2005 ANNUAL REPORT
TO THE
UTAH DIVISION OF OIL, GAS AND MINING

DUGOUT CANYON MINE
C/007/039

Canyon Fuel Company, LLC
P.O. Box 1029
Wellington, UT 84542

File in:
❑ Confidential
❑ Shelf
☒ Expandable
Refer to Record No 0017 Date 03062006
In C/0070039, Incoming

*To enter text, click in the box and type your response. If a box already contains an entry select the entry and type the replacement. You can use the **tab** key to move from one field to the next. To select a check box, click in the box or type an x.*

GENERAL INFORMATION

Permitte Name	CANYON FUEL COMPANY, LLC
Mine Name	DUGOUT CANYON MINE
Operator Name (If other then permittee)	
Permit Expiration Date	MARCH 16, 2008
Permit Number	C/007/039
Authorized Representative Title	ERWIN SASS, GENERAL MANAGER
Phone Number	(435) 637-6360
Fax Number	(435) 636-2897
E-mail Address	esass@archcoal.com
Mailing Address	PO Box 1029, Wellington, Utah 84542
Designated Representative	
Resident Agent	C.T. Corporation Systems
Resident Agent Mailing Address	50 West Broadway, Salt Lake City, Utah 84104
Number of Binders Submitted	(1) Binder, Two Copies

IDENTIFICATION OF OTHER PERMITS

Identify other permits that are required in conjunction with mining and reclamation activities.

Permit Type	ID Number	Description	Expiration Date
MSHA Mine ID(s)	42-01890	Rock Canyon Seam	N/A
	42-01888	Gilson Seam	N/A
MSHA Impoundment(s)	N/A		
NPDES/UPDES Permit(s)	UT0025593	UPDES Discharge Permit and Storm Water Discharge Permit	Nov. 30, 2009
PSD Permit(s) (Air)	DAQE-001-1999	Air Quality Permit	N/A

Other

MSHA Mine ID(s)	1211-UT-09-01890-01	Refuse Pile	N/A

CERTIFIED REPORTS

List the certified inspection reports as required by the rules and udder the approved plan that must be periodically submitted t the Division. Specify whether the information is included as Appendix A to this report or currently on file with the Division.

Certified Reports:	Required		Included or on file with DOGM		Comments
	Yes	No	Included	On File	
Excess Spoil Piles	☐	X	☐	☐	
Refuse Piles	X	☐	X	☐	
Impoundments	X	☐	X	☐	
Other					
	☐	☐	☐	☐	
	☐	☐	☐	☐	

REPORTING OF OTHER TECHNICAL DATA

List other technical data and information as required under the approved plan, which must be periodically submitted to the Division. Specify whether the information is included as Appendix B to this report or currently on file with the Division.

Technical Data:	Required		Included or on file with DOGM		Comments
	Yes	No	Included	On file	
Climatological	☐	X	☐	☐	
Subsidence Monitoring	X	☐	X	☐	
Vegetation Monitoring	☐	X	☐	☐	
Raptor Survey	X	☐	X	☐	
Soils Monitoring	☐	X	☐	☐	
Water Monitoring	☐	☐	☐	☐	
First quarter	X	☐	☐	X	
Second quarter	X	☐	☐	X	
Third quarter	X	☐	☐	X	
Fourth quarter	X	☐	☐	X	
Geological / Geophysical	☐	X	☐	☐	
Engineering	☐	X	☐	☐	
Non Coal Waste / Abandoned Underground Equipment*	☐	X	☐	☐	
Other Data					
Geomorphology	X	☐	X	☐	
SNOTEL Report	X	☐	X	☐	
	☐	☐	☐	☐	
	☐	☐	☐	☐	

*Reminder: If equipment has been abandoned during 2005, an amendment must be submitted that includes a map showing its location, a description of what was abandoned, whether there were any hazardous or toxic materials and any revision to the PHC as necessary.

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

Change in administration or corporate structure can often bring about necessary changes to information found in the mining and reclamation plan. The Division is Requesting that each permittee review and update the legal, financial, compliance and related information in the plan as part of the annual report. Please provide the Department of Commerce, Annual Report of Officers, or other equivalent information as necessary to ensure that the information provided in the plan is current. Provide any other change as necessary regarding land ownership, lease acquisitions, legal results from appeals of violations, or other changes as necessary to update information required in the mining and reclamation plan. Include certified financial statements, audits or worksheets, which may be required to meet bonding requirements. Specify whether the information is currently on file with the Division or included as Appendix C to the report.

Legal / Financial Update	**Required**		**Included or on File with DOGM**		**Comments**
	Yes	No	Included	On file	
Department of Commerce, Annual Report Officers	☐	X	☐	☐	
Other					
Officers & Directors	X	☐	☐	X	General Chapter 1
	☐	☐	☐	☐	
	☐	☐	☐	☐	

MINE MAPS

Copies of mine maps, current and up-to-date through at least December 31, 2005, are to be provided to the Division as Appendix D to this report in accordance with the requirements of R 645-301-525.240. These map copies shall be made in accordance with 30 CFR 75.1200 as required by MSHA. Upon request, the Division shall keep mine maps confidential. Please provide a CD.

Map Number(s)	**Map Title/ Description**	**Confidential** Yes	No
	2006 Budget Map	☐	X
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

OTHER INFORMATION

Please provide any comments of further information to be included as part of the Annual Report. Any other attachments are to be provided as Appendix E to this report. If information is submitted as a group rather then by individual mine, please identify each of the mine's data in the list below.

Additional attachment to this report? **Yes** ☐ **No** ☐

APPENDIX A

Certified Reports

Excess Spoil Piles
Refuse Piles
Impoundments

As required under R645-301-514

CONTENTS

CERTIFIED IMPOUNDMENT REPORTS
CERTIFIED REFUSE PILE REPORT

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			Page 1 of 2
Permit Number	*ACT/007/039*	**Report Date**	*02/13/06*
Mine Name	*Dugout Canyon Mine*		
Company Name	*Canyon Fuel Company, LLC*		
Impoundment Identification	**Impoundment Name**	*Surface Facility Sedimentation Pond*	
	Impoundment Number	*None*	
	UPDES Permit Number	*UT0025593*	
	MSHA ID Number	*Impoundment –None (Mine - 42-01890)*	

IMPOUNDMENT INSPECTION

Inspection Date	*12/27/05*
Inspected By	*Dave Spillman*
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	*Routine Quarterly Inspection and Annual Certification*

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

There were no signs of instability, structural weakness or other hazardous conditions observed during this inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.	**2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.** *Sediment Storage Capacity - 100% = 0.34 acre-feet @ an elevation of 6,953.56 feet* *- 60% = 0.20 acre-feet @ an elevation of 6,951.66 feet* .
	3. Principle and emergency spillway elevations. *Principal Spillway Elevation (as designed) - 6,964.44 feet* *Emergency Spillway Elevation (as designed) - 6,964.5 feet*

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

At the time of the inspection, there had been no discharge from the pond during December.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

At the time of inspection, the water elevation was approximately 3 to 4 feet below the top of the primary spillway. A layer of ice was present on the surface of the impounded water and the sediment clean-out marker was submerged and not visible. However, based on the visible accumulation of sediment at the northern end of the pond, it is believed that the sediment storage is nearing clean-out volume. It is hereby recommended that sediment accumulations be cleaned from the pond in the spring of 2006. Typically, clean-out in the May / June timeframe has worked best in the past and should be our target timeframe for 2006.

Qualification Statement

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

Signature: _____ **Date:** _____

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	X	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	X	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	X	

COMMENTS AND OTHER INFORMATION

On January 3, 2006 UDOGM approved the removal of the dewatering device at the Dugout Canyon Mine. This was due to our request, since the dewatering device and turning rod has been repeatedly damaged by shifting winter ice. At the time of the inspection, the flanged cover was in-place at the spillway outlet to prevent any inadvertent discharge due to any unexpected decant damage. It is expected that the dewatering device will be removed during the 2006 sediment clean-out operation.

Certification Statement:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

LICENSED PROFESSIONAL ENGINEER
No. 151610
DAVID G. SPILLMAN
STATE OF UTAH

By: *David G. Spillman, Technical Services Manager*
(Full Name and Title)

Signature: David G. Spillman **Date:** *02/13/06*

P.E. Number & State: *No. 151610, State of Utah*

IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			Page 1 of 2
Permit Number	*C/007/039*	**Report Date**	*02/13/06*
Mine Name	*Dugout Canyon Mine*		
Company Name	*Canyon Fuel Company, LLC*		
Impoundment Identification	**Impoundment Name**	*Surface Facility Wastewater Disposal System (Leach Field)*	
	Impoundment Number	*None*	
	UPDES Permit Number	*None*	
	MSHA ID Number	*None (Mine - 42-01890)*	

IMPOUNDMENT INSPECTION

Inspection Date	*12/27/05*
Inspected By	*Dave Spillman*
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	*Routine Quarterly Inspection and Annual Certification*

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

There were no signs of instability, structural weakness or other hazardous conditions observed during this inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.	**2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.**
	3. Principle and emergency spillway elevations.

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

At the time of the inspection, the leach field site was covered with approximately one inch of snow and the site appeared to be functioning as designed. There was no evidence to suggest that any effluent was improperly flowing to the surface at the septic tank, at the distribution line clean-outs / air vent or down hill from the leach field.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

Qualification Statement

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

Signature: _____ **Date:** _____

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	X	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	X	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	X	

COMMENTS AND OTHER INFORMATION

The Dugout Canyon Mine wastewater disposal system was approved for operation on October 30, 2001. The Utah Department of Environmental Quality, Southeast Utah District, granted this approval.

Certification Statement:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

LICENSED PROFESSIONAL ENGINEER
No. 151610
DAVID G. SPILLMAN
STATE OF UTAH

By: *David G. Spillman, Technical Services Manager*
(Full Name and Title)

Signature: David G. Spillman **Date:** *02/13/06*

P.E. Number & State: *No. 151610, State of Utah*

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GENERAL INFORMATION

Report Date	February 7, 2006
Permit Number	C/007/039
Company Name	Canyon Fuel Company, LLC - Dugout Canyon Mine

EXCESS SPOIL PILE OR REFUSE PILE IDENTIFICATION

Pile Name	Dugout Canyon Mine Refuse Pile
Pile Number	1211-UT-09-01890-01
MSHA ID Number	42-01890

Inspection Date	December 27, 2005
Inspected By	David G. Spillman
Reason for Inspection	Quarterly Inspection & Certification

Attachment to Report? Yes ☐ No ☒

Field Evaluation

1. Foundation preparation, including the removal of all organic material and topsoil.

The foundation preparation was found to be in accordance with the approved plan.

2. Placement of underdrains and protective filter systems.

N/A

3. Installation of final surface drainage systems

All necessary drainage systems were constructed, functional and well established at the time of the inspection.

4. Placement and compaction of fill materials

Placement and compaction of the estimated 120,800 tons material hauled to the site has been completed in accordance with the approved plan.

5. Final grading and revegetation of fill.

N/A

6. Appearances of instability, structural weakness, and other hazardous conditions

There was no appearance of instability, structural weakness or other hazardous conditions observed during this inspection.

7. Other comments. Describe any changes in the geometry of the Excess Spoil/Refuse Pile structure, instrumentation, average and maximum lifts of materials placed in the pile, elevations of active benches, total and remaining storage capacity of the structure, evidence of fires in the pile and abatment of such fires, volumes of materials placed in the structure during the year, and any other aspect of the structure affecting its stability or function which has occurred during the reporting period

At the time of this inspection, it is estimated that a total of 120,800 tons of refuse have been hauled and compacted into the single stockpile onsite. The current remaining storage is 91,065 tons. This is based on an agreement with UDOGM that authorized Dugout to place an additional 170,000 tons of refuse onsite. The 170,000 tons was in addition to the material that was onsite as of 12/01/04.

An aerial volumetric survey was conducted by Olympus Aerial Surveys on December 21, 2005. Results from this survey, when received, will be utilized to validate the stored volumes.

CERTIFICATION STATEMENT

I hereby certify that; I am experienced in the construction of earth and rock fills; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of earth and rock fills in accordance with the certified and approved designs for this structure; that the fill structure has been maintained in accordance with the approved design and meet or exceed the minimum design requirements under all applicable federal, state, and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

By David G. Spillman, Technical Services Manager
Full Name and Title

Signature David G. Spillman Date 2/7/06

P.E. Number and State No. 151610, State of Utah

[Cert. Stamp]

LICENSED PROFESSIONAL ENGINEER
No. 151610
DAVID G. SPILLMAN
STATE OF UTAH

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IMPOUNDMENT INSPECTION AND CERTIFIED REPORT			Page 1 of 2
Permit Number	*ACT/007/039*	**Report Date**	*02/13/06*
Mine Name	*Dugout Canyon Mine*		
Company Name	*Canyon Fuel Company, LLC*		
Impoundment Identification	**Impoundment Name**	*Refuse Pile Sedimentation Pond*	
	Impoundment Number	*None*	
	UPDES Permit Number	*UT0025593*	
	MSHA ID Number	*Impoundment –None (Refuse Pile 1211-UT-09-01890-01)*	

IMPOUNDMENT INSPECTION

Inspection Date	*12/27/05*
Inspected By	*Dave Spillman*
Reason for Inspection (Annual, Quarterly or Other Periodic Inspection, Critical Installation, or Completion of Construction)	*Quarterly Inspection / Certification*

1. Describe any appearance of any instability, structural weakness, or any other hazardous condition.

Construction of the Refuse Pile Sedimentation Pond has been completed in accordance with the approved plan. There were no signs of instability, structural weakness or other hazardous conditions observed during this inspection.

Required for an impoundment which functions as a SEDIMENTATION POND.

2. Sediment storage capacity, including elevation of 60% and 100% sediment storage volumes, and, estimated average elevation of existing sediment.

Sediment Storage Capacity (as designed) - 100% = 0.78 acre-feet @ an elevation of 5,895.9 feet

- 60% = 0.47 acre-feet @ an elevation of 5,894.7 feet

3. Principle and emergency spillway elevations.

Emergency Spillway Elevation (as designed) - 5,902 feet

4. Field Information. Provide current water elevation, whether pond is discharging, type and number of samples taken, monitoring/instrumentation information, inlet/outlet conditions, or other related activities associated with the pond including but not limited to sediment cleanout, pond decanting, embankment erosion/repairs, monitoring information, vegetation on outslopes of embankments, etc.

Impounded water appeared to be approximately 1.0 foot in depth and iced over at the time of the inspection. Judging by the existing water level and other recent pond observations, it did not appear that accumulation of sediment has reached the allowed 60% level.

This pond has never discharged.

5. **Field Evaluation.** Describe any changes in the geometry of the impounding structure, average and maximum depths and elevations of impounded water, estimated sediment or slurry volume and remaining storage capacity, estimated volume of water impounded, and any other aspect of the impounding structure affecting its stability or function which has occurred during the reporting period.

Qualification Statement

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized under the direction of a Registered Professional Engineer to inspect the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability.

Signature: _____ **Date:** _____

CERTIFIED REPORT

IMPOUNDMENT EVALUATION (If NO, explain under Comments)	YES	NO
1. Is impoundment designed and constructed in accordance with the approved plan?	X	
2. Is impoundment free of instability, structural weakness, or any other hazardous condition?	X	
3. Has the impoundment met all applicable performance standards and effluent limitations from the previous date of inspection?	X	

COMMENTS AND OTHER INFORMATION

Certification Statement:

I hereby certify that; I am experienced in the construction of impoundments; I am qualified and authorized in the State of Utah to inspect and certify the condition and appearance of impoundments in accordance with the certified and approved designs for this structure; that the impoundment has been maintained in accordance with approved design and meet or exceed the minimum design requirements under all applicable federal, state and local regulations; and, that inspections and inspection reports are made by myself or under my direction and include any appearances of instability, structural weakness or other hazardous conditions of the structure affecting stability in accordance with the Utah R645 Coal Mining Rules.

LICENSED PROFESSIONAL ENGINEER
No. 151610
DAVID G. SPILLMAN
STATE OF UTAH

By: *David G. Spillman, Technical Services Manager*
(Full Name and Title)

Signature: David G. Spillman **Date:** *02/13/06*

P.E. Number & State: *No. 151610, State of Utah*

APPENDIX B

Reporting of Technical Data

Including monitoring data, reports, maps, and other information
As required under the approved plan or as required by the Division

In accordance with the requirement of R645-310-130 and R645-301-140

CONTENTS

2005 DUGOUT CANYON SUBSIDENCE MONITORING STATIONS MAP
RAPTOR SURVEY INFORMATION **(CONFIDENTIAL)**
SNOTEL REPORT

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Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
3/25/05	T13S R12E Sections 14, 22, 23, 27 & 34	No subsidence observed at a mine site or on Dugout Canyon Road.
3/31/05	T13S R12E Sections 24, 25 & 13 T13S R13E Sections 19, 20, 21, 30, 31 & 32.	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
4/14/05	T13SR12E Sections 25 & 36	No effects of subsidence observed on roadways.
4/20/05	T13SR13E Sections 31 & 32	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
4/26/05	T13S R12E Sections 25 T13S R13E Sections 19, 20, 21 & 30	No effects of subsidence observed on roadways, pathways to bat survey locations or at survey sites.
4/27/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
4/28/05	T13S R12E Sections 24, 25 & 13 T13S R13E Sections 18,19, 20, 21, & 30	No effects of subsidence observed on roadways, pathways to Fan Site or at degas wells.
5/2/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/3/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/5/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.

