Set A	1	0.19	332	82 w	3+	3+	I(b)			pl			
		2	0.16	336 ?										
		3	0.3	334	86 w									
	Set B	4	0.24	334	90									
		5	0.25											
		6	0.54											
8-14-01-199 Landing Strip Crk QD	Set A		53		85 n	.2+	6+	I(A)			pl			
								mostly M(B), I&MA(B), M&I(D)	calc sh					
		1	0.22	64	87 s	.07+	11+				pl			
	Set B	2		65	88 n									
		1	0.1	44		.03+	5+	A(A), I&MA(A) A(D)			pl-cl			
	Set C	2	0.04	45										
		3	0.07	30										
		4	0.12	45										
	Set D		0.08											
			0.12											
	Set C		337		80 e	.07+		I(D), I&A(D) curving			pl			
								1.7 perp.						
		1	0.16	345	60 e	.07+	2+c	M(B), I(C , A&I(A)			pl			

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
8-14-01-199a Landing Strip Crk QD	2	1.12	336	90									
	3	0.46	338	90	sos	not c							
	4	0.13	330	90									
	5	1.25											
								siltstone = .06m th					
Set A	2.21	340					I(B)						
	2.06												
	2.18												
	0.37	65					I(A)						
	0.86												
Set B	0.53												
8-15-01-400 Landing Strip Crk QD	1	55	84 SE	.10+	20+		M(B,C)			pl			CL
	Set B												
	1	74	90	.25+	7+		A(A)M&I(C)		drclws twists	pl			
	2	69	87 s										
	3	74	90										
Set C	4	70	90										
Set A	1	334	90	.05+	<1m		I&A(B)A(A)			pl-cl			
	2	340	65										
	3	335	90										
		0.32											
	0.43												
8-15-01-401 Landing Strip Crk QD	1	337	87 e	1.5+	1-7+		NA	Calc. Sh		pl			CL
	2	336	90										
	3	330	90										
		0.15											
	0.25												
Set A	0.53												
	0.13												
	0.28												
8-15-01-402 Landing Strip Crk QD	1	0.82	336	90	4+	10+	I(B)	Calc. Sh.					CL
	2	0.38	336	90					*w/clws teists	pl*			
		0.49											
	Set A'	w/in fid											
	1	0.07	331	90	7+	1+	NA			pl			
Set A	2	0.29	334	90									
	3	0.18	331	90									
	4	0.12											
	5	0.07											
	6	0.01											
Set B	7	0.23											
Set A	1	0.16	53	87 se			I(A)						
	2	54	90										
	3												
	4												
								Calc. Sh.					
8-15-01-403	Set A												

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
Friers Creek QD	1	334	86 e		1+	4+	M(B, C)			pl			
	2	5.09	332	86 e									
	3	4.12	338	90									
Set B													
	1	85	80 n		.2+	2.5+	A(A) curving parallel			pl-cl			
	2	0.35	87 ?										
	3	0.16	270	72 s									
Set C													
	1	19	68 se		.70+	1+	A(A)			pl-cl			
	2	1.35	17	90									
	3	1.9	16	80 se									
8-15-01-404 Set A													
Friers Creek QD	1	334	90		.09+	4+	I(B)			pl			
	2	2.02	330	90									
	3	2.17	332	90									
FID width = .29													
Set B	1	0.11	56	81 se						pl-cl			
	2	0.07	54	84 se									
	3	0.09	56	90									
8-15-01-405 Set A													
Friers Creek@89	1	65	90		.75+	4+	A(B1) curv. Perp. A(B1) w/.02m rl offset	gry sh		pl			
Set B													
QD	2	0.68	60 88 (var)										
Set C													
	1	0.63	359	90		.03+	1+	M(A1) A2,C1) I(C2)		pl			
	2		10	90						pl			
8-16-01-406 Set A													
Kidders Creek	1	0.42	75	89 s				ss<=36m th 1st sand pavement					
	2	0.23	74	87 s		1+	A&I(B)M(C)			pl			
	3	0.3	71	87 s		8+							
Set B													
	1	0.32	342	90		.2+	4+	M&I(A) I(C)		pl			
	2	0.52	335	90									
	3	0.49	336	89 w									
Set C													
8-16-01-407 Set A	1	304	85 NE		.3+	1+	I(B)A(A)	*clws twists		pl-cl*			
		0.52	65				MA					CL	

	Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
Kidders Creek QD	Set B	0.17 0.61 0.57	285					MA						
8-16-01-408 Kidders Creek QD	Set A w/in fid	1 0.1 2 0.08 3 0.23 0.18 0.07	334 326 334	.3+	90 90 87 e		.75+	I(ew.65's)			pl	CL		
		outside fid												
		0.78 0.64 0.83												
	Set A' Set B	0.08 0.04 0.05 0.03 0.5 0.07	353 26 ? 29 ? 29 ? 37 ?		90	0.01 <1 0.01 .1-.15m	mostly M(B), I(B) I(&A(A)				pl pl			
8-16-01-409 Kidders Crk QD	Set A	1 0.51 2 0.54 3 0.38 0.41 0.54	346 348 345	.75+	90 90 90		1.5+	M(295)I(7 0)			pl	CL		
	Set B	1 0.38 2 0.38	70 67	.1+	87 s 90		4+	I(A)			pl			
	Set C	1 0.67 2 0.295 3 0.48 sos(c2)	295 295 sos(c2)	.15+	90 65 ne		.5+	A(A)			pl			
8-21-01-411 Willow Lodge Crk QD	Set A outside fid	1 0.49 2 0.19 3 0.37 0.34 w/in fid	331 333	3+	90 89 e		.1+	NA			pl			
	Set B	1 0.09 2 0.04 3 0.05 0.03 0.05 0.02	341 ? 330 var 355 var	sos outside fid				na			pl-cl			
8-21-01-412 Willow Lodge Creek QD	Set A	1 0.57 2 0.44 3 0.42 0.51	69 71 73	.15+	89 n 90 88 s		2+	I(B)M(C) above tully/s			pl	CL		
	Set B	1	359	.25+	90		4+	I(A)			pl			