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Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
5/9/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/11/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/17 - 19/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/24/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/26/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
5/31/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
6/6/05	T13S R12E Sections 24, 25 & 13 T13S R13E Sections 18,19, 20, 21, & 30	Hillside erosion above mine site, not subsidence related, caused by logging in 1998, no mining in area. No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
6/7/05	T13S R12E Section 25 T13S R13E Sections 19, 20, 21, 28, & 30	No effects of subsidence observed on roadways. Large rocks and soil on roadways likely cause by spring thaw in Section 28, no mining in area of water monitoring site 200.
6/20/05	T13S R12E Sections 13 &14 T13S R13E Sections 17,18, 19, 20, 21, 28, & 30	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
6/23/05	T13S R12E Sections 22, 23 & 27	No subsidence observed at mine site or on Dugout Canyon Road.

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Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
6/24/05	T13S R12E Sections 24, 25 & 13 T13S R13E Sections 18,19, 20, 21, & 30	No effects of subsidence observed on roadways, pathways to Fan Site or at degas wells.
7/6/05	T13S R12E Section 25 T13S R13E Sections 19, 20, 21, 28, & 30	No effects of subsidence observed on roadways. Large rocks and soil on roadways likely cause by spring thaw in Section 28, no mining in area of water monitoring site 200.
7/18/05	T13S R12E Section 25 T13S R13E Sections 19 & 30	No effects of subsidence observed on roadways, at Fan Site or water monitoring locations.
7/20/05	T13SR13E Sections 29, 31 & 32	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
8/2/05	T13S R12E Sections 13, 14, 23 & 27 T13S R13E Sections 17,18, 19, 20, 21, 28, & 30	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
8/15/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
8/17/05	T13S R12E Section 25 T13S R13E Section 19,20 & 21	No effects of subsidence observed on roadways, at Fan Site or Degas Well Sites G-9 and G-10.
8/30/05	T13S R12E Sections 13, 24 & 25 T13S R13E Sections 17,18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, at Fan Site or Degas Well Sites G-7, G-9, G-10 and G-14.

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Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
9/1/05	T13S R12E Sections 24 & 25 T13S R13E Sections 18, 19 & 30	No effects of subsidence observed on roadways, at Fan Site, Degas Well Sites G-7, G-3 or at the proposed Well Site G-8.
9/5/05	T13S R12E Sections 13, 24 & 25 T13S R13E Sections 17,18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, at Fan Site or Degas Well Sites.
9/8/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
9/13/05	T13S R12E Sections 13, 24 & 25 T13S R13E Sections 17,18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, at Fan Site or Degas Well Sites.
9/14/05	T13S R12E Section 12, 13, 14, 23 T13S R13E Section 18, 19, 20 & 21	No effects of subsidence observed on roadways, Degas Well Sites G-9 and G-10 or above mine site.
9/21/05	T13S R12E Sections 24 & 25 T13S R13E Sections 18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well Sites G-3 and G-7.
9/26/05	T13S R12E Sections 24, 25 & 13 T13S R13E Sections 18,19, 20, & 30	No effects of subsidence observed on roadways, pathways to Fan Site or at degas wells.

2005 ANNUAL REPORT

Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
10/3/05	T13SR13E Sections 28, 29, 30, 31 & 32	No effects of subsidence observed on roadways, pathways to water monitoring locations or at monitoring sites.
10/5/05	T13S R12E Sections 13, 24 & 25 T13S R13E Sections 17,18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, at Fan Site or Degas Well Sites.
10/11/05	T13S R12E Sections 13, 24 & 25 T13S R13E Sections 17,18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, at Fan Site or water monitoring locations.
10/12/05	T13S R12E Sections 14 & 23	No effects of subsidence observed on roadways or at Mine Site.
10/17/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.
10/19 - 24/05	T13S R12E Sections 24 & 25 T13S R13E Sections 18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well Sites G-3 and G-7.
10/26	T13S R12E Sections 24 & 25 T13S R13E Sections 18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well Sites.

2005 ANNUAL REPORT

Dugout Canyon Mine, M&RP, Chapter 5, Section 525 "Visual checks for subsidence will be made during all surface activities, especially during water monitoring activities. These visual surveys will be used to detect surface irregularities and surface cracks."

Date	Location	Description of visual survey observations
11/7/05	T13S R12E Sections 24 & 25 T13S R13E Sections 18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well Sites.
11/10/05	T13S R12E Section 25 T13S R13E Sections 18, 19, 20, 21 & 30	No effects of subsidence observed on roadways, or along Pace Creek.
11/23/05	T13S R12E Section 13, 25 T13S R13E Sections 18, 19, 20 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well G-4
11/28/05	T13S R12E Section 13, 25 T13S R13E Sections 18, 19, 20 & 30	No effects of subsidence observed on roadways, along Pace Creek or at Degas Well G-3 and G-4
11/29/05	T13S R12E Section 25 T13S R13E Section 30	No effects of subsidence observed on roadways or at Fan Site.

Inspections of the Mine site and/or the Pace Canyon Fan site were performed in 2005 on January 26, February 28, March 21, April 19, May 17, June 28, July 20, August 16, September 27, October 26, November 29, and December 19. According to the inspection reports no subsidence was observed by the inspector during the inspection. The August 16, 2005 Inspection Report, discusses the review of the annual subsidence report for 2004.

Consultants (hydro-geologist, geologist, biologist, soil scientist, etc.) UDOGM personnel, NRCS personnel and DWR personnel were in the Pace Canyon looking at the degas wells which have been drilled and the wells proposed for drilling in 2005 - 2006. To best of our knowledge, no subsidence was observed during the visits from the agency personnel or consultants.

For additional information refer to the subsidence map, geomorphology study and raptor survey in this annual report.

S N O W - P R E C I P I T A T I O N U P D A T E

Based on Mountain Data from NRCS SNOTEL Sites
As of WEDNESDAY: MARCH 1 , 2006

BASIN Data Site Name	ELEV. (Ft)	SNOW WATER EQUIVALENT Current	Average	% Avg	TOTAL PRECIPITATION Current	Average	% Avg
UTAH							
TOOELE VALLEY-VERNON CREEK							
ROCKY BASIN-SETTLEME	8900	16.6	21.2	78	19.8	20.3	98
MINING FORK	8000	17.0	14.9	114	20.8	18.5	112
VERNON CREEK	7500	-M	10.1	*	13.1	13.2	99
Basin wide percent of average				93			103
GREEN RIVER							
STEEL CREEK PARK	10100	13.2	12.7	104	14.3	12.9	111
HEWINTA	9500	10.3	9.1	113	12.5	11.6	108
TROUT CREEK	9400	5.1	8.1	63	7.8	10.3	76
HOLE-IN-ROCK	9150	5.9	5.7	104	6.5	5.8	112
HICKERSON PARK	9100	3.5	5.8	60	5.7	6.2	92
KING'S CABIN	8730	4.7	9.4	50	7.2	9.9	73
Basin wide percent of average				84			95
DUCHESNE RIVER							
LAKEFORK BASIN	10900	19.3	16.6	116	17.5	17.1	102
FIVE POINTS LAKE	10920	15.3	13.8	111	14.7	15.9	92
BROWN DUCK	10600	17.2	15.0	115	17.0	16.2	105
CHEPETA	10300	10.2	11.4	89	8.8	12.6	70
LAKEFORK #1	10100	8.7	10.5	83	11.0	11.6	95
TRIAL LAKE	9960	24.7	20.6	120	23.4	20.5	114
MOSBY MTN.	9500	7.7	9.3	83	8.1	11.2	72
INDIAN CANYON	9100	7.8	9.6	81	9.6	11.8	81
STRAWBERRY DIVIDE	8400	18.2	16.3	112	18.2	18.2	100
DANIELS-STRAWBERRY	8000	19.4	15.1	128	18.2	17.2	106
CURRANT CREEK	8000	10.4	9.6	108	12.7	12.6	101
ROCK CREEK	7900	9.4	7.9	119	10.1	10.7	94
Basin wide percent of average				108			96
PRICE-SAN RAFAEL							
SEELEY CREEK	10000	10.6	12.3	86	13.1	11.1	118
BUCK FLAT	9800	17.3	15.3	113	18.1	16.1	112
RED PINE RIDGE	9200	14.9	14.2	105	18.9	15.1	125
MAMMOTH-COTTONWOOD	8800	17.0	17.6	97	15.5	13.4	116
WHITE RIVER #1	8550	9.7	11.6	84	13.3	11.9	112
Basin wide percent of average				98			117
DIRTY DEVIL							
DONKEY RESERVOIR	9800	-M	6.6	*	5.8	7.6	76
BLACK FLAT-U.M. CK	9400	7.7	8.5	91	8.8	9.4	94

APPENDIX C

Legal Financial, Compliance and Related Information

Annual Report of Officers
As submitted to the Utah Department of Commerce

Other change in ownership and control information
As required under R645-301-110

CONTENTS

REFER TO THE GENERAL CHAPTER ONE

MARSH

CERTIFICATE OF INSURANCE

CERTIFICATE NUMBER
CHI-000333513-10

PRODUCER

Marsh USA Inc.
800 Market Street, Suite 2600
St. Louis, MO 63101-2500
Attn: Renee' L. Butler

001950-state-GL8-05-06 Y

INSURED

Canyon Fuel Company, LLC
c/o Arch Western Bituminous Group, L.L.C.
225 N. 5th Street, Suite 900
Grand Junction, CO 81501

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER OTHER THAN THOSE PROVIDED IN THE POLICY. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES DESCRIBED HEREIN.

COMPANIES AFFORDING COVERAGE

COMPANY A ACE AMERICAN INSURANCE COMPANY

COMPANY B

COMPANY C

COMPANY D

COVERAGES This certificate supersedes and replaces any previously issued certificate for the policy period indicated below.

THIS IS TO CERTIFY THAT POLICIES OF INSURANCE DESCRIBED HEREIN HAVE BEEN ISSUED TO THE INSURED NAMED HEREIN FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THE CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, CONDITIONS AND EXCLUSIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY	HDOG21723198	07/31/05	07/31/06	GENERAL AGGREGATE	$ * 500,000
	X COMMERCIAL GENERAL LIABILITY	*****$500,000 general aggregate			PRODUCTS - COMP/OP AGG	$ 500,000
	CLAIMS MADE X OCCUR	*****per location*****			PERSONAL & ADV INJURY	$ 300,000
	OWNER'S & CONTRACTOR'S PROT				EACH OCCURRENCE	$ 300,000
	X Includes XCU				FIRE DAMAGE (Any one fire)	$ 50,000
					MED EXP (Any one person)	$ 5,000
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	$
	ANY AUTO					
	ALL OWNED AUTOS				BODILY INJURY (Per person)	$
	SCHEDULED AUTOS					
	HIRED AUTOS				BODILY INJURY (Per accident)	$
	NON-OWNED AUTOS					
					PROPERTY DAMAGE	$
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	ANY AUTO				OTHER THAN AUTO ONLY:	
					EACH ACCIDENT	$
					AGGREGATE	$
	EXCESS LIABILITY				EACH OCCURRENCE	$
	UMBRELLA FORM				AGGREGATE	$
	OTHER THAN UMBRELLA FORM					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				WC STATUTORY LIMITS / OTHER	
	THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE: INCL / EXCL				EL EACH ACCIDENT	$
					EL DISEASE-POLICY LIMIT	$
					EL DISEASE-EACH EMPLOYEE	$
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

Permit Dug Out Canyon Mine C007039

CERTIFICATE HOLDER

Utah Dept. Of Natural Resources
Division of Oil, Gas and Mining
1594 W. North Temple
Suite 1210
Salt Lake City, UT 84114-5801

CANCELLATION

SHOULD ANY OF THE POLICIES DESCRIBED HEREIN BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE INSURER AFFORDING COVERAGE WILL ~~ENDEAVOR TO~~ MAIL 45 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED HEREIN, ~~[illegible]~~

MARSH USA INC.
BY: Alfred A. Peterfeso

MM (3/02)

VALID AS OF: 08/01/05

APPENDIX D

Mine Maps

As required under R645-302-525-270

CONTENTS

2006 BUDGET MAP

APPENDIX E

Other Information

In accordance with the requirements of R645-301 and R645-302

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GEOMORPHOLOGY STUDY
WASTE ROCK ANALYSIS – PACE CANYON
WASTE ROCK ANALYSIS – REFUSE PILE

GEOMORPHOLOGY EVALUATION OF THE PACE CREEK STREAM CHANNEL

Prepared for

CANYON FUEL COMPANY LLC
Dugout Canyon Mine
Wellington, Utah

December 2005

Prepared by

EARTHFAX ENGINEERING, INC.
Engineers/Scientists
Midvale, Utah
www.earthfax.com

EarthFax

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GEOMORPHOLOGY EVALUATION OF THE PACE CREEK STREAM CHANNEL

CHAPTER 1
INTRODUCTION

Canyon Fuel Company has recently constructed a fan portal in Pace Canyon to allow more efficient access of their Dugout Canyon Mine coal reserves. At the request of the Utah Division of Oil, Gas and Mining (the "Division"), a stream channel geomorphology study was conducted up- and downstream from areas disturbed by the new portal, including areas overlying planned new mine workings. The purpose of this study was to define baseline geomorphic conditions in the area to assist in future mine-impact evaluations. Specifically, this study involved the following scope of work:

- Establish permanent benchmarks and cross sections at five locations along Pace Creek.
- Survey channel cross sections and gradients at the established locations, in accordance with guidelines established by the U.S. Forest Service (Harrelson et al., 1994).
- Classify the stream sections in accordance with procedures established by Rosgen (1996).
- Prepare drawings showing surveyed cross section and profile data.

CHAPTER 2
METHODS

Reference sites were established in September 2005 at the locations shown on Figure 1. The approximate coordinates of these reference sites, as determined with a Garmin eTrex hand-held GPS unit, are listed in Table 1. All reference sites were established in general conformance with the recommendations of Harrelson et al. (1994). Benchmarks were installed at each reference site by drilling an 8-inch diameter hole to a depth of approximately 36-inches using a portable power auger. Each hole was filled with concrete and the monument was identified with a brass marker, embedded in the concrete and stamped with the site number. Cross sections were established at each reference site, with the endpoints identified with ½-inch diameter steel reinforcing bars driven approximately 3 feet into the ground. The bars were capped with plastic survey end caps marked with the cross-section number.

The longitudinal profile was surveyed at each reference site, with profiles extending a distance of at least 20 times the channel width (half upstream and half downstream from the cross section location). Data were collected relative to the benchmark elevation to indicate the elevation of the channel bottom, the water surface, indications of bankfull stage, and the top of the stream banks. Measurements were collected on intervals at least equal to the channel width using a Sokkia survey level and rod. Data readings were recorded in a field log book (see Appendix A).

The cross section at each reference site was also surveyed using a Sokkia survey level and rod. This was accomplished by attaching a measuring tape to one of the cross section monuments and stretching the tape across the stream to the other monument. Elevations were shot at each important feature or change in elevation (e.g., slope breaks, channel banks, etc.). The survey was closed by re-shooting the site benchmark and readings were recorded in a field log book (see Appendix A).

Following surveying, each reference site was photographed. As recommended by Harrelson et al. (1994), convenient locations were selected to take photographs upstream, downstream, and across the channel at each cross section location. Photographs obtained during this evaluation are provided in Appendix B.

The flow of Pace Creek was determined at each reference site using a cutthroat flume with a throat width of 8 inches and a length of 18 inches. A thunderstorm occurred in Pace Canyon on the day the reference reaches were established. To avoid fluctuating conditions, flow measurements were collected from the stream 9 days later.

CHAPTER 3
RESULTS SUMMARY

3.1 Channel Descriptions

Data and plots of the channel cross sections and profiles are provided in Appendix C. Table 2 presents a summary of the channel data for each reference site.

The hydraulic slope of the Pace Creek channel varies from about 5 to 7% within the reaches evaluated for this investigation. The channel is somewhat entrenched, with steep, eroded streambanks. Sloughing of the streambanks is common, as are natural debris dams formed by tree limbs and trunks that have fallen into the stream. Along most sections of the stream, vegetative cover density along the stream channel is high (see photographs in Appendix A).

As indicated in Table 2, within the area of investigation Pace Creek is classified as an A4 or A3 stream type. According to Rosgen (1996), streams of these types are generally entrenched into a steep, confined channel. Natural dams formed by woody debris commonly occur in such streams, and their banks are typically steep and eroded. The primary difference between the two stream types is that the bed material of A4 streams is predominantly gravel, while that in A3 streams is primarily cobbles.

It should be noted that stream classification was based on factors other than the entrenchment ratio. Rosgen (1996) indicates that the entrenchment ratio of an A-type stream should be less than 1.4 whereas the entrenchment ratio for all Pace Canyon reference sites was greater than or equal to 1.4. However, the channel slope, width-depth ratio, and sinuosity of the stream at these locations preclude their classification as any other stream type. Furthermore, the entrenchment ratio only slightly exceeded the typical value given by Rosgen (1996). Hence, the stream was classified as type A at all locations.

3.2 Streamflow Measurements

Results of streamflow measurements collected in Pace Creek are provided in Table 3. Although minor quantities of inflow from tributary canyons were visually observed on the day flow measurements were collected, the majority of the flow increase between sites P-1 and P-5 appears to have been primarily from groundwater inflow (i.e. baseflow). The incremental rate of increase of greatest in the section from P-3 to P-4.

CHAPTER 4

REFERENCES

Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. General Technical Report RM-245. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

TABLE 1

Pace Canyon Benchmark Coordinates[a]

Reference Site	Northing (m)	Easting (m)	Elevation (ft)
P-1	4,391,660	545,903	8057
P-2	4,391,684	545,249	7867
P-3	4,391,702	544,627	7679
P-4	4,391,816	543,812	7488
P-5	4,390,971	542,047	6938

[a] NAD-27 coordinate system. Data collected using Garmin eTrex hand-held GPS unit.

TABLE 2

Summary of Channel Data

Reference Site	Entrenchment Ratio			Width/Depth Ratio			Sinuosity	Hydraulic Slope (ft/ft)	Bed Material	Stream Class
	W_{fpa}[a] (ft)	W_{bkf}[b] (ft)	Ratio	W_{bkf}[b] (ft)	D_{bkf}[c] (ft)	Ratio				
P-1	7.8	4.5	1.7	4.5	1.2	3.8	Low	0.054	Sandy gravel	A4
P-2	4.7	3.4	1.4	3.4	0.5	6.8	Low	0.059	Sandy gravel	A4
P-3	12.1	7.4	1.6	74	0.8	9.3	Low	0.066	Sandy gravel	A4
P-4	7.3	5.1	1.4	5.1	0.5	10.2	Low	0.046	Sandy gravel	A4
P-5	13.6	9.0	1.5	9.0	0.8	11.3	Low	0.049	Sandy cobble	A3

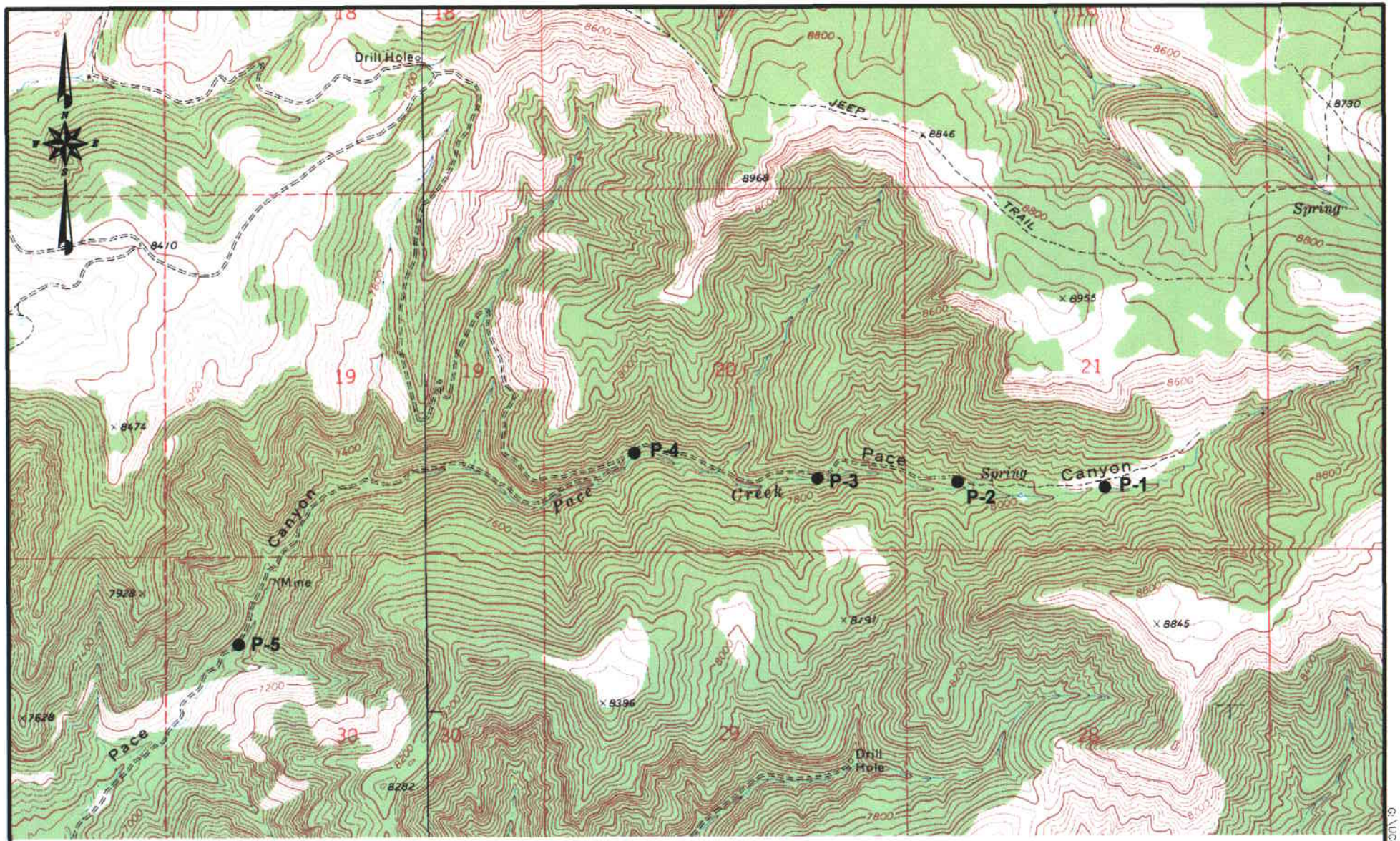
[a] Width of the floodplain at a depth of twice the bankfull depth
[b] Width of flow at bankfull depth
[c] Depth of flow at bankfull stage

TABLE 3

Results of Pace Creek Streamflow Measurements

Reference Site	Flow[a] (cfs)	Distance to Upstream Site (ft)	Flow Gain	
			Total (cfs)	Incremental (cfs/1000')
P-1	0.095			
P-2	0.137	2,300	0.042	0.018
P-3	0.152	2,200	0.015	0.007
P-4	0.264	2,700	0.112	0.041
P-5	0.406	7,700	0.142	0.018

[a] Measured on September 30, 2005 using an 18-inch cutthroat flume with an 8-inch throat width



BASE MAP:
USGS 7.5' QUADRANGLE
PINE CANYON, UTAH (1972) AND
MOUNT BARTLES, UTAH (1972)

0' 2000'

EarthFax

FIGURE 1. REFERENCE SITE LOCATIONS

G:\UC801\14\DWG\FIG1-RFS.DWG

APPENDIX A

Field Notes

CONTENTS

PAGE	REFERENCE	DATE

UC-801-14

21 Sep 2005

Geomorphic evaluation of Pace Creek

10:00 am Established reference station P-1

- 8" diameter hole augered to 3'
- Fill w/ post mix and hydrated
- Set brass cap
- Installed 3' rebar w/ plastic cap to mark cross section end points
- Location (w/ hand held GPS):

E 545903
N 4391660
} NAD 27 coordinates (Grid-12)
Elev. 8057 ft

Established station P-2

- Installed as above
- Location

E 545249
N 4391684
Elev. 7867

Installed P-3 as above. Rained out by large thunderstorm. Will collect GPS data on next site visit.

Waited out storm

Installed P-4 as above. Location as follows:

E 543812
N 4391816
Elev. 7488

Installed P-5 as above. Location as follows:

E 542047
N 4390971
Elev. 6938

5:30 pm – Left site

23 Sep 2005 P-1 profile BM = 5.29

Relative to upstream view

Sta	Top left	Bankfull	WS	Bottom	Top R
0+00	0.52	3.52	3.76	3.92	0.91
0+10	1.05	3.88	4.06	4.34	0.74
0+20	1.46	4.40	4.58	4.67	1.60
0+30	2.88	4.75	4.96	5.19	2.56
0+40	2.54	4.96	5.41	5.58	2.92
0+50	3.07	6.40	7.01	7.24	3.90
0+60	4.14	6.41	7.93	8.10	4.06
0+70	4.90	7.05	8.08	8.40	4.66
0+80	4.65	8.09	8.59	8.68	5.33
0+90	6.55	8.24	8.64	8.82	5.55
1+00	6.80	8.77	9.66	9.92	5.80
1+10	6.51	9.73	10.14	10.41	6.82
1+20	6.74	10.49	10.68	10.96	7.43
1+30	7.88	11.30	12.65	13.09	8.14
1+40	8.33	12.12	12.75	12.90	8.80
1+50	8.88	12.89	13.03	13.23	9.53
1+60	10.13	13.38	13.46	13.61	11.15
1+70	11.68	13.54	13.67	13.80	11.81
1+80	12.72	13.73	13.81	13.95	12.50
1+90	13.42	13.94	14.12	14.22	13.72
2+00	13.26	14.25	14.53	14.74	13.92

Close BM = 5.29 Bank actively sloughing in this reach

P-1 cross section (L to R, looking upstream)

Sta	Elev. (ft)	
0+00	5.39	
0+15	5.86	
0+22	9.54	
0+22.5	9.76	
0+23.5	9.97	BM close = 5.29
0+24	9.98	
0+25.5	8.36	
0+26.5	7.09	
0+31	5.65	
0+42	5.13	

P-2 profile BM = 4.04

Sta	Top L	Bankfull	WS	Bottom	Top R
0+00*	1.27	3.78	4.10	4.28	1.15
0+10	2.59	4.52	4.93	5.30	2.81
0+20	2.69	4.97	5.16	5.36	2.57
0+30	3.60	5.11	5.37	5.48	3.90
0+40	4.49	—	5.57	5.79	4.51
0+50	4.03	5.59	5.92	6.08	4.52
0+60	4.90	5.99	6.54	6.76	4.43
0+70	5.01	6.38	6.64	6.78	4.55
0+80	5.40	6.59	6.88	7.18	5.05
0+90	5.14	6.85	7.21	7.43	4.96
1+00	5.81	7.42	7.70	7.88	5.40
1+10**	6.20	7.90	8.22	8.39	6.69
1+20	~12 (a)	10.89	11.93	12.26	7.83
1+30	~16 (a)	11.82	12.60	12.77	9.30
1+40	~15 (a)	—	13.23	13.60	10.47
1+50	~14 (a)	13.05	14.20	14.40	10.03
1+60	9.93	14.02	14.53	14.73	10.95
1+70	11.51	13.34	14.75	14.95	9.99
1+80	10.90	—	15.05	15.32	—
1+90	—	—	15.44	15.55	12.18
2+00	—	—	15.93	16.31	14.18

(a) Approx height of vertical wall at bank (ft)

BM close = 4.03

* Just below log jam

** Top of steep drop (~3.7')

P-2 cross section

Sta	Elev. (ft)
0+00	3.51
0+12.5	5.52
0+15.5	7.85
0+17	7.88
0+18	7.80
0+19.5	6.31
0+24.5	3.82
0+26	2.94
0+27	2.02

BM close = 4.03

P-3 profile BM = 4.39

Sta	Top L	Bankfull	WS	Bottom	Top R.
0+00	—	0.12	0.22	0.38	—
0+10	—	—	0.42	0.50	—
0+20	1.51	2.40	2.77	3.11	—
0+30	—	—	3.00	3.18	—
0+40	2.08	—	3.90	4.10	2.02
0+50	—	~~4.43~~	4.43	4.68	2.39
0+60	2.77	4.20	4.51	4.59	2.42
0+70	3.04	3.77	4.76	4.87	3.39
0+80	4.09	4.54	5.13	5.34	3.51
0+90	5.15	—	6.00	6.50	4.43
1+00	5.02	5.76	6.36	6.62	4.93
1+10	5.74	6.01	6.50	6.63	5.54
1+20	6.27	7.16	7.75	7.95	5.58
1+30	—	7.22	7.81	7.99	—
1+40	—	7.74	7.87	8.04	4.90
1+50	—	7.58	8.02	8.18	4.81
1+60	—	7.75	8.15	8.25	—
1+70	—	8.84	9.63	9.79	8.20
1+80	—	10.00	10.57	10.78	8.62
1+90	9.54	—	10.88	11.10	8.86
2+00	12.19	12.24	13.45	13.67	11.20

BM close = 4.39

Unstable banks.

P-3 cross section

Sta	Elev (ft)
0+00	1.93
0+02	3.89
0+06	5.79
0+07	6.45
0+08	6.57
0+09	6.42
0+10	6.15
0+13	5.86
0+18	4.66
0+22	1.55

BM close = 4.39

Station coordinates (GPS):

E 544627

N 4391702

Elev. 7679

P-4 profile BM = 2.70

Sta	Top L	Bankfull	WS	Bottom	Top R
0+00	—	2.29	2.90	3.09	—
0+10	—	—	3.03	3.22	—
0+20	0.24	2.38	3.42	3.60	—
0+30	0.75	2.79	3.80	4.21	—
0+40	0.01	3.14	3.88	4.01	—
0+50	3.39	4.11	4.52	4.90	1.85
0+60	1.85	3.94	4.73	4.91	2.37
0+70	—	4.92	5.25	5.49	3.06
0+80	—	5.90	6.12	6.28	2.74
0+90	—	—	6.73	6.96	1.52
1+00	—	—	7.97	8.18	2.88
1+10	—	—	8.32	8.62	3.91
1+20	—	8.50	8.97	9.44	5.32
1+30	—	—	9.24	9.47	5.50
1+40	—	9.50	9.77	9.89	7.43
1+50	—	9.01	10.00	10.22	—
1+60	—	9.30	10.30	10.50	—
1+70	—	~~10.89~~	10.89	11.07	—
1+80	—	10.70	11.15	11.43	—
1+90	9.54	11.05	11.95	12.20	—
2+00	9.70	11.49	12.10	12.38	—

BM close = 2.70

Unstable banks

P-4 cross section

Sta	Elev. (ft)
0+00	3.50
0+05.5	7.84
0+07	7.99
0+08	8.17
0+10.5	7.68
0+13	6.88
0+19	6.41
0+23.5	2.97
0+26	2.56

BM close = 2.70

P-5 profile

BM = 2.99

Sta	Top L	BF	WS	Bottom	Top R
0+00	0.82	2.60	3.00	3.58	1.36
0+10	1.26	2.21	3.12	3.25	1.90
0+20	1.52	2.73	3.55	3.75	2.23
0+30	2.11	—	4.46	4.76	3.03
0+40	1.95	3.97	4.60	4.73	2.43
0+50	2.94	—	4.67	4.82	3.12
0+60	3.24	5.13	5.53	6.09	1.97
0+70	3.91	6.29	6.80	7.30	2.31
0+80	3.64	—	6.97	7.23	3.08
0+90	4.69	6.73	7.25	7.88	—
1+00	4.84	6.61	7.28	7.82	4.69
1+10*	—	—	7.31	7.53	6.08
1+20	—	8.77	10.16	11.49	7.29
1+30	—	—	10.18	11.01	6.95
1+40	—	9.75	10.40	10.60	6.78
1+50	9.51	—	10.55	10.82	6.53
1+60	10.95	—	12.40	12.88	6.24
1+70	10.43	11.80	12.36	13.43	6.55
1+80	—	11.71	12.36	12.65	6.72
1+90	—	12.28	12.73	13.12	7.40
2+00	—	12.78	12.79	13.12	8.30

* Top of steep drop

BM close = 2.99

P-5 cross section

Sta	Elev (ft)
0+00	2.63
0+03.5	4.38
0+09	4.98
0+10	6.25
0+13	7.25
0+15	7.85
0+18.5	7.27
0+19.5	6.92
0+20	6.58
0+21.5	6.04
0+22	5.60
0+24.5	4.85
0+26	4.56