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
Set C	1	291	90	.05+	1.7 A(A)	sh above Tully/Is	pos. x-jnt	pl			CL		
8-21-01-413 Set A													
Willow Lodge Crk QD	1 2 3	0.22 0.2 0.39	341 341 342	90 89 s 90	.20+	1.5+	Mostly I(B), M(B)		pl				
	0.24 0.18												
Set B	1 2 3	1.03 1.26	66 67 65	85 n 87 n 90			I(A), A(A)						
8-21-01-414 Set A													
Lively Run QD	1 2 3	0.15 0.75 sos 1.15	336 338 339	86 e 90 87 e	.25+	9+	na	Tully LS	pl		CL		
8-21-01-415 Set A													
Lively Run QD	1 2 3	0.05 0.07 0.1	344 ? 341 ? 342		.01+	8+	I(B)M(B)	blk sh	pl		CL		
NS FID		0.02 0.05 0.04 0.01 0.15		90									
Set B	1 2 3	0.26 0.55 0.24 sos2	73 76 ?	85 n	.02+		1 A&I(A)		pl				
8-21-01-416 Set A													
Lively Run QD	1 2 3	0.12 0.91 0.6	69 70 66	90 90 86 n	.75+	.75+	I(B)	blk sh below tully	pl		CL		
FID		0.21											
Set B	outside fid												
	1 2 3	0.79 0.53 0.8	335 338 335	87 e 84 e 90	.75+	3+	I(A)		pl				
		0.31 0.22 0.43 0.67											
Set B'	w/in fid												
	1 2 3	0.01 0.01 0.008	334 332 335	90 90 90	0.03 3+		I(A)		pl				
		0.03 0.07 0.01 0.005 0.01 0.04											
8-22-01-417 Set A													
Cliff Prk Crk QD	1 2	0.28 0.03	344 345	90 90	.75+	5+	m(B)	sh	*w/ctrlcls twists	pl*	CL AH		

Date-Site	#	Intersect (m)	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
8-22-01-418	3	0.04	88 w									
		0.07										
		0.33										
Set A'		0.12										
	1	2.3 sosA		sosA		na	ss= .04m		pl			
	1	75				A(A)	interbedded ss&sh		pl			
8-22-01-418		fid width										
	1	w/in fid = .2										
	2	0.16	350 ?									
Cliff Prk Crk QD	2	0.06	344	76 e	1+	2.5+					CL AH	
	3	0.03	345	80 e					pl			
		outside fid										
8-22-01-419		0.76										
		1.3										
		1.83										
8-22-01-419							ss = .28					
	Set A						th				CL AH	
Cliff Prk Crk QD	1		340	90	.3+	1.5+			pl			
	2	1.06	343	85 e								
	3	1.119	344	90		NA						
8-22-01-420												
	Set A											
	1	1.03	345	85 e	.15+	3+	M(B)/(B)		pl			
Cliff Prk Crk QD	2	0.3	347	78 e								
	3	0.51	349	80 e								
		0.57										
Set B		0.67										
	1											
	2	0.23	70	90	.54+	1-3+	A(A)/(A)		pl			
8-22-01-421	3	0.55	72	90				this set isn't prevalent in this creek until here				
		0.56	73	86 n								
Linderman Crk QD		1.58	70	90								
	Set A										CL AH	
	1	0.88	341	85 e	.15+	3+	M(B)	composite	pl			
8-22-01-422	2	0.77	342	85 e								
	3	0.54	337	88 e								
		0.48	344 ?									
Set B		0.66										
	1		70	90	.1+	1+	A(A)		pl			
	2	1.07	68	90								
8-22-01-422												
	Set A										CL AH	
	1	0.36	337	85 e								
Linderman Crk QD	2	0.53	330 ?									
	3	0.06	329	80 e								
	4	0.17	337	78 e								
		0.05										
		0.02										
		0.03										
		0.03										
		0.25										
		0.17										
		0.22										

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B abut	Sed. Char.	Comments	Frac. Char.	Group
8-22-01-423 LindermanC rk QD 335 fid	Set A	Bad creek lots of over growth											
		0.06										CL, AH	
		0.07											
		0.1											
		0.76											
8-22-01-424 LindermanC rk QD	Set A	0.16											
		0.19											
		0.23											
		0.1											
		0.68											
8-22-01-424 LindermanC rk QD	Set A	0.55											
		0.57											
		1.1											
		1.63											
		0.81											
8-22-01-424 LindermanC rk QD	Set B	0.06											
		0.18											
		0.45											
		1.38											
		0.98											
8-22-01-426 Williams Crk QD	Set A	0.13											
		0.81											
		0.06											
		0.18											
		0.45											
8-22-01-427 Williams Crk QD	Set A	1.38											
		0.98											
		0.13											
		0.08											
		0.31											
8-22-01-428 Williams Crk QD	Set A	0.51											
		0.38											
		0.43											
		0.5											
		0.46											
8-22-01-428 Williams Crk QD	Set A	0.88											
		0.79											
		0.49											
		0.74											
		0.72											
8-22-01-428 Williams Crk QD	Set A	9											
		0											
		0.22											
		0.2											
		0.12											
8-22-01-428 Williams Crk QD	Set A	0.55											
		0.43											
		0.55											
		0.43											
		0.55											

Date-Site	#	Intersect (m)	Dip	Strike	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
Set B	1	0.82	75	90	.5+	3+	M&I(A)& A(C)			pl			
	2	0.53	75	85 n									
	3	0.9	75	88 s									
	4	0.28											
Set C	1.17												
	approx.												
	1	0.31	335 ?		.3+	.45+	A(A)M&I(70)			pl			
	2	0.09	330	90									
8-22-01-429 Set A Tanfers Creek QD	3	0.08	325 ?										
	4	0.06	320 ?										
	0.02												
								sh			CL		
Set B	1	0.84	74	90	2.5+	7+	M(B)			pl			
	2	1.3	64	86 n									
	3	1.41	64	90									
Set B	1	319	68 ne		.10+	0.85 A(A)				cl			
	2	0.49	309	71 ne									
								ss= .4m th			CL		
8-22-01-430 Set A Tanfers Creek QD	1	1.2	341	80 e		0.4 7+	na			pl			
	2	1.04	340 ?										
	3	1.09	345 ?										
		1.31											
8-23-01-431 Set A Heith Cliff QD	1	339		90	.5+	4+	M&I(B) (mostly I)			pl			CL
	2	1.45 sos											
	3	1.36	336	90									
	4	0.18	340	90									
Set B	1	72	90		.75+	4.5+	A&I(A)			pl			
	2	0.73	73	88 s									
	3	1.75	70	90									
8-23-01-432 Set A Heith Cliff QD ns-nnw fld	1	0.82	355	87 w	.25+	5+	I(B)M(B) o nce			pl			CL
	2	0.65	353	90									
	3	0.45	356	90									
		0.75											
Set B		0.83											
		0.23											
	1		69	90	1+	7+	I(A). A(A) once			pl			
	2	0.37	70	90									
8-23-01-433 Set A Next Ditch s. of Heith Cliff QD	1	354		86 w	1+	3.5+	na only one set	SS =.05m th		pl			CL
	2	0.72	351	90									
	3	0.77	353	90									
	4	3.2	352	90									
8-23-01-434 Set A													
								ss=.2m th					CL

	Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
? QD	1	0.48	342	90		.10+	3+	A&(B)						
	2	0.49	341	88 e										
	3	0.28	344	90							pl			
		0.16	344											
8-23-01-435 Hen Coop Creek QD		0.42												
		w/in .05 m												
	Set A'													
	1	0.02	342	90		.03+	0.2			*w/ hooks	pl*			
	2	0.03	345	90										
	3	0.03	344	90										
		0.04												
		0.01												
		0.04												
		outside												
8-23-01-435 Hen Coop Creek QD		.05m												
		0.07												
		0.15												
	Set B													
	1		0 ?			.01+	5+	M&(A,A')			pl	CL, AH		
	Set A													
	1	3.94	71	90				M						
	2	0.4	71	90										
	3	2.45	71	90										
	Set B													
8-23-01-435 Hen Coop Creek QD														
	1	0.8	324	71 ne				A(A) curv.						
	2	0.37	326	71 ne				Perp						
		0.46												
		0.73												
	Set C													
	1		351	73 e				A(B), A&(A)						

Appendix 3

Seneca Lake Site Log
(Field Season 2001 and 2002)

Site	RDJ	Page	Book	Date	Ma p #	Location	Data Type	Structure	Observations	Data Entry	HIST	Sep. Sets Orient.	M/A Relat	Spac Calc	Rose	Marked Map
1		5	cl1 kw	7-5-00, 7-6-00	Burdett 17	Along Rte 414	SL			x	x	x	x	x	x	x
2		17	cl1 kw	7-6-00	Burdett 17	Excelsior Glen	SL			x		x	x	x	x	x
3		20	cl1 kw	07/07/2004	Burdett 17	Hector Falls	SL			x		x	x	x	x	x
4		24	cl1 kw	7-7-00	Burdett 17	Seneca Lake Inlet	c-notes c-notes			x		x	x	x	x	x
5		30	cl1 kw	7-7-00	Burdett 17	NJ House	SL			x		x	x	x	x	x
6	72	28	cl1 kw	07/08/2004	Burdett 14	Warner Rd	OD			x		x	x	x	x	x
7	71	34	cl1 kw	7-11-00 07-11-00	Burdett 14	Warner Rd	SL&OD SL&OD			x		x	x	x	x	x
15c		34	cl1 kw	07/12/2004	Burdett 11	Sawmill Creek	OD			x		x	x	x	x	x
15k		80	cl1 kw	7-14-00	Burdett 11	Sawmill Creek	OD			x		x	x	x	x	x
16		82	cl1 kw	7-14-01 07-14-00	Burdett 11	Sawmill Creek	SL		GPS = N42°25'19.3, w076°51'25.6	x		x	x	x	x	x
17		88	cl1 kw	7-17-00 07-17-00	Burdett 17	Glen Eldridge Hollow, Sam's property	SL	FID		x		x	x	x	x	x
18		89	cl1 kw	7-17-00 07-17-00	Burdett 17	Glen Eldridge Hollow, Sam's property	SL			x		x	x	x	x	x
32		93	kw	07-24-00	Burdett 11	Saw Mill @ Logan Rd	SL			x		x	x	x	x	x
33		132	cl1	7-24-00	Burdett 11	Saw Mill @ Logan Rd	SL		need to go back for M/A relationships	x		x	x	x	x	x
	71	~25	rdj	10/19/2004	Burdett 11	butler's bedbrkfst	OD			x		x	x	x	x	x
	72	~25	rdj	10/20/2004	Burdett 14	Haber's cellar	Strat.			Strat.		Strat.	Strat.	Strat.	Strat.	Strat.
	73a	148	kw	10-19-00	Burdett 14	Haber's	OD			x		x	x	x	x	x
	73a	~25	RDJ2	10/20/2004	Burdett 14	Haber's	Notes			none		none	none	none	none	none
	73b	149	kw	10-19-00	Burdett 14	Haber's	OD			x		x	x	x	x	x
	73b	~25	RDJ2	10/20/2004	Burdett 14	Haber's	Notes			none		none	none	none	none	none
	73	150	kw	10-19-00	Burdett 14	Haber's	OD			x		x	x	x	x	x
	74a&B	~25	RDJ2	10/20/2004	Burdett 14	Smith's	Strat.			none		none	none	none	none	none
	74b	150	kw	10-19-00	Burdett ?	Nipantuck	OD			x		x	x	x	x	x
	74a	151	kw	10-19-00	Burdett 14	Nipantuck	OD			x		x	x	x	x	x
19A		94	cl1	7-17-00	Reading Cent.	Bullhorn Creek	SL			x		x	x	x	x	x
19		65	kw	07-18-00	Reading Cent.	Bullhorn Creek	SL			x		x	x	x	x	x
20		97	cl1 kw	7-18-00 07-18-00	Reading Cent.	Bullhorn Crk.	SL			x		x	x	x	x	x
	75	~30	RDJ2	10/21/2004	Reading Cent.	Sunset Shores	Strat. OD			none		none	none	none	none	none
	75	153	kw	10-19-00	Reading Cent.		OD			x		x	x	x	x	x
	76	~30	RDJ2	10/21/2004	Reading Cent.	Bullhorn Cr.	Notes			none		none	none	none	none	none
	76	154	kw	10-19-00	Reading Cent.		OD			x		x	x	x	x	x
	77	~35	RDJ2	10/21/2004	Reading Cent.	Bullhorn Cr	Strat.			none		none	none	none	none	none
	78	155	kw	10-20-00	Dundee D9	Camp Meeting House	OD			x		x	x	x	x	x
8		44	cl1 kw	7-12-00	Dundee D9	San Falz Hotel	SL			x		x	x	x	x	x
9		36	kw	07-12-00	Dundee D9	Vallos	SL			x		x	x	x	x	x
		45	cl1	7-12-00	Dundee D9		SL			x		x	x	x	x	x
		38	kw	07-12-00	Dundee D9		SL			x		x	x	x	x	x
10 a&B		50	cl1	7-12-00	Dundee D9	Vallos	SL			x		x	x	x	x	x
		40	kw	07-12-00	Dundee D9		SL			x		x	x	x	x	x
12		62	cl1 kw	7-13-00 07-13-00	Dundee D9	Camping Meeting House, Ellison House	OD			x		x	x	x	x	x

450			104	4	09/30/2005	Burdett 14	sos 448	QD				x		NA		x	x	x
451			104	4	09/30/2005	Burdett 14	sos 448	QD				x		NA		x	x	x
452			106	4	10/07/2005	Burdett 14	sos 448	QD				x		NA		x	x	x
452a			107	4	10/07/2005	Burdett 11	Sawmill Crk S Brch	QD				x		NA		x	x	x
453			108	4	10/07/2005	Burdett 11	sos 452	QD				x		NA		x	x	x
454			109	4	10/07/2005	lodi e4	lametlux landing	QD				x		NA		x	x	x
455			111	4	10/07/2005	lodi e4	lametlux landing	QD				x		NA		x	x	x
456			112	4	10/07/2005	lodi e4	lametlux landing	QD				x		NA		x	x	x
Karen's Data																		
203					07/08/2005	lodi	Breaknek	?				x		x ask karen				x
204					07/06/2005	lodi	Breaknek	?				x		x		x	?	?
01-2					07/07/2005	lodi	Breaknek	?				x		x		x	?	?
101					07/07/2005	lodi	Breaknek	?				x		x		x	x	?
200					07/07/2005	lodi	Breaknek	?				x		x		x	x	?
104					07/07/2005	lodi	Breaknek	?				x		x		x	x	?
201					07/07/2005	lodi	Breaknek	?				x		x		x	x	x
202					07/07/2005	lodi	Breaknek	?				x		x		x	x	x
RDJ's Data																		
01-1			29	rd 3	07/08/2005	lodi e7	Rd E. of Chny Line	QD				x		NA		NA		?
01-3			31	rd 3		lodi e7	Breakneck	QD				x		NA		x		?
		on map as																
103		102	33	rd 3	07/07/2005	lodi e7	Breakneck	QD				x		NA		notes	x	x(102 ON MAP)
100			36	rd 3	07/07/2005	lodi	Breakneck	notes				?		notes		x	notes	x
01-5			36	rd 3	07/07/2005	lodi	Breakneck	QD				x		NA		x	x	x
01-6			38	rd 3	07/07/2005	lodi	Breakneck	QD				x		NA		x	x	x
01-7			40	rd 3	07/07/2005	lodi	Breakneck	QD				x		NA		x	x	x
01-8			41	rd 3	07/07/2005	lodi	Breakneck	QD				x		NA		x	x	x
01-9			47	rd 3	07/08/2005	lodi	Breakneck	QD				x		NA		x	x	?
		28	119	rd 3	08/10/2005	lodi	Siu's Creek	QD				x		NA		x	x	?
01-28		200A	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		200B	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		201A	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		201B	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		202	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		203	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x
		204	RDJ		11/13/2005	lodi	Cnty rd 137	QD				x				x	x	x

Appendix 4

Seneca Lake Field Season 2001 Data

Date-Site # Intersect (m) Strike Dip Dip Dir Height (m) Length (m) M/A T/B abut Sed. Char. Comments Frac. Char. Group

2001 Field Campaign

8-9-01-192														
Set A														
Stu's Crk QD	1			329	90							Interbedded ss & sh, ss<=.05m		pl AH, CL
	2	0.58	330	90										
	3	1.84	331	90										
Set B														
													sos a	
1	only one	75	80		n	.03+	1+						* determine b/c there is only one so probably A	pl
Set C														
1			88		s	.8+	1.5+					Sand		pl
2	1.46	90	?											
Set C'														
1	0.12	85	90			.03+	2+					Shale		pl jagged
2	0.21	80	60		s									
3	0.31	87	87		s									
4	0.15													
5	0.15													
6	0.17													
Set D'														
1		0-10	90			.05+	2+					SOS A		pl-cl

8-9-01-193														
Set a														
Stu's Crk QD	1	0.47	355	90									upstream a 10° A(330°)	pl
	2	1.08	0	85	w									
Set b														
1														
2	0.76	90	90											pl-cl
3	0.1	88	90											
4	0.2													

8-16-2001-410														
Set A														
Crk s. of cnty 1	1		0	90		.10+	10+						pl	
	Set B													
QD	longer than b'													
	1	0.6	332	90										
2	0.43	328	?											

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
	3	1.31	329	?									
	Set b'												
	1	0.09	329	90		0	0.3	I&A(A)					
	2	0.07	330	90									
	3	0.11											
		0.05											
9-28-01-436		0.08											
	Set A												
	1	0.16	90	84	s	.3+	3.0+	M(B)		Interbedded ss, sh		CL	MC, CL
	2	0.14	86	90									
	3	0.38	85	90									
	4	0.47	87	90									
9-28-01-437	5	0.45											
	Set B												
	1		14	70	nw	.04+	0.45	A(A)			xjnt	CL	
	Set A w/in FID												
	1	0.14	337	87	e	3+	10+	I(65°)		blk sh and sand, ss.=.23m		pl	
	2	0.2	335	87	e								
Glenora owner's QD	3	0.15	334	90									
	4	0.26											
	outside domain												
	Set A'												
	1	1.5	sos										
	2	1.6											
335FID	3	1.9											
	Set A												
	1	0.33	335	90		.15+	1.5+	I(b)		.10m sand		pl	MC, CL
	2	0.27	332	90									
	3	0.14	333	87	w								
		0.16											
9-28-01-438		1.3											
	Set B												
	1		10	90		.75+	7+	I(A)				pl	
	Set A												
	1	0.24	327	85	sw	0.07	1.5+	I(B,C)		shale		pl	mc, cl
	2	0.21	318	90									
9-28-01-439	3	0.28	325	85	sw								
		0.34											
		0.28											
	Set A												
	1	0.24	327	85	sw	0.07	1.5+	I(B,C)		shale		pl	mc, cl
	2	0.21	318	90									
Hazlit rd QD	3	0.28	325	85	sw								
		0.34											
		0.28											
	Set A												
	1	0.24	327	85	sw	0.07	1.5+	I(B,C)		shale		pl	mc, cl
	2	0.21	318	90									