BM close = 3.00

30 Sep 2005 Pace Canyon flow measurements

8" cutthroat flume

Sta	Depth in flume (ft) Upstream	Downstream	Flow (cfs)*
P-1	0.15	0.07	0.095
P-2	0.18	0.08	0.137
P-3	0.19	0.10	0.152
P-4	0.25	0.11	0.264
P-5	0.31	0.15	0.406

* $q = 4.22\ h_a^2$

where h_a = upstream gauge height (ft)

Equation valid for 8" throat width, 18" flume length

APPENDIX B

Reference Site Photographs

P-1 cross section

P-1 downstream view

P-1 upstream view

P-2 cross section

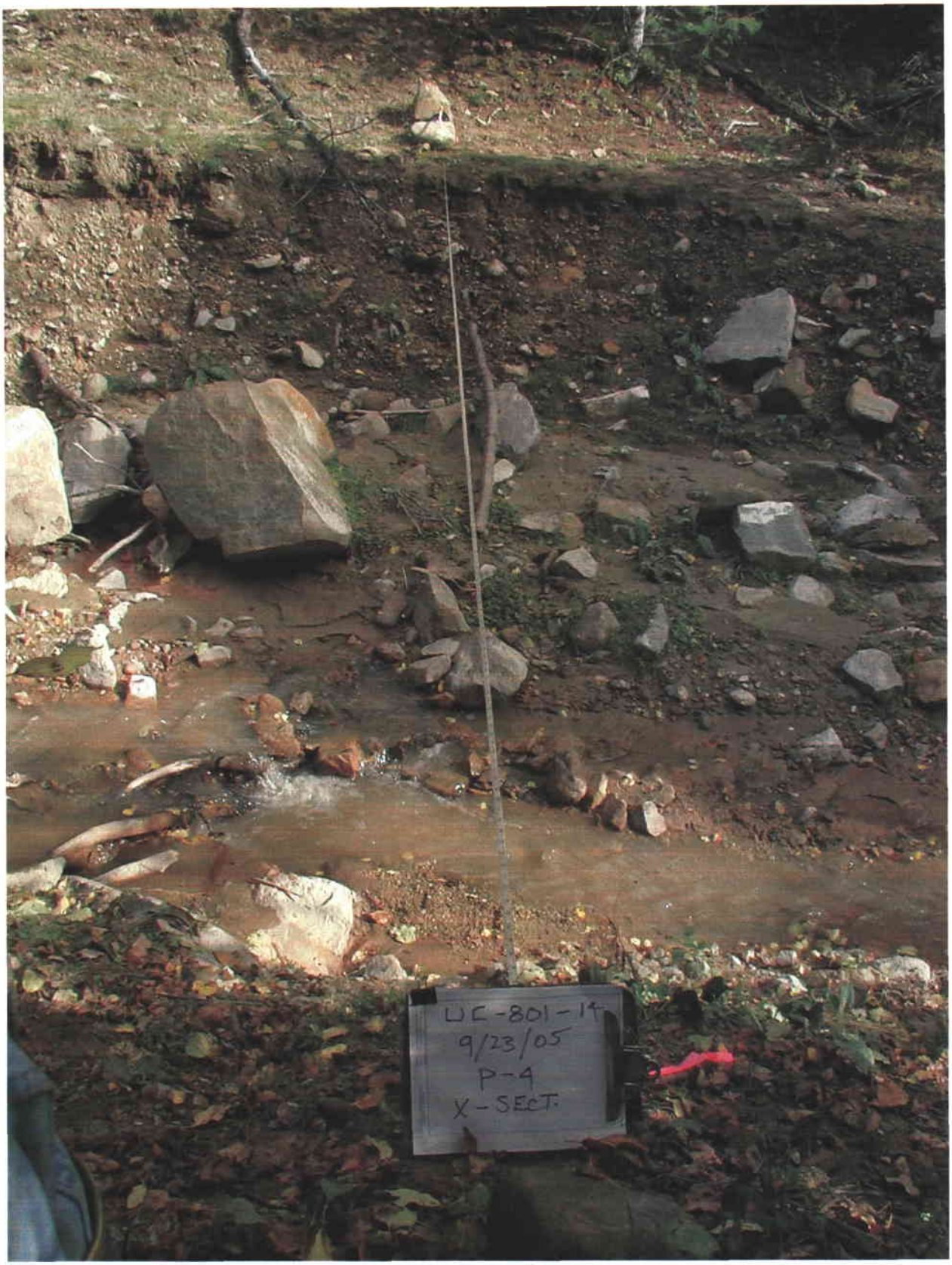
P-2 downstream view

P-2 upstream view

P-3 cross section

P-3 downstream view

P-3 upstream view



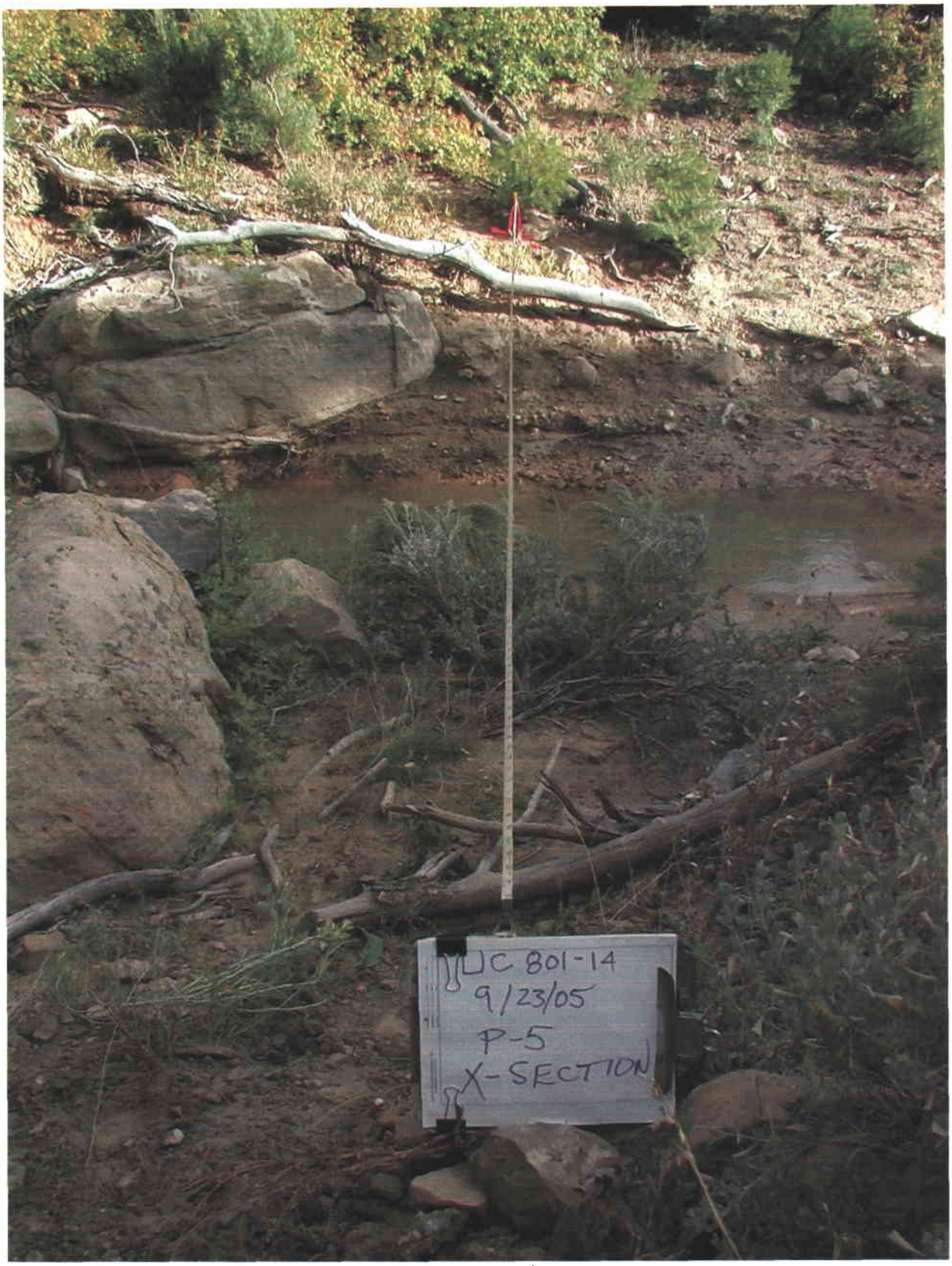
P-4 cross section

P-4 downstream view

P-4 lower upstream view

P-4 middle upstream view

P-4 upper upstream view



P-5 cross section

P-5 upper downstream view

P-5 lower downstream view

P-5 lower upstream view

P-5 upper upstream view

Typical benchmark installation

Typical cross section marker

Upstream view of portable cutthroat flume used to measure streamflow

APPENDIX C

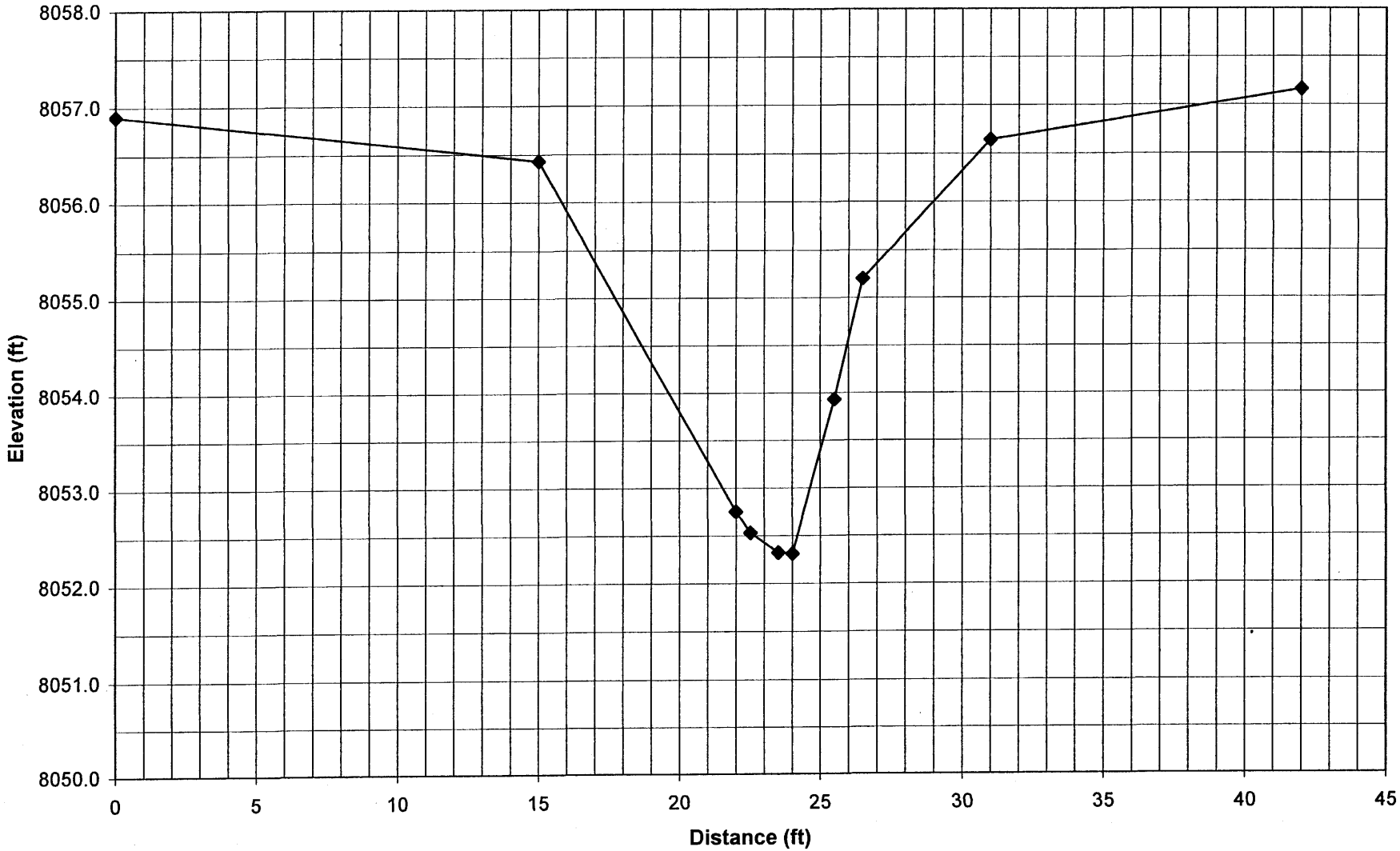
Channel Cross Sections and Profiles

Cross Section: P-1

Survey date:	23-Sep-05
Benchmark elevation:	8057.00
Benchmark rod reading:	5.29

Station	Rod Reading	Elevation
0	5.39	8056.90
15	5.86	8056.43
22	9.54	8052.75
22.5	9.76	8052.53
23.5	9.97	8052.32
24	9.98	8052.31
25.5	8.36	8053.93
26.5	7.09	8055.20
31	5.65	8056.64
42	5.13	8057.16

Cross-Section P-1



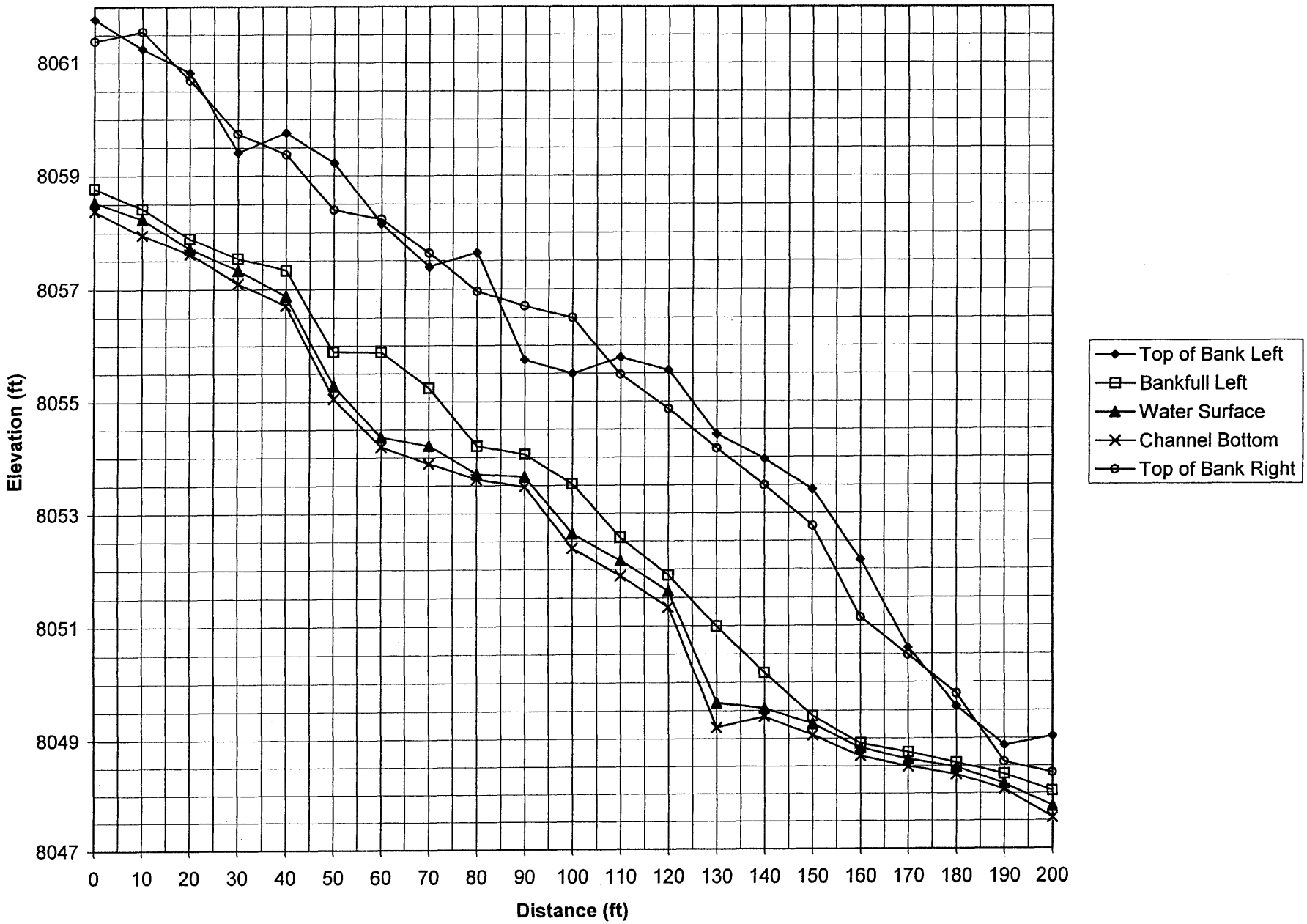
Profile: P-1

Survey date: 23-Sep-05
Benchmark elevation (ft): 8057
Rod reading at benchmark (ft): 5.29