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
	4	0.58	85	75	n								
	5	0.49											
	6	0.57											
	Set B												
	1	0.79	330	90		0.15	3+	I(A)		.15m Sand		pl	
	2	0.56	334	90									
	3	0.62	334	87	e								

9-28-01-444 Set A													
Rte 5 N. of Burdett QD	1	0.72	87	80	s	.5+	8+	A(B)		Siltstone		pl	MC, CL
	2	0.49	84	90									
	3	0.42	84	89	n								
	4	0.45	85	90									
Set B													
	1	3.5	331	90		.5+	3+	M(a)				pl	
	2	3.5	335	87	e								
	3	2.4	334	88	e								

9-28-01-445 Set A													
rd just n of rte 5 QD	1		4	90						INie3medded ss&sh, ss, = .10m		pl	
	Set B												
	1		90	?		0.1	0.5						
	2	1.4	87	90									
Set C													
	1	3.5	1	84	e	1+	2+	M(D)				pl	
	2	1.7	358	90								cl	
	3		350	90								cl	
Set D													
	1	0.21	331	90		.15+	2+	A@				pl	
	2	0.1	332	90									
	3	0.07	335	89									
	4	0.41											

9-29-01-446 Set A													
Just N. of Haber's QD	1		332	86 w	1+	3+				Shale		pl	CL
	2	3	0	90									
	3	1.75	15	90									
9-29-01-447 Set A													

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
Yellow house near Haber's QD	1	1.5	5	90		.2+	1+	M(B)		Sandy Sh		pl	CL
	2	0.75	0	90									
	3	0.67	3	87	e								
	4	0.97											
Set B													
	1		81	?		0.07	0.3	A(A)				cl	
	2	0.76	83	var									
	3	0.32	sos										

9-29-01-448 Set A													
Creek 1/2 way b/t Shumway and Covert	1	1.75	0	?		1+	8+	NA		SHALE		pl-cl	MC, CL
	2	0.44	3	sos 1									
	3	0.2	359	90									
	4		5	90									

9-29-01-449 NOTES													
sos 448 QD													

9-29-01-450 SET A													
sos 448 QD	1	3.88	334	90		2	8	NA					
	2	3.05	332	90									
	3	3.32	335	90									
	4	1.4	334	90									
	5	0.4											

9-29-01-451 soso 448	Set A	1.1	335	6+	10+								
		1.95											
		1.6											
Set B													

9-29-01-452 sos 448 QD	Set A												
	1	0.22	335	87	s	5+	3+	?				pl	
	2	0.14	325	90									
	3	0.21	330	89	n								
	4	0.35											
	5	0.4											
Set A													
	1	0.7	310	90		.15+	1+	?				cl-pl	
	2	0.63	305	90									
	3	0.51	307	90									

9-29-01-452A SETA													
-------------------	--	--	--	--	--	--	--	--	--	--	--	--	--

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
SawMill Creek off rte 2 east of fork QD	1		279	76	n	.45+	7+			shale		pl	
	2	0.46	273	?									
	3	0.52	274	83	n								
2-29-01-453													
Set A													
Saw Mill Creek QD	1	1.02	82	76	s	0.26	8+	I(NS)		ss=.26		pl	
	2	0.58	86	34	s								
	3	0.36	90	90									
	4	0.54											
	5	0.75											
Set B													
	1		10	90		4	7+	I(A)				pl-cl	
	2	6	10	sos									
	3	3	355	?									
9-30-01-454													
Set A													
Lam. Landing QD	1		332	90		.3+	8+	I(C), FM(b) w/.04 rl offset				pl	MC, CL
	Set B												
	1	0.23	355	90				I(C), A(A)					
	2	1.25	10	?									
	3	0.41	7	90									
	Set C												
	1	0.49	78	90				A&I(A), I(B)					
	2	0.16	75	90									
	3	0.3	77	90									
	4	0.07											
	5	0.02											
	6	0.06											
	7	0.09											
	8	0.25											
9-30-01-455													
Set A													
Lam Landing QD	1	1	332	90		.75+	10+	I(B)		SHALE, tuffa covered		pl	MC, CL
	2	0.46	331	89	e								
	3	1.9	330	90									
	4	0.71											
Set B													
	1	0.45	77	89	s	.4+	7+	I(A)				pl	
	2	1.2	76	83	s								
	3	0.3	75	86	n								
		0.15											
		0.01											

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
		0.07											
		0.05											
		0.11											
		0.29											
9-30-01-456 Lam. Landing QD	Set A	0.23	330	90									
		0.17											
		0.12											
		0.09											
		0.04											
	Set B	0.26	75	90									
		0.05											
		0.06											
		1											
Site No. 7-7-01-203 Seneca County Line Rd. Tom's punchbowl @ Breakneck Ck.	1		0					M				P	kw,rm
	2	13cm	0					M				P	kw,rm
	3	54cm	0					AB #11				C	kw,rm
	4	87cm	340					AB #11				P	kw,rm
	5	143cm	349					AB #11				P	kw,rm
	6	175cm	0					AB #11				C-P	kw,rm
	7	134cm	0									P	kw,rm
	8		66					TWIST-HKLS				P	kw,rm
	9	74cm	71									P	kw,rm
	10	57cm	73									P	kw,rm
	11	8cm	71									P	kw,rm
	12		90					AB #3		SS soft-sed def.			kw,rm
	13	11,13=108	71										kw,rm
	14		96									P	kw,rm
	15	117cm, #13	71									P	kw,rm
	16	72cm	71									P	kw,rm
	17	123cm	70									P	kw,rm
	18		90									P	kw,rm
	19		72									P	kw,rm
	20	31cm	72										kw,rm
	21	12cm	74							All of these are limited to			kw,rm
	22	28cm	68									P	kw,rm