	Top of Bank Left		Bankfull Left		Water Surface		Channel Bottom		Top of Bank Right	
Station	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation
0	0.52	8061.77	3.52	8058.77	3.76	8058.53	3.92	8058.37	0.91	8061.38
10	1.05	8061.24	3.88	8058.41	4.06	8058.23	4.34	8057.95	0.74	8061.55
20	1.46	8060.83	4.40	8057.89	4.58	8057.71	4.67	8057.62	1.60	8060.69
30	2.88	8059.41	4.75	8057.54	4.96	8057.33	5.19	8057.10	2.56	8059.73
40	2.54	8059.75	4.96	8057.33	5.41	8056.88	5.58	8056.71	2.92	8059.37
50	3.07	8059.22	6.40	8055.89	7.01	8055.28	7.24	8055.05	3.90	8058.39
60	4.14	8058.15	6.41	8055.88	7.93	8054.36	8.10	8054.19	4.06	8058.23
70	4.90	8057.39	7.05	8055.24	8.08	8054.21	8.40	8053.89	4.66	8057.63
80	4.65	8057.64	8.09	8054.20	8.59	8053.70	8.68	8053.61	5.33	8056.96
90	6.55	8055.74	8.24	8054.05	8.64	8053.65	8.82	8053.47	5.59	8056.70
100	6.80	8055.49	8.77	8053.52	9.66	8052.63	9.92	8052.37	5.80	8056.49
110	6.51	8055.78	9.73	8052.56	10.14	8052.15	10.41	8051.88	6.82	8055.47
120	6.74	8055.55	10.40	8051.89	10.68	8051.61	10.96	8051.33	7.43	8054.86
130	7.88	8054.41	11.30	8050.99	12.65	8049.64	13.09	8049.20	8.14	8054.15
140	8.33	8053.96	12.12	8050.17	12.75	8049.54	12.90	8049.39	8.80	8053.49
150	8.88	8053.41	12.89	8049.40	13.03	8049.26	13.23	8049.06	9.53	8052.76
160	10.13	8052.16	13.38	8048.91	13.46	8048.83	13.61	8048.68	11.15	8051.14
170	11.68	8050.61	13.54	8048.75	13.67	8048.62	13.80	8048.49	11.81	8050.48
180	12.72	8049.57	13.73	8048.56	13.81	8048.48	13.95	8048.34	12.50	8049.79
190	13.42	8048.87	13.94	8048.35	14.12	8048.17	14.22	8048.07	13.72	8048.57
200	13.26	8049.03	14.25	8048.04	14.53	8047.76	14.74	8047.55	13.92	8048.37

Max. Water Surface Slope (fraction): 0.197
Min. Water Surface Slope (fraction): 0.005
Avg. Water Surface Slope (fraction): 0.054

Profile P-1

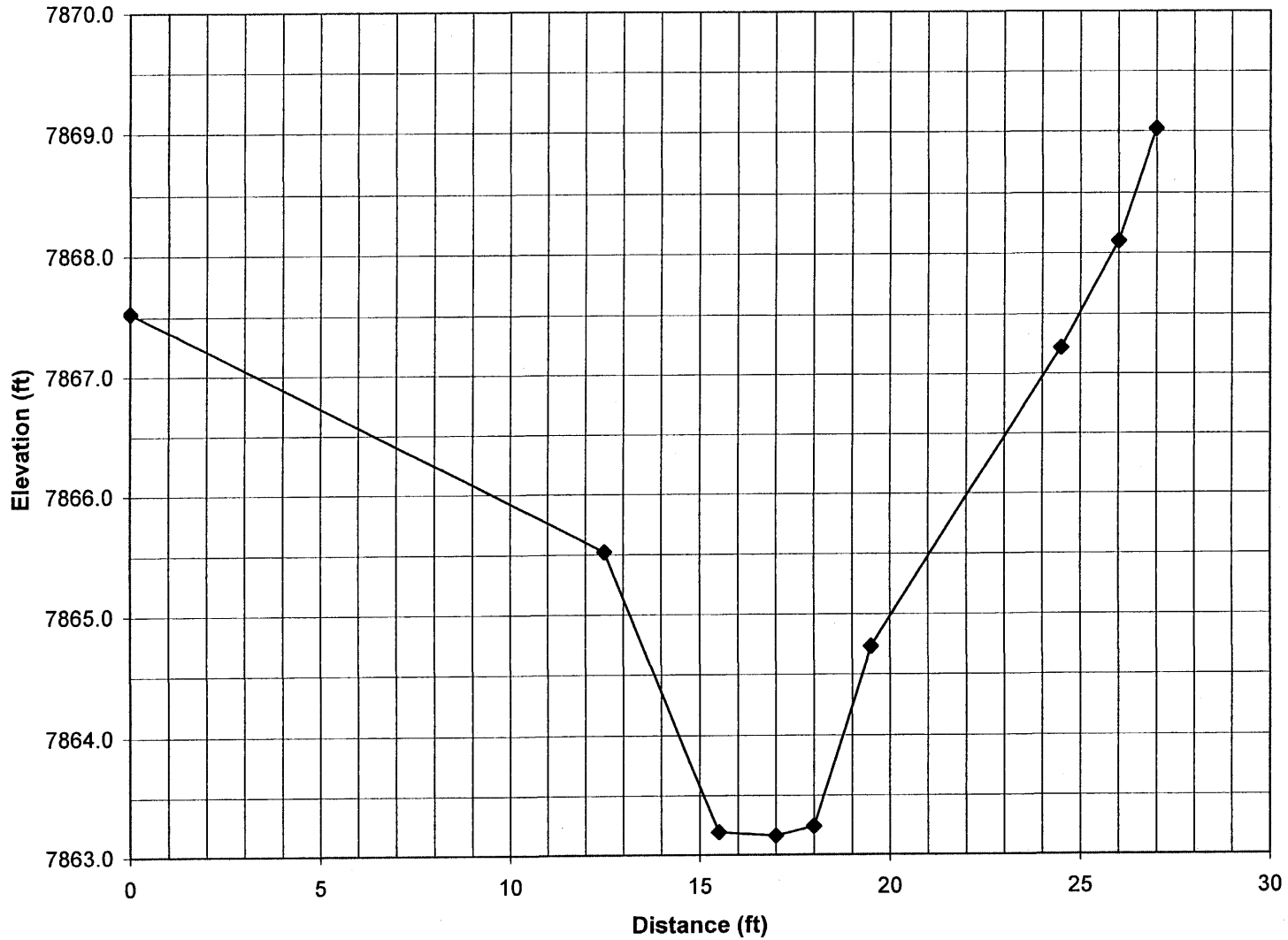

Elevation (ft)
8061
8059
8057
8055
8053
8051
8049
8047
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance (ft)
Top of Bank Left
Bankfull Left
Water Surface
Channel Bottom
Top of Bank Right

Cross Section: P-2

Survey date:	23-Sep-05
Benchmark elevation:	7867.00
Benchmark rod reading:	4.04

Station	Rod Reading	Elevation
0	3.51	7867.53
12.5	5.52	7865.52
15.5	7.85	7863.19
17	7.88	7863.16
18	7.80	7863.24
19.5	6.31	7864.73
24.5	3.82	7867.22
26	2.94	7868.10
27	2.02	7869.02

Cross-Section P-2



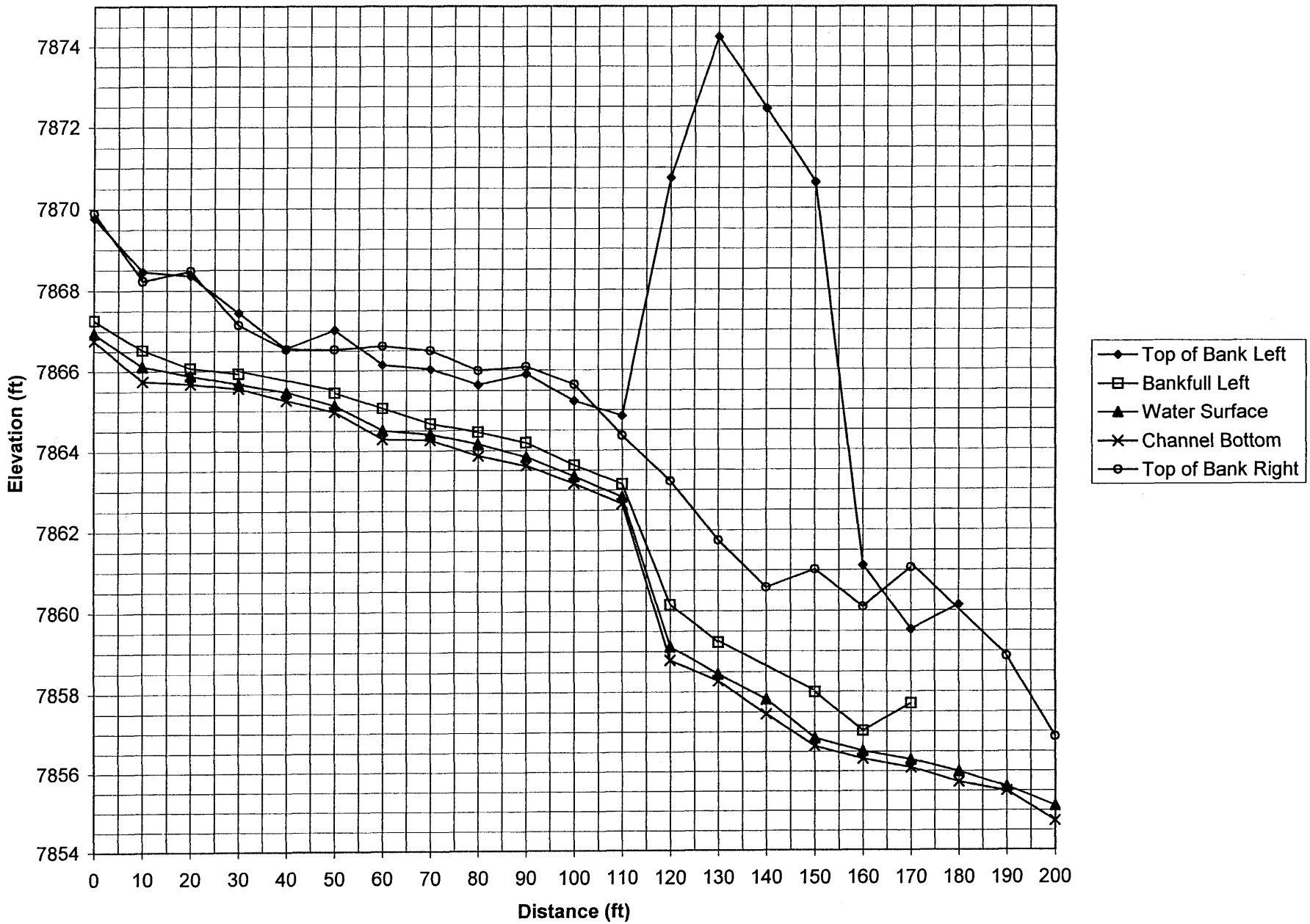
Profile: P-2

Survey date:	23-Sep-05
Benchmark elevation (ft):	7867
Rod reading at benchmark (ft):	4.04

	Top of Bank Left		Bankfull Left		Water Surface		Channel Bottom		Top of Bank Right	
Station	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation
0	1.27	7869.77	3.78	7867.26	4.10	7866.94	4.28	7866.76	1.15	7869.89
10	2.59	7868.45	4.52	7866.52	4.93	7866.11	5.30	7865.74	2.81	7868.23
20	2.69	7868.35	4.97	7866.07	5.16	7865.88	5.36	7865.68	2.57	7868.47
30	3.60	7867.44	5.11	7865.93	5.37	7865.67	5.48	7865.56	3.90	7867.14
40	4.49	7866.55		7871.04	5.57	7865.47	5.79	7865.25	4.51	7866.53
50	4.03	7867.01	5.59	7865.45	5.92	7865.12	6.08	7864.96	4.52	7866.52
60	4.90	7866.14	5.99	7865.05	6.54	7864.50	6.76	7864.28	4.43	7866.61
70	5.01	7866.03	6.38	7864.66	6.64	7864.40	6.78	7864.26	4.55	7866.49
80	5.40	7865.64	6.59	7864.45	6.88	7864.16	7.18	7863.86	5.05	7865.99
90	5.14	7865.90	6.85	7864.19	7.21	7863.83	7.43	7863.61	4.96	7866.08
100	5.81	7865.23	7.42	7863.62	7.70	7863.34	7.88	7863.16	5.40	7865.64
110	6.20	7864.84	7.90	7863.14	8.22	7862.82	8.39	7862.65	6.69	7864.35
120	12	7859.04	10.89	7860.15	11.93	7859.11	12.26	7858.78	7.83	7863.21
130	16	7855.04	11.82	7859.22	12.60	7858.44	12.77	7858.27	9.30	7861.74
140	15	7856.04		7871.04	13.23	7857.81	13.60	7857.44	10.47	7860.57
150	14	7857.04	13.05	7857.99	14.20	7856.84	14.40	7856.64	10.03	7861.01
160	9.93	7861.11	14.02	7857.02	14.53	7856.51	14.73	7856.31	10.95	7860.09
170	11.51	7859.53	13.34	7857.70	14.75	7856.29	14.95	7856.09	9.99	7861.05
180	10.90	7860.14		7871.04	15.05	7855.99	15.32	7855.72		7871.04
190		7871.04		7871.04	15.44	7855.60	15.55	7855.49	12.18	7858.86
200		7871.04		7871.04	15.93	7855.11	16.31	7854.73	14.18	7856.86

Max. Water Surface Slope (fraction):	0.371
Min. Water Surface Slope (fraction):	0.010
Avg. Water Surface Slope (fraction):	0.059

Profile P-2

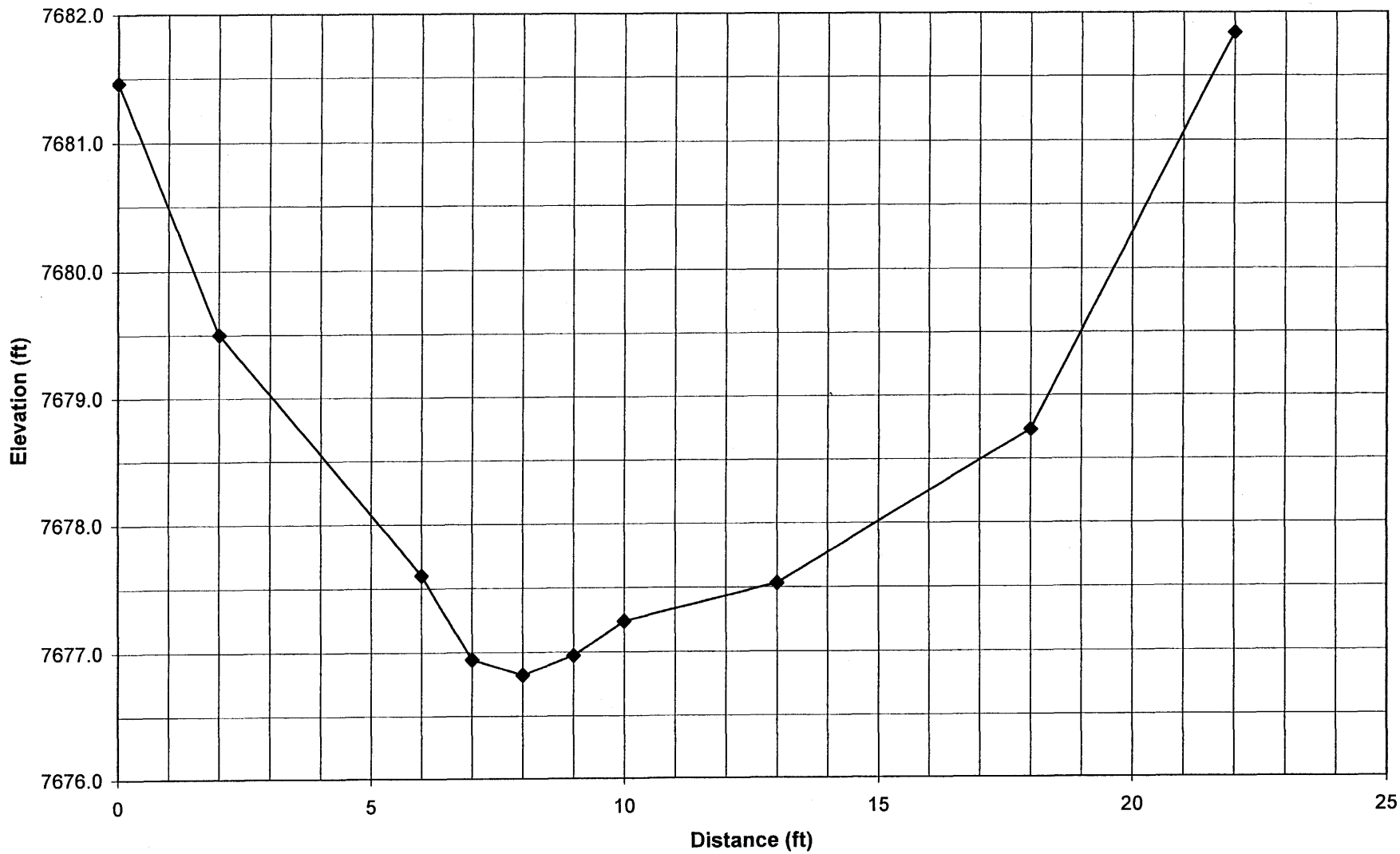

7874
7872
7870
7868
7866
7864
7862
7860
7858
7856
7854
Elevation (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance (ft)
Top of Bank Left
Bankfull Left
Water Surface
Channel Bottom
Top of Bank Right

Cross Section: P-3

Survey date:	23-Sep-05
Benchmark elevation:	7679.00
Benchmark rod reading:	4.39

Station	Rod Reading	Elevation
0	1.93	7681.46
2	3.89	7679.50
6	5.79	7677.60
7	6.45	7676.94
8	6.57	7676.82
9	6.42	7676.97
10	6.15	7677.24
13	5.86	7677.53
18	4.66	7678.73
22	1.55	7681.84

Cross-Section P-3



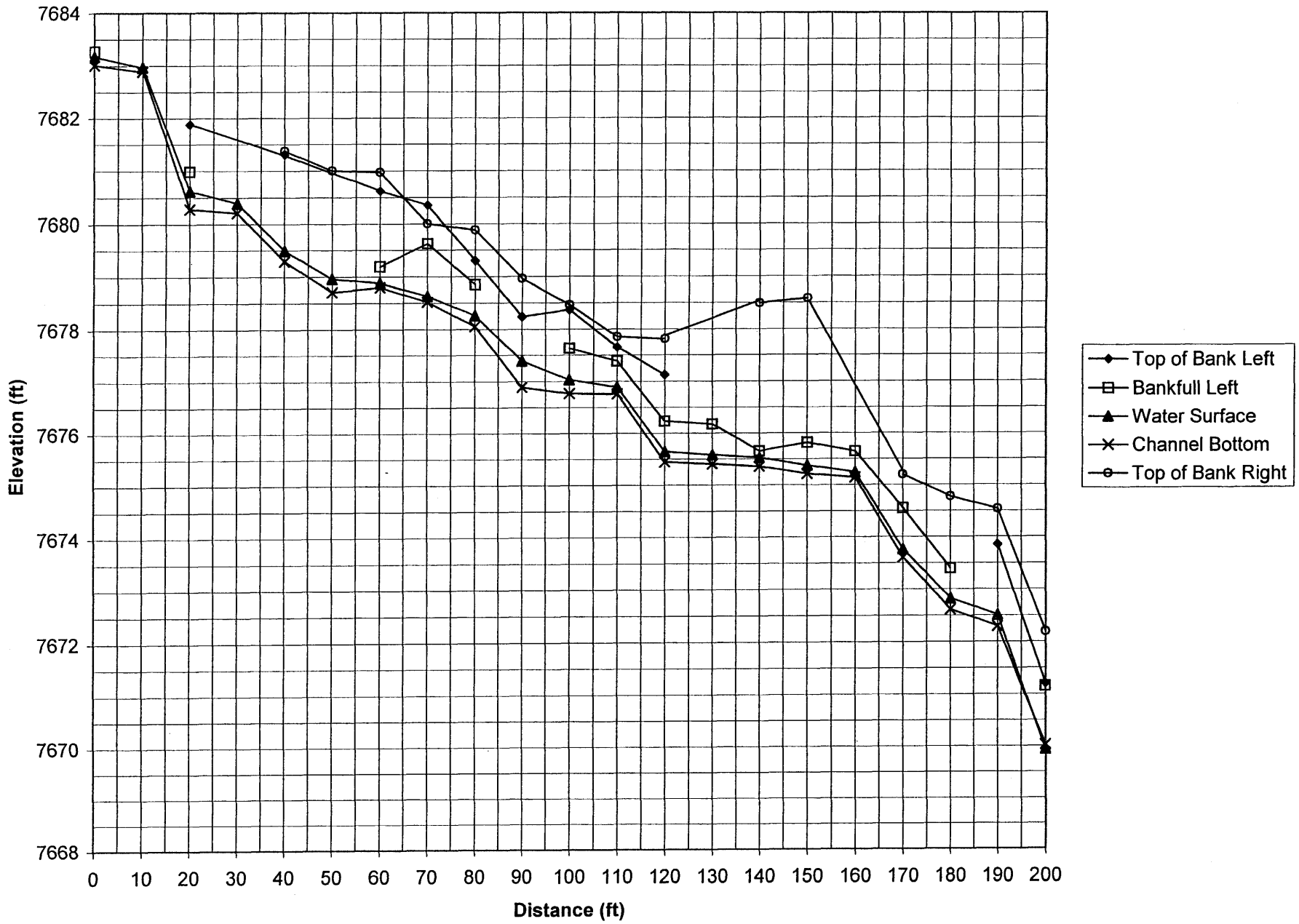
Profile: P-3

Survey date:	23-Sep-05
Benchmark elevation (ft):	7679
Rod reading at benchmark (ft):	4.39

	Top of Bank Left		Bankfull Left		Water Surface		Channel Bottom		Top of Bank Right	
Station	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation
0			0.12	7683.27	0.22	7683.17	0.38	7683.01		
10					0.42	7682.97	0.50	7682.89		
20	1.51	7681.88	2.40	7680.99	2.77	7680.62	3.11	7680.28		
30					3.00	7680.39	3.18	7680.21		
40	2.08	7681.31			3.90	7679.49	4.10	7679.29	2.02	7681.37
50					4.43	7678.96	4.68	7678.71	2.39	7681.00
60	2.77	7680.62	4.20	7679.19	4.51	7678.88	4.59	7678.80	2.42	7680.97
70	3.04	7680.35	3.77	7679.62	4.76	7678.63	4.87	7678.52	3.39	7680.00
80	4.09	7679.30	4.54	7678.85	5.13	7678.26	5.34	7678.05	3.51	7679.88
90	5.15	7678.24			6.00	7677.39	6.50	7676.89	4.43	7678.96
100	5.02	7678.37	5.76	7677.63	6.36	7677.03	6.62	7676.77	4.93	7678.46
110	5.74	7677.65	6.01	7677.38	6.50	7676.89	6.63	7676.76	5.54	7677.85
120	6.27	7677.12	7.16	7676.23	7.75	7675.64	7.95	7675.44	5.58	7677.81
130			7.22	7676.17	7.81	7675.58	7.99	7675.40		
140			7.74	7675.65	7.87	7675.52	8.04	7675.35	4.90	7678.49
150			7.58	7675.81	8.02	7675.37	8.18	7675.21	4.81	7678.58
160			7.75	7675.64	8.15	7675.24	8.25	7675.14		
170			8.84	7674.55	9.63	7673.76	9.79	7673.60	8.20	7675.19
180			10.00	7673.39	10.57	7672.82	10.78	7672.61	8.62	7674.77
190	9.54	7673.85			10.88	7672.51	11.10	7672.29	8.86	7674.53
200	12.19	7671.20	12.24	7671.15	13.45	7669.94	13.37	7670.02	11.20	7672.19

Max. Water Surface Slope (fraction):	0.257
Min. Water Surface Slope (fraction):	0.006
Avg. Water Surface Slope (fraction):	0.066

Profile P-3

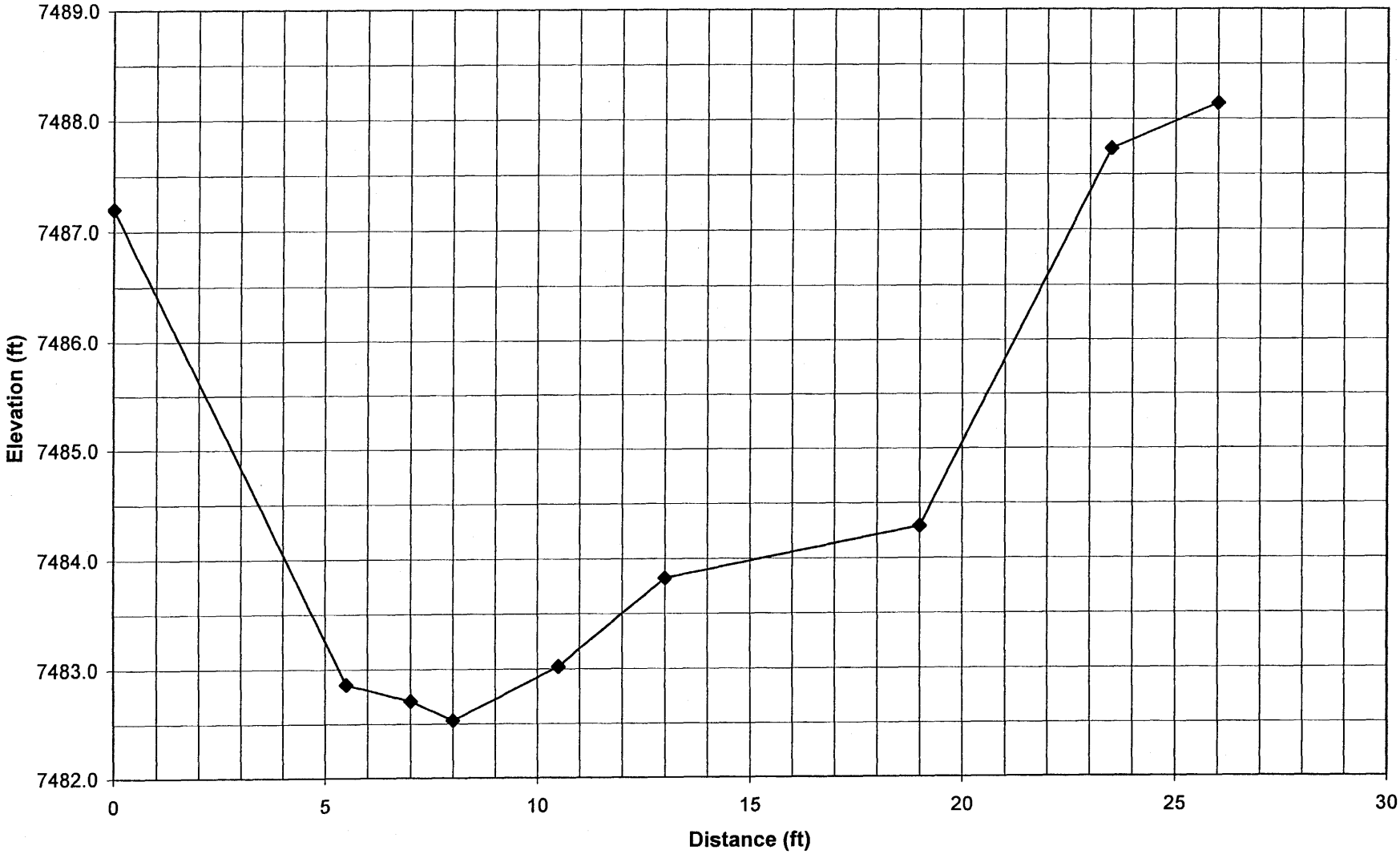

7684
7682
7680
7678
7676
7674
7672
7670
7668
Elevation (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance (ft)
Top of Bank Left
Bankfull Left
Water Surface
Channel Bottom
Top of Bank Right

Cross Section: P-4

Survey date:	23-Sep-05
Benchmark elevation:	7488.00
Benchmark rod reading:	2.70

Station	Rod Reading	Elevation
0	3.50	7487.20
5.5	7.84	7482.86
7	7.99	7482.71
8	8.17	7482.53
10.5	7.68	7483.02
13	6.88	7483.82
19	6.41	7484.29
23.5	2.97	7487.73
26	2.56	7488.14

Cross-Section P-4



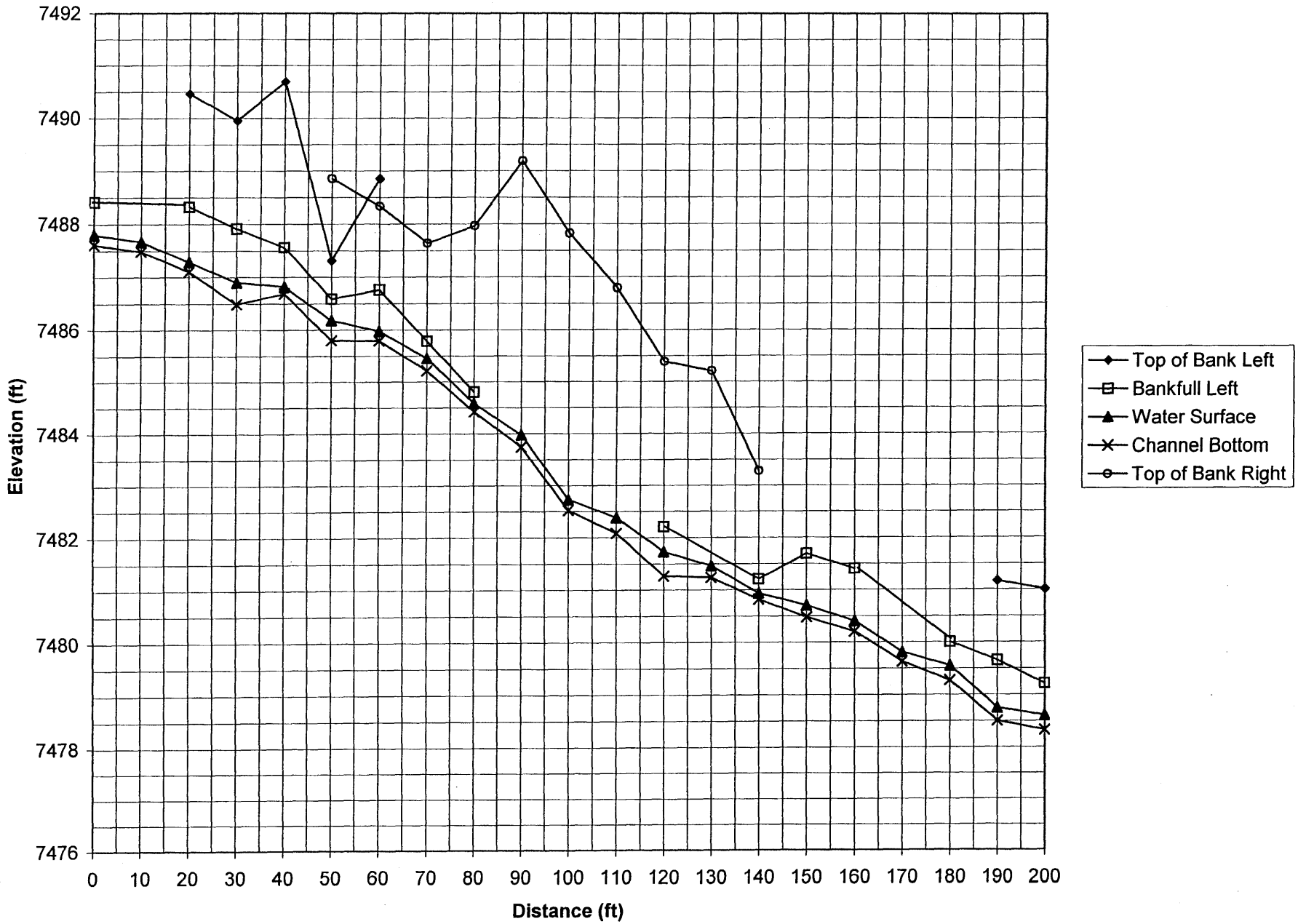
Profile: P-4

Survey date: 23-Sep-05
Benchmark elevation (ft): 7488
Rod reading at benchmark (ft): 2.70