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char. shale below the SS w/ soft sed. Deformation. "non-master"	Comments	Frac. Char.	Group
	23	67cm	68									P	kw,rm
	24	28cm	72										kw,rm
													kw,rm
	1		94					curves into 5					kw,rm
	2	39cm	92					curves into 5					kw,rm
	3	45cm	96					curves into 7					kw,rm
	4	104cm	92					curves into 7					kw,rm
	5		64									C	kw,rm
	6	8cm	64									P	kw,rm
	7	4.5cm	60									P	kw,rm

7-7-01-204 Cat's Elbow QD	1	.15 (1&7)	102										
	2		72										
	3		70										
	4	1.36 (1&4)	100					A(5)					
	5		212										
	6		10					a(1)					
	7	.15(1&7)	104					m(6)					
	8		80					m(10-12)					
		.63											
	9	(9&10)	23					a(7)					
	10	1.80 (?)	7					a(8)					
	11		350					a(8)					
	12		356										
	18		90										
	19		104										
		.20 (19- 21)	0										
	20												
	21		100										
	22		67										
	22a		215										
	23	.15(21,23)	104										

RDJ'S DATA

7-05-01-01 Rd E. of Cnty Line QD			340	83	w					IT <=1"			rdj
			339	82	w								cl
			339	82	w								kw
Field Indoctrination			330	82	w								rm
			330	80	w								mm
			340										

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
7-5-01-3 Breakneck QD	Set A												
	1		337.5	85	w	12	1+			.26m sandy unit		pl	mm.rdj
	2	1.59	337	89	w	13.5+	.26+						
	3	1.08	335	88	w	3+	.24+						
	4	1.89	337	87	w	8+	1+						
	5	0.92	336	89	w	7.5+	.26+						
	6	1.12	337	88	w	7+	.5+						
	Set B												
	1		349	90		2+	35+						
	2	1.07	350	89	e	2+	35+						clws twists
	Set C												
		1.22	300					A(B), curving parallel					
		0.96											
		0.99											
		1.08											
7-6-01-103 Lodi E7 QD	Set A												
	1		64	89	SE	6+	6+	M(B)				pl	rdj.cl
	2	7.05	67	90		2+	7+	M(B)			* w/ hook	pl*	
	3	8	78	?		.3+	2+	M(B)				poorly exposed	
	Set B												
	1		355	84	w	0.3	0.4	A(A)				cl	
	2	1.66	342	?		0.3	2.5					pl	
	3	1.78	342			0.3	2.5					cl	
	4	1.22	345	80	w	0.3	5					pl	
7-6-01-5 Breakneck QD	Set A												
	1		332	88	E		6+	M(B)		ss		pl	
	2	2.35	329	90		0.5+	sos					pl	
	3	3.91	333	90		.2+	sos					pl	
	Set B												
	1		70	?		0.27	3.98	A(A)				Sigmoid	
	2	1.45	85	?		0.27	4.18						
	3	2.2	82	?		0.63	?						
	4		80	84	s								
7-6-01-6 Breakneck upstream from rr QD	Set A												
	1		339	85	e	.5+	6+	I(B)				pl	
	2	2.1	338	90		.75+	7+					pl	
	3	4.39	338	90								wiggly	
	4	4.33	340	-									
	Set B												

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
	1		69	87	s	0.23	18+						
	2	0.7	70	88	s								
	3	1.83	68	90									
	4	0.86	68	88	n								
	5	0.86	69	88	n								
7-06-01-7 Breakneck	Set A		338	88	e	2.5+	5+	M					rdj,kw
	Set B		85									cl	
	Set C	1.5 1.3 1.2	350					A(B)				cl	
7-06-01-8 Breakneck	Set A												
	1	6+	338	85	e	0.8		A(b)		ss		pl	rdj
	2	0.8	333	87	e	2+							
	3	0.94	335	88	e	4+	7+						
	Set A'												
	1	0.29	SOS A							sh			
	2	0.48											
	3	0.4											
	4	0.32											
	5	0.13											
	6	0.33											
	7	0.04											
	8	0.05											
	9	0.04											
	10	0.02											
	Set B												
	1		350	89	w	2+	8+	M(A)				pl	
	2		3			.03+	2+	M(305°)					
	3		355	88	e	6+	8+						
	4		1	90									
	5		2	87	w			M(95°)					
	6		0			6+		l(70)					
	7		2			6+							
	8		1			6+							
	9		5	86	w	6+							
	10		0										
	11		3										
	Set C												
	1	0.49	73	85	s	0.77				sh			
	2	0.37	72	85	s	0.77	6+						
	3	0.75	73	86	s								
	4	1.22	76										
	5	0.75	77	86	s								

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
	6	0.6											
	7	0.79											
	Set D												
	1		275										
	2	2.2	278										

7-7-01-9													
Breakneck													
QD													
	Set A												
	1		71	88	n	1.5+	9+	M		IS		pl	rdj.cl
	2	2.84	67	90									
	3		70	88	s								
	4	2.15	73	87	s								
	5	1.12	73	90									
	6	0.07	73	?									
	7	1.13	79	80	n								
	8		89										
	Set B												
	1		328	90		.6+	6+	A(A1)					
	2	4.33	330	88	e	.85+	6+	A(A1)*			*curv. Perp to A1		
	3	4.52	325	90									
	Set C												
	1		85	75	n			A(B)		ss=.025m			
	2	0.74	88	82	n			Later than B, cur. Perp. W/B,					
	Set C'												
	1	0.135	81	?								pl	
	2	0.13	82	?									
	3	0.175	80	86	n								
	Set C'												
	1												
	2												
	3												

8-9-01-28													
Stu's Creek													
QD													
	Set A												
	1		90	84	n	1+	6+	A(b)		sh		pl-wavey	
	2	1.2	88	88	n								
	3	0.84	87	88	s								
	1		82	90									
			75	90				A(a3)					
	Set B												
	1	12	334	90		1+	7					pl	
	Set C												
	1		5	90				A(B1)					
	7-7-01-203												
	1	13cm	0					M				P	kw

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B Abut	Sed. Char.	Comments	Frac. Char.	Group
Seneca County/ Line Rd. Tom's punchbowl @ Breakneck Ck.	2	54cm	0					M				P	kw
	3	87cm	0					AB #11				C	kw
	4	143cm	340					AB #11				P	kw
	5	175cm	349					AB #11				P	kw
	6	134cm	0					AB #11				C-P	kw
	7		0									P	kw
	8	74cm	66					TWIST-HKLS		SS soft-sed def.		P	kw
	9	57cm	71									P	kw
	10	8cm	73									P	kw
	11		71									P	kw
	12	11,13-108	90					AB #3					kw
	13		71										kw
	14	117cm, #13	96									P	kw
	15	72cm	71									P	kw
	16	123cm	71									P	kw
	17		70									P	kw
	18		90							All of these are limited to		P	kw
	19	31cm	72							shale below the SS w/		P	kw
	20	12cm	72							soft sed Deformation.			kw
	21	28cm	74							"non-master"			kw
	22	67cm	68									P	kw
	23	28cm	68									P	kw
	24		72										kw
	1	39cm	94					curves into 5					
	2	45cm	92					curves into 5					kw
	3	104cm	96					curves into 7					kw
	4		92					curves into 7					kw
	5	8cm	64									C	kw
	6	4.5cm	64									P	kw
	7		60									P	kw
7-5-01-2 Lodi quad; Seneca County/ Line Rd.	1	6.05m	350					"335's"=M to 75's		interbd SS,SH		C	kw
	2	4.95m	332										kw
	3	3.25m	355										kw

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
	4	1.07m	353										kw
	5	2.32m	0										kw
	6	1.49m	359										kw
	7	1.71m	355										kw
	8	1.75m	350										kw
	9		340										kw
7-6-01-101 Breakneck Ck.@4155 County Rd. (Lodi)	1		66	90								P	kw
	2		337	64E				I(A)				P	kw
	3	7.5CM	338	68E				I(A)				P	kw
	4	200CM	239	73E				I(A)				P	kw
	5	567CM	341	84W				I(A)				P	kw
	6	84CM	342	NA				I(A)				P	kw
	7		329	NA				AB, A				C	kw
	8	250CM	348	NA								C	kw
	9	68CM	337	NA								C	kw
	10	141CM	337	89W								C	kw
7-6-01-200	1		80					AB 345			As we continued east, we measured numerous 340's	P	kw
	2	210cm	80					AB 345				P	kw
	3	131cm	84					M TO "Q", AB 345				P	kw
	4											P	kw
7-6-01-104	1	240cm	85								Many more to the east		kw
	2	40cm	84										kw
	3	70cm	84										kw
	4		85										kw
Site No. 7-6-01-201 Lodi quad; Seneca County Line Rd.	1	120cm	105					1 curves into 2				C	kw
	2	38cm	108									C	kw
	3	74cm	109					c parallel to 2				C-P	kw
	4	17cm	105					AB #6				C	kw
	5		109					AB #6				C	kw
	6	70cm	328					M 105's				twist-hkls	kw

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
	7	70cm	106.5					AB #6					kw
	8	55cm	106									C	kw
	9	43cm	112					AB #11				C	kw
	10		96					AB #11				C	kw
	11	44cm	331					M 96				twist-hkls	kw
	12	103cm	108					AB #11				C	kw
	13	340cm	94					AB #11				C	kw
	14		108					FALLS				C	kw
	15	13cm	328					M				P	kw
	16	11cm	327					M				P	kw
	17	13cm	324					M				P	kw
	18	180cm	324					M				P	kw
	19	5cm	330					M				P	kw
	20	16cm	328					M				P	kw
	21	22cm	330					M				P	kw
	22	8cm	328					M				P	kw
	23	130cm	330					M				P	kw
	24	520cm	328					M				P	kw
	25		334					M				P	kw
	26	220cm	90					X 330's				C	kw
	27	43cm	82									C	kw
	28		82					330's are M to this				C	kw
	29	96cm	104					AB 334				C	kw
	30		104					curves into 334				C	kw

7-6-01-202	1		335	74w				M	350+			P	kw
	2	410cm	328					M	350+			P	kw

Data RDJ
collected after
GSA -2001

11-12-01-200A	Set A												
Crty Rd137 QD	1	0.42	330										
	2	0.69	332					looks like master					
	3	0.5	330										
		1											
	Set B												
	1	0.34	287				1						
	2		88										
			92										
11-12-01-200B	Set A												

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/ B about	Sed. Char.	Comments	Frac. Char.	Group
Cnty Rd137 QD	1	0.25	87					M		IS sand = 4-5 cm th			RDJ
	2	0.26											
	3	0.3											
11-12-01-201A Set A													
Cnty Rd137 QD	1		24					M(B)				pl	RDJ
	2	0.19	28										
Set B													
	1	0.56	86					A(A) curving perp.				pl	
	2	0.63	88					M(C)					
Set C													
	1		346					A(B)				pl	
11-12-01-201B Set A													
Cnty Rd137 QD	1	0.64	84					A					RDJ
	2	0.4	87										
	3	0.51	79										
	4	0.68	87										
Set B													
	1		334										
11-12-01-202 Set A													
Cnty Rd137 QD	Set A	0.6	331					l(b)					
		0.8						M(c)					
		0.12											
		1.12											
Set B													
			39					l(A)					
Set C													
		0.37	64										
			55										
11-12-01-203 Set A													
Cnty Rd137 QD	1		2					M(b)		4" ss			
	2	1.16	8										
w. side of rd Set B													
			278					A(A)					
11-12-01-204 Set A													
Cnty Rd137 QD	Set A		335					A(B) Curving parallel					
Set B													
		0.34	84					M(A)					
		1.19											
		0.59											
		0.22											
		0.04											