	Top of Bank Left		Bankfull Left		Water Surface		Channel Bottom		Top of Bank Right	
Station	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation
0			2.29	7488.41	2.90	7487.80	3.09	7487.61		
10					3.03	7487.67	3.22	7487.48		
20	0.24	7490.46	2.38	7488.32	3.42	7487.28	3.60	7487.10		
30	0.75	7489.95	2.79	7487.91	3.80	7486.90	4.21	7486.49		
40	0.01	7490.69	3.14	7487.56	3.88	7486.82	4.01	7486.69		
50	3.39	7487.31	4.11	7486.59	4.52	7486.18	4.90	7485.80	1.85	7488.85
60	1.85	7488.85	3.94	7486.76	4.73	7485.97	4.91	7485.79	2.37	7488.33
70			4.92	7485.78	5.25	7485.45	5.49	7485.21	3.06	7487.64
80			5.90	7484.80	6.12	7484.58	6.28	7484.42	2.74	7487.96
90					6.73	7483.97	6.96	7483.74	1.52	7489.18
100					7.97	7482.73	8.18	7482.52	2.88	7487.82
110					8.32	7482.38	8.62	7482.08	3.91	7486.79
120			8.50	7482.20	8.97	7481.73	9.44	7481.26	5.32	7485.38
130					9.24	7481.46	9.47	7481.23	5.50	7485.20
140			9.50	7481.20	9.77	7480.93	9.89	7480.81	7.43	7483.27
150			9.01	7481.69	10.00	7480.70	10.22	7480.48		
160			9.30	7481.40	10.30	7480.40	10.50	7480.20		
170					10.89	7479.81	11.07	7479.63		
180			10.70	7480.00	11.15	7479.55	11.43	7479.27		
190	9.54	7481.16	11.05	7479.65	11.95	7478.75	12.20	7478.50		
200	9.70	7481.00	11.49	7479.21	12.10	7478.60	12.38	7478.32		

Max. Water Surface Slope (fraction): 0.124
Min. Water Surface Slope (fraction): 0.008
Avg. Water Surface Slope (fraction): 0.046

Profile P-4

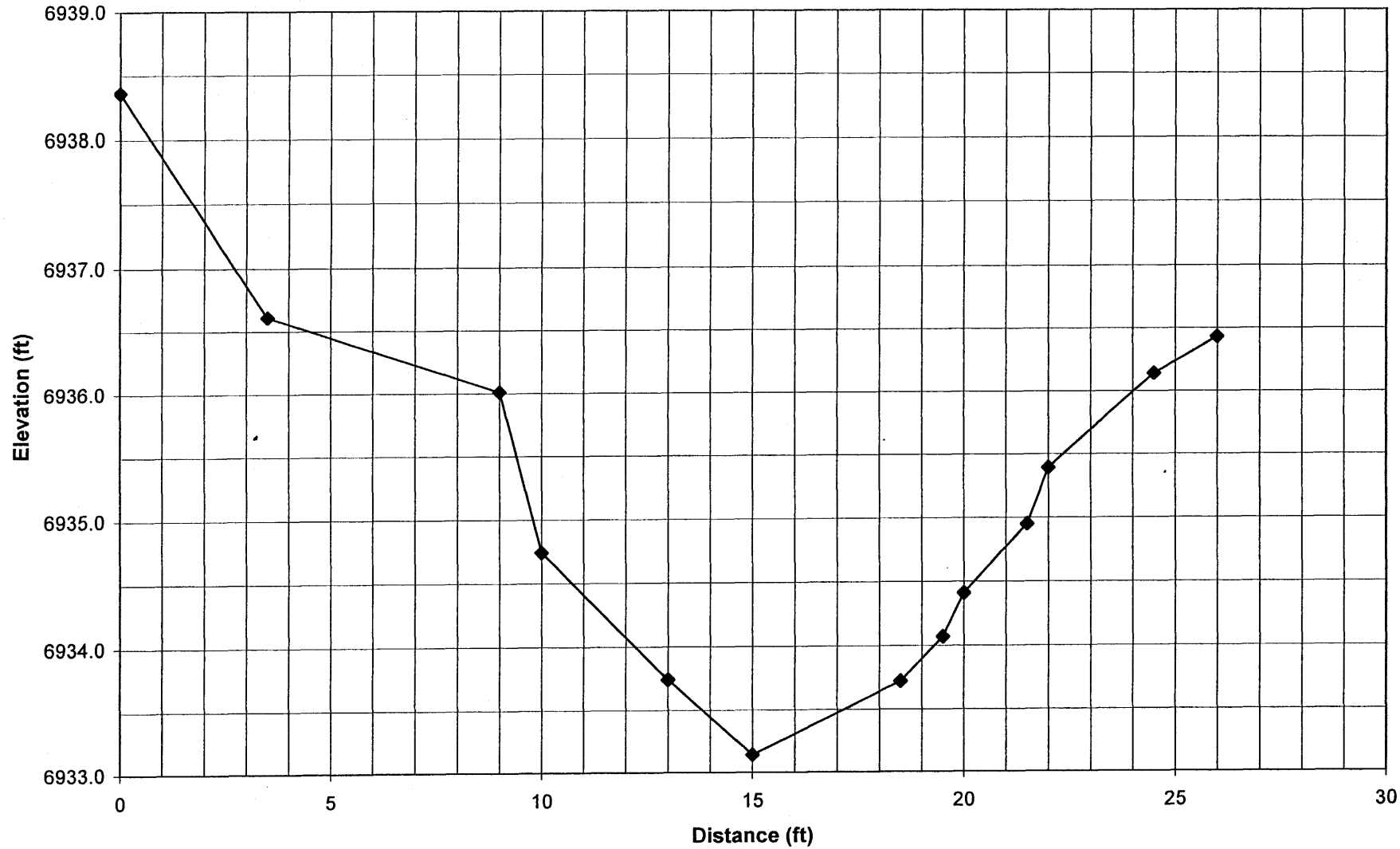

7492
7490
7488
7486
7484
7482
7480
7478
7476
Elevation (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance (ft)
Top of Bank Left
Bankfull Left
Water Surface
Channel Bottom
Top of Bank Right

Cross Section: P-5

Survey date:	23-Sep-05
Benchmark elevation:	6938.00
Benchmark rod reading:	2.99

Station	Rod Reading	Elevation
0	2.63	6938.36
3.5	4.38	6936.61
9	4.98	6936.01
10	6.25	6934.74
13	7.25	6933.74
15	7.85	6933.14
18.5	7.27	6933.72
19.5	6.92	6934.07
20	6.58	6934.41
21.5	6.04	6934.95
22	5.60	6935.39
24.5	4.85	6936.14
26	4.56	6936.43

Cross-Section P-5



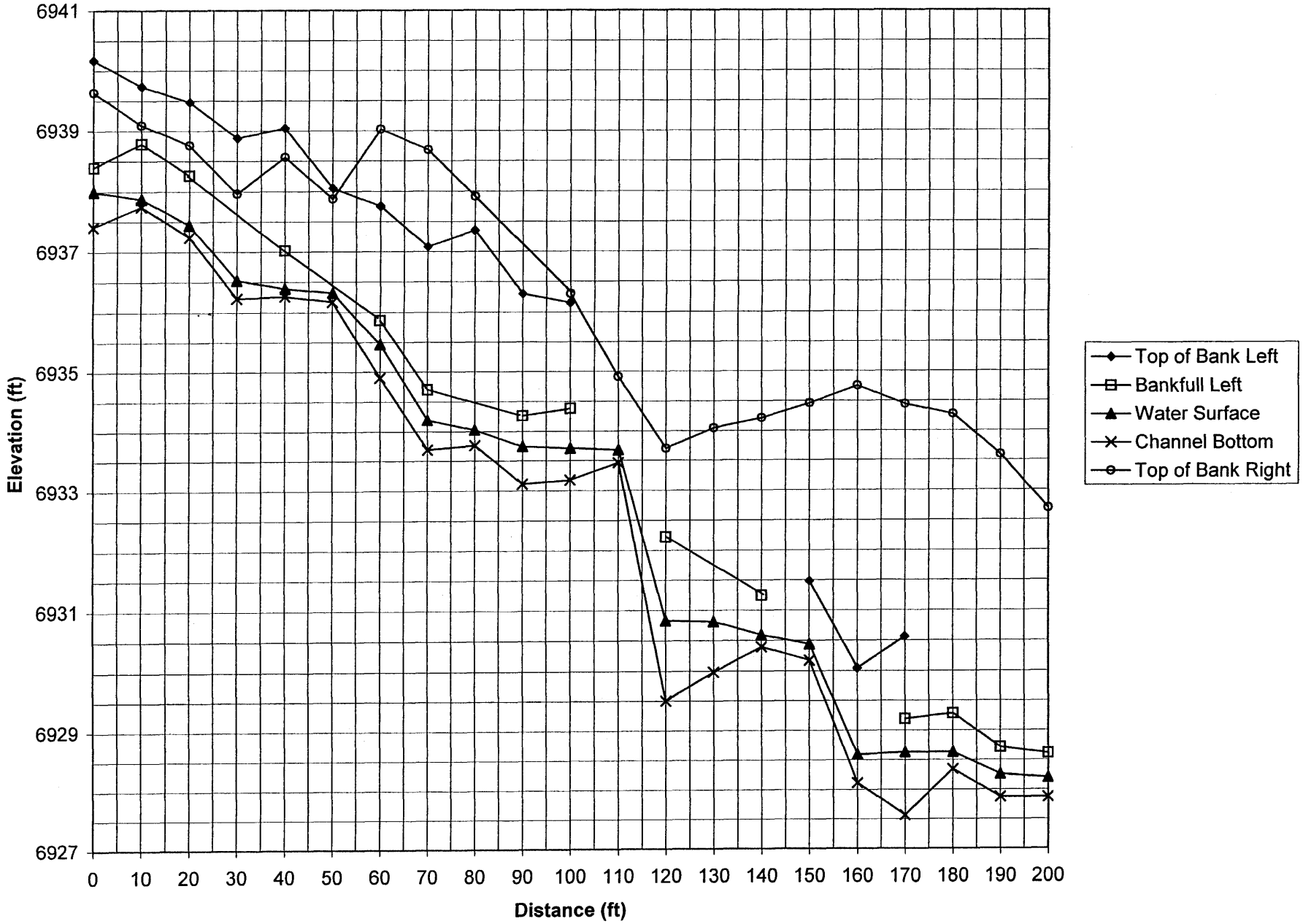
Profile: P-5

Survey date:	23-Sep-05
Benchmark elevation (ft):	6938
Rod reading at benchmark (ft):	2.99

	Top of Bank Left		Bankfull Left		Water Surface		Channel Bottom		Top of Bank Right	
Station	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation	Rod Reading	Elevation
0	0.82	6940.17	2.60	6938.39	3.00	6937.99	3.58	6937.41	1.36	6939.63
10	1.26	6939.73	2.21	6938.78	3.12	6937.87	3.25	6937.74	1.90	6939.09
20	1.52	6939.47	2.73	6938.26	3.55	6937.44	3.75	6937.24	2.23	6938.76
30	2.11	6938.88			4.46	6936.53	4.76	6936.23	3.03	6937.96
40	1.95	6939.04	3.97	6937.02	4.60	6936.39	4.73	6936.26	2.43	6938.56
50	2.94	6938.05			4.67	6936.32	4.82	6936.17	3.12	6937.87
60	3.24	6937.75	5.13	6935.86	5.53	6935.46	6.09	6934.90	1.97	6939.02
70	3.91	6937.08	6.29	6934.70	6.80	6934.19	7.30	6933.69	2.31	6938.68
80	3.64	6937.35			6.97	6934.02	7.23	6933.76	3.08	6937.91
90	4.69	6936.30	6.73	6934.26	7.25	6933.74	7.88	6933.11		
100	4.84	6936.15	6.61	6934.38	7.28	6933.71	7.82	6933.17	4.69	6936.30
110					7.31	6933.68	7.53	6933.46	6.08	6934.91
120			8.77	6932.22	10.16	6930.83	11.49	6929.50	7.29	6933.70
130					10.18	6930.81	11.01	6929.98	6.95	6934.04
140			9.75	6931.24	10.40	6930.59	10.60	6930.39	6.78	6934.21
150	9.51	6931.48			10.55	6930.44	10.82	6930.17	6.53	6934.46
160	10.95	6930.04			12.40	6928.59	12.88	6928.11	6.24	6934.75
170	10.43	6930.56	11.80	6929.19	12.36	6928.63	13.43	6927.56	6.55	6934.44
180			11.71	6929.28	12.36	6928.63	12.65	6928.34	6.72	6934.27
190			12.28	6928.71	12.73	6928.26	13.12	6927.87	7.40	6933.59
200			12.38	6928.61	12.79	6928.20	13.12	6927.87	8.30	6932.69

Max. Water Surface Slope (fraction):	0.285
Min. Water Surface Slope (fraction):	-0.004
Avg. Water Surface Slope (fraction):	0.049

Profile P-5


6941
6939
6937
6935
6933
6931
6929
6927
Elevation (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Distance (ft)
Top of Bank Left
Bankfull Left
Water Surface
Channel Bottom
Top of Bank Right

Stream Channel Above Site P-1 – Geomorphology Study

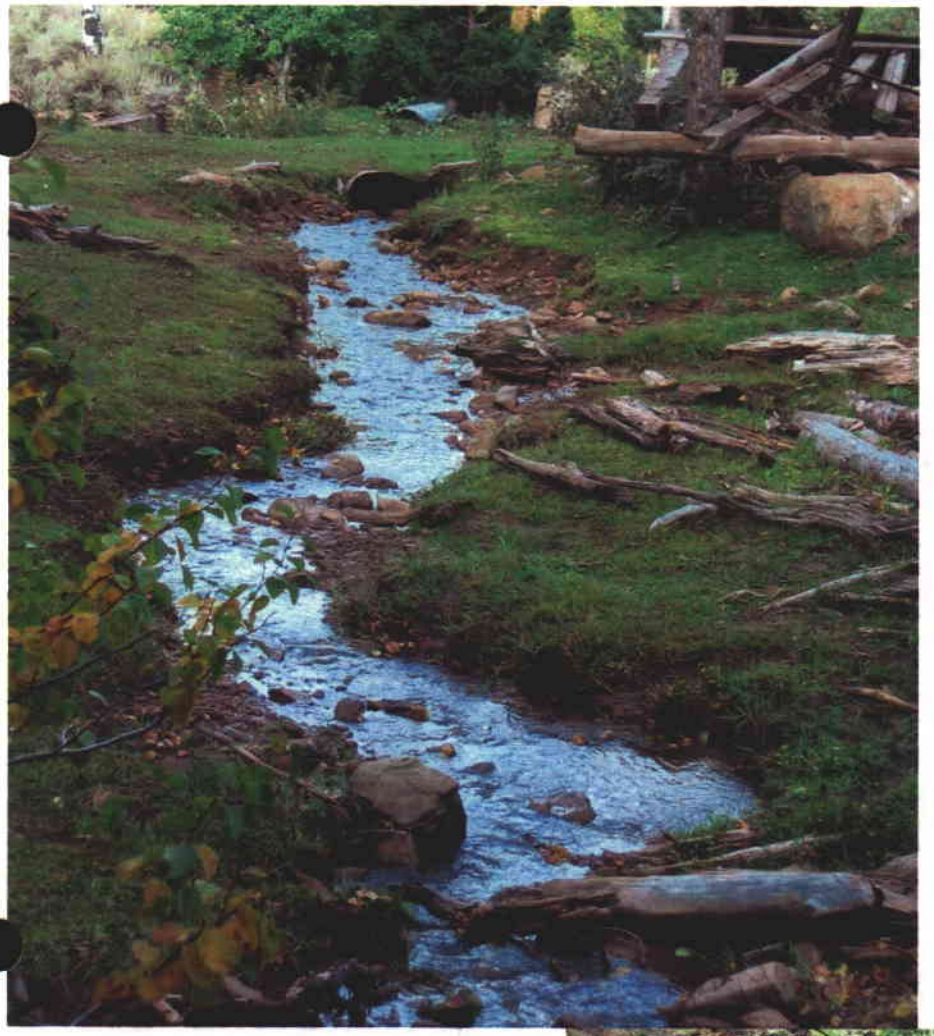
Stream Channel Above Site P-1 – Geomorphology Study