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
		0.05											

7-6-01-100 Breakneck Crk SL	1	0.725	63	88	n	.04+	.13+	m(350°)*		blk sh	*350o is a x-jnt	pl	mm,cl
	2	2.57	66	89	n	sos(1)	sos(1)	m(350°)*			*sos(1)	pl	mm,cl
	3	2.91	352	?		.05+	2.5	A(2.5)M(4)			x-jnt	pl	mm,cl
	4	5.27	64	66	s	.02+	1.5	A(3)				cl	mm,cl
	5	6.13	66	89	s	.09+	sos(1)	M(3)I(6)				pl	mm,cl
	6	6.13	0	?		.04+	5	I(5)				cl	mm,cl
	7	9.2	335	?		?	2	A(9)I(8)				pl	mm,cl
	8	9.79	60	90		.05+	4+	I(7.9)A(10)				pl	mm,cl
	9	10.11	355	?		.08+	6+	I(8)m(9)A(5)			curving parallel to 10	pl-cl	mm,cl
	10	12.29	330	?		.03+*	6+*	M(8)I(5.11)			*composite	pl	mm,cl
	11	13.36	67	?		sos(1)	sos(1)	I(10.9)M(12)				pl	mm,cl
	12	13.83	354	?		?	3+	A(11)			curves parallel to 350° offline	pl	mm,cl
	13	14.63	90	?		?	0.9	A(14,12)			possible x-jnt	cl	mm,cl
	14	15.49	350	86	e	?	7	M(13,15)I(11)				pl	mm,cl
	15	16.44	75	?		?	0.9	A(14,350°)			possible x-jnt	cl	mm,cl

7-6-01-104 Breakneck crk QD													
Set A													
1		331	89	e				m		interbedded ss & sh			mm,cl
2	4.1	333	?										
3	3.65	335	?										
4	5	335	?										
5	2.8	334	?										
6	0.85	333	?										
7	2.2	334	?								clws twists		
Set B													
1		83	?					a		sos			
2	2	80	?										
3	0.84	78	?										
4	2.2	81	?										
5	0.69	83	?										
6	1.46	79	?										
7	1.41	85	?										
8	2.6	81	?										

7-6-01-105 Break Neck Creek E. of RR tunnel Fault													
set a ns fld													
1		350	90			0.45	6+	M					MM, CL
2	0.51	340	?	?		0.35	6+						MM, CL
3	0.28	339	?	?		SOS	SOS						MM, CL
4	0.18	344	?	?		SOS	SOS						MM, CL
5	0.22	350	?	?		SOS	SOS						MM, CL

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B abut	Sed. Char.	Comments	Frac. Char.	Group
	6	0.17	340	?	?	SOS	SOS						MM, CL
	7	0.33	342	?	?	SOS	SOS						MM, CL
	8	0.14	345	?	?	SOS	SOS						MM, CL
	9	0.36	347	?	?	SOS	SOS						MM, CL
	10	0.18	345	?	?	SOS	SOS						MM, CL
	setb												
	1	0.08	15			0.3	<2m	A					MM, CL
	2	0.08	14										MM, CL
	3	0.15	16										MM, CL
	4	0.06	12										MM, CL
	5	0.07											MM, CL
	6	0.05											MM, CL
	7	0.03											MM, CL
	8	0.07											MM, CL
	9	0.075											MM, CL
	10	0.07											MM, CL
	11	0.035											MM, CL
	12	0.14											MM, CL
	13	0.1											MM, CL

7-6-01-106 Breachneck Creek	1	0.18	333					M&I(65°)					MM, CL
	2	0.2	333										
fid =5.78m wide QD	3	0.19	337										
	4	0.12	337										
	5	0.05											
	6	0.09											
	7	0.12											
	8	0.2											
	9	0.09											
	10	0.1											

7-6-01-107	Set A												
Breachneck Creek	1	1.69	325					MA		Interbedded ss & sh, SS= .07,.06,.08		pl	MM, CL
qd	2	1.64	335					Mostly M but some A so MA					
	3	2.45	335										
	4	0.38	330										
	5	1	335										
	6		332										
	Set b												
	1	0.88	85					MA				CL	
	2	0.45	85					MA					

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B Abut	Sed. Char.	Comments	Frac. Char.	Group
	3	0.35											
	4	0.62											
	5	0.25											
	6	1.4											
	7	0.25											

Set A 7-7-01-108 330's													
Breakneck Crk qd	1		334				10+	M* (85's)			*control creek direction	pl	
	2	3.21	336										
	3	5											
	4	1.39											
	5	1.19											
	6	0.65											
	7	0.57											
	8	0.54											
	9	3.2											
	10	0.7											
	11	2.2											
	12	3.4											
	13	0.55											
Set B 85's													
	1		83				variable length	A(65's)				cl	
	2	0.89	80										
	3	1.04	89										
	4	0.4	89										
Set C 65's													
	1		63					M(85's)					
	2	1.23	60										

7-7-01-109 Set A 355													
Breakneck Crk QD 355 FID	1		350	90			4+						mm.cl
	2	0.06											
	3	0.08											
	4	0.04											
	5	0.05											
	6	0.035											
	7	0.02											
	8	0.04											
	9	0.03											
	10	0.02											

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B Abut	Sed. Char.	Comments	Frac. Char.	Group
	11	0.01											
	12	0.06											
	13	0.01											
	14	0.06											
	15	0.01											
	16	0.01											
	17	0.05											
	18	0.04											
	dist. to next FID = 2.4m												
	Set A' 2nd FID												
	19	0.08	353										
	20	0.08											
	21	0.015											
	22	0.01											
	23	0.05											
	24	0.3											
	25	0.05											
	26	0.05											
Set B 65's													
	1		65			.4+	8+	A(A set)					
	2	3.6											
	3	0.3											
	4	2											
Set B' b/t FID's													
											65's located b/t the two FID's are more tightly spaced and some are calcite filled		
		0.7											
		0.3											
		0.5											
		0.04											
		0.05											
7-7-01-110 Breakneck Crk near 414 QD													
	Set a	.6m*	330					m					MM, CL
7-7-01-111 Set A													
	Set b	2-4m*	20-Oct					a					

Date-Site	#	Intersect (m)	Strike	Dip	Dip Dir	Height (m)	Length (m)	M/A	T/B about	Sed. Char.	Comments	Frac. Char.	Group
N.Branch Breakneck Crk Cat Elbow QD	1		75					I(B)*		Int. Bedded SS&SH	*In a strange way drawn on pg 35	pl	MM,CL
	2	0.55	70										
	3	0.32											
	4	0.76											
	5	0.23											
	6	2.27											
	7	0.17											
	8	0.12											
	9	1.16											
	10	0.28											
	11	1.13											
	12	0.69											
	13	0.85	72								cntrlcls twists		
	14	1.21	70										
Set B													
	1	only one	350			3+	6+	I(A)*			SOS(A)	cl	