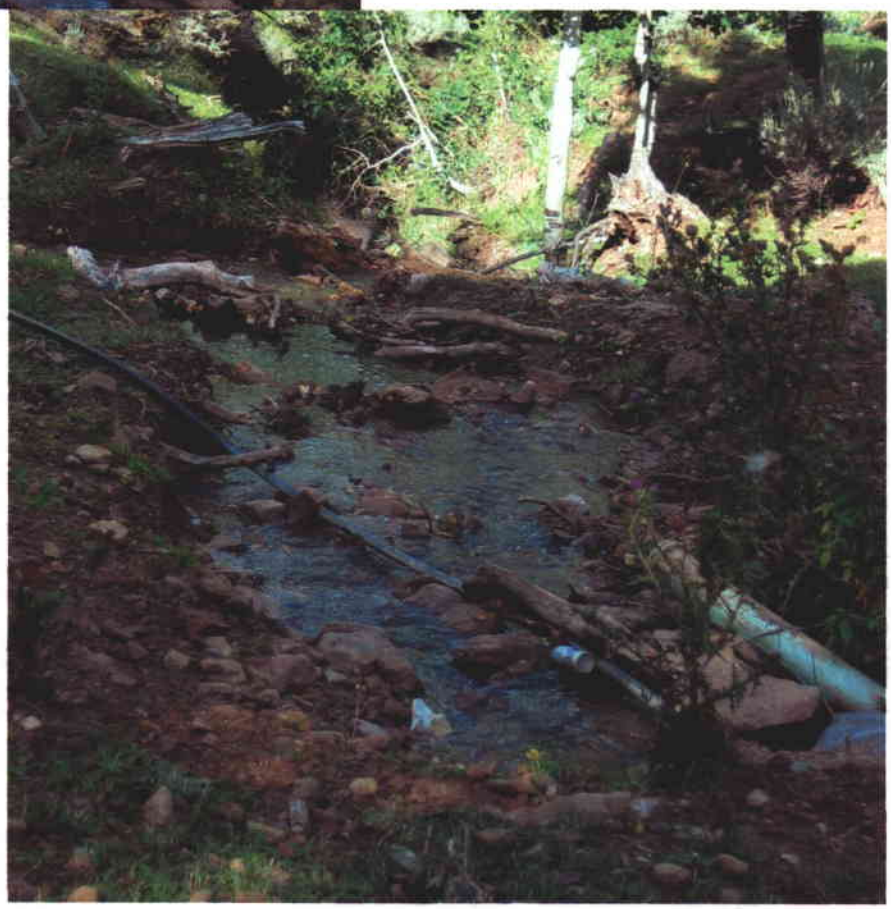
Stream Channel Between Sites P-1 & P-2 , Geomorphology Study

Stream Channel Between Sites P-1 & P-2 , Geomorphology Study

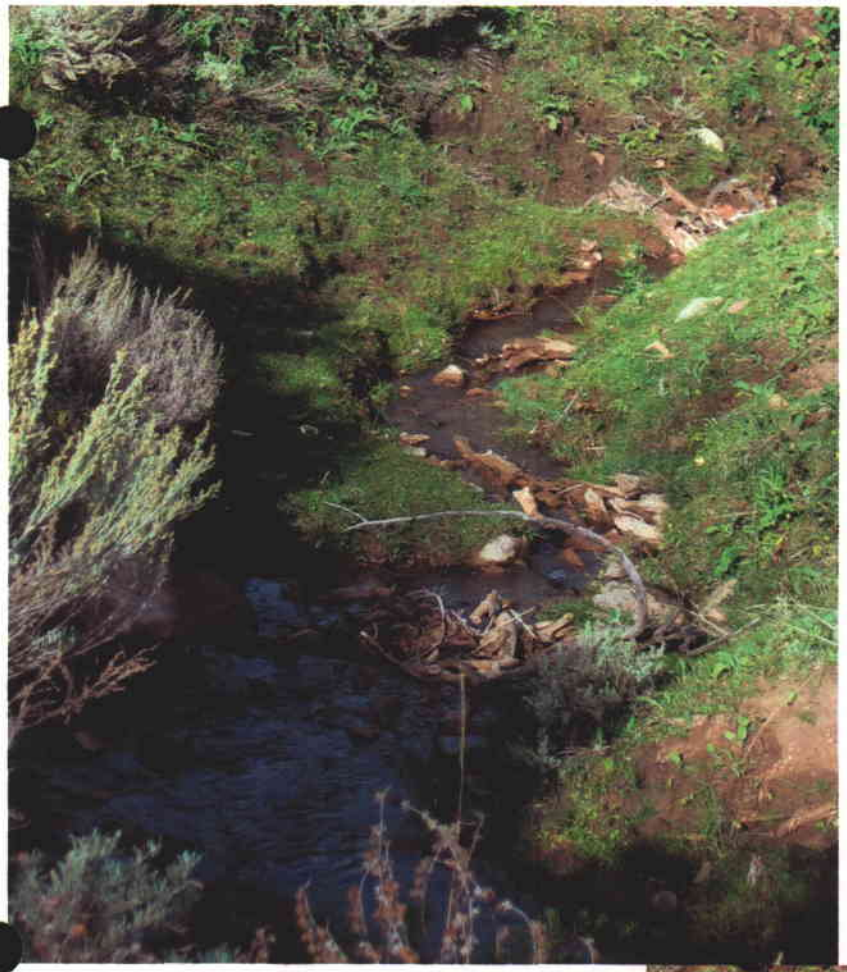
Stream Channel
Immediately
Above Site P-2

Stream
Channel
above
Site P-2



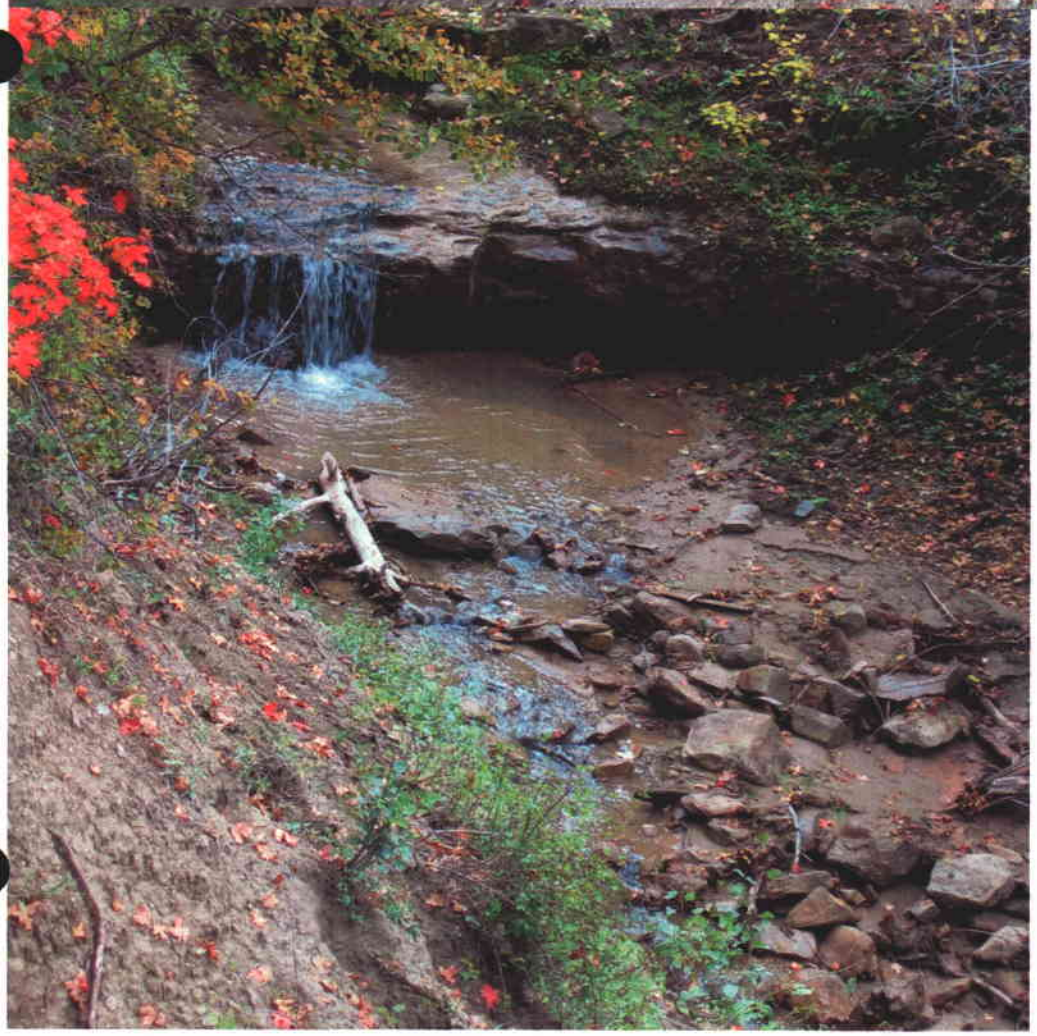


Stream Channel above Site P-2, Geomorphology Study



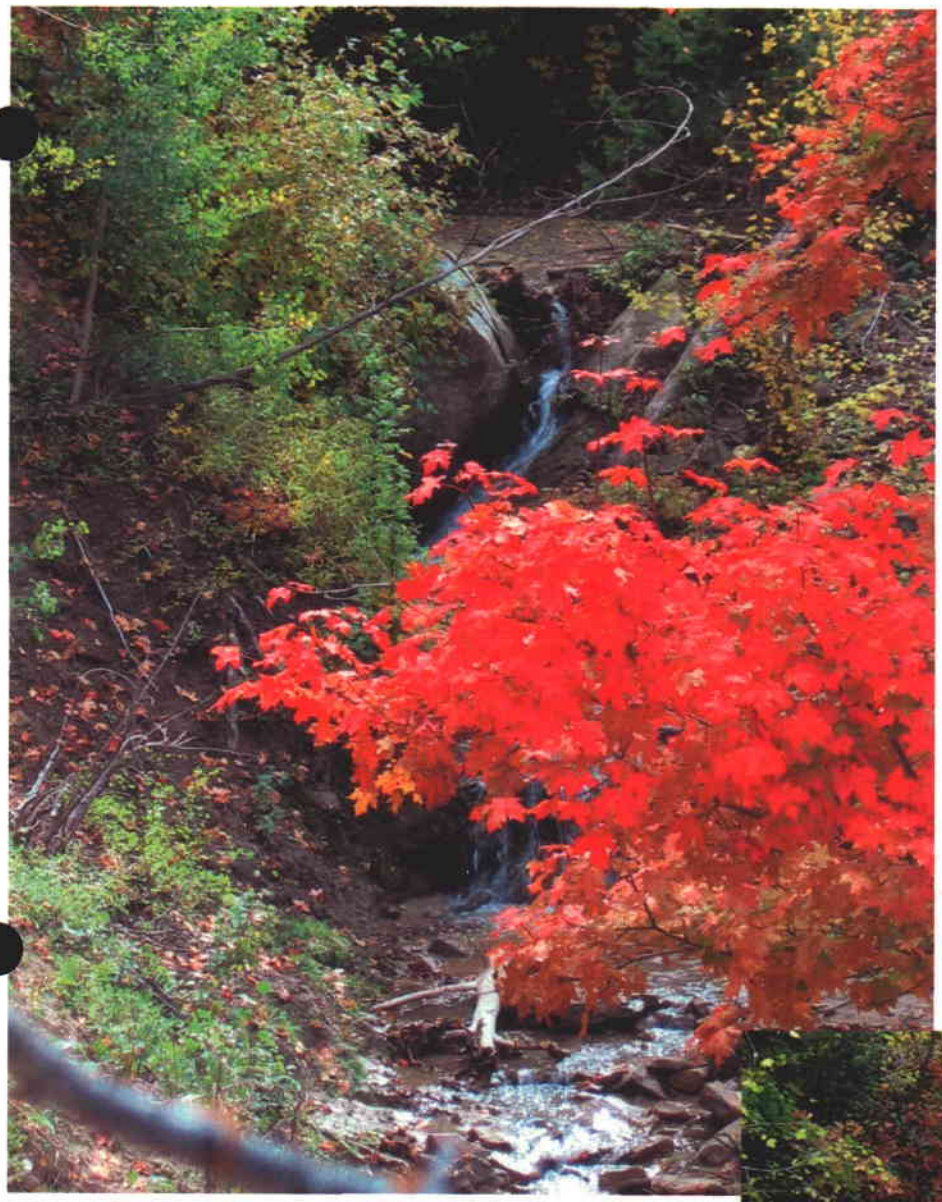
Stream Channel Below Site P-2, Geomorphology Study

Stream Channel Between Sites P-2 & P-3 , Geomorphology Study



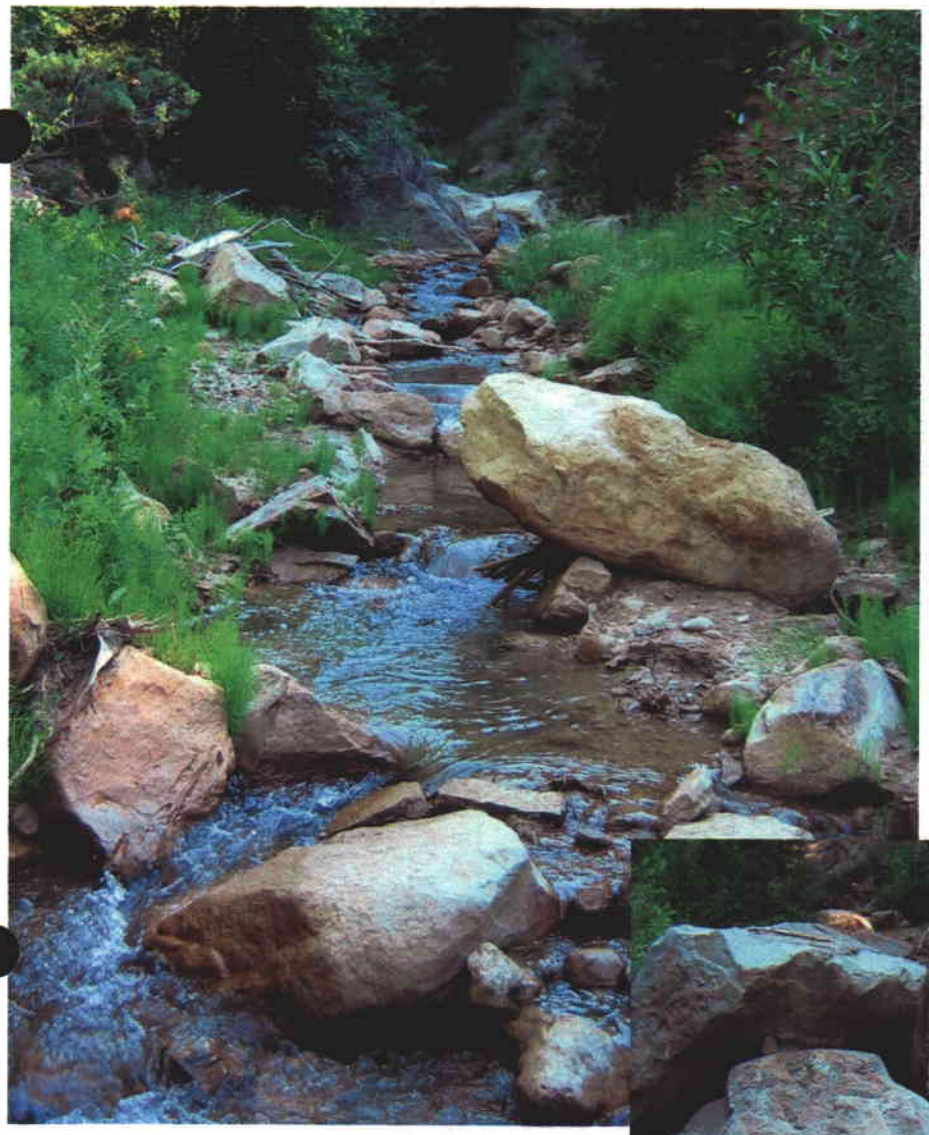
Stream Channel Between Sites P-2 & P-3 , Geomorphology Study

Stream Channel Between Sites P-3 & P-4 , Geomorphology Study



Stream Channel Between
Sites P-3 & P-4 ,
Geomorphology Study

Stream Channel Between Sites P-4 & P-5 , Geomorphology Study



Stream Channel Between Sites P-4 & P-5 , Geomorphology Study

Stream Channel Between Sites P-4 & P-5 , Geomorphology Study

Inter·Mountain Laboratories, Inc.

Report ID: 010501873

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01873
Report Date: 04/19/05

Lab Id	Sample Id	pH	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Total Sulfur	T.S. AB	Neutral. Pot.	T.S. ABP
		s.u.	dS/m	meq/L	meq/L	meq/L		%	t/1000t	t/1000t	t/1000t
0105S01873	Waste Oxidized	4.2	2.20	25.1	8.75	0.20	0.05	<0.01	0.00	-0.53	-0.53

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501875

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01875	Near Creek Waste	6.5	46.7	2.49	26.9	4.40	0.13	0.03	67.0	21.0	12.0	SANDY LOAM
0105S01876	Horizon B W-1	7.6	33.0	0.26	1.56	0.61	0.09	0.09	53.0	29.0	18.0	SANDY LOAM
0105S01877	Horizon B 2 W-1	7.6	32.4	0.26	1.44	0.65	0.15	0.15	43.0	37.0	20.0	LOAM
0105S01878	By Well Waste	5.7	51.5	0.43	2.40	1.11	0.09	0.07	82.0	8.0	10.0	LOAMY SAND
0105S01879	Horizon A W-1	7.3	38.2	0.43	2.68	0.99	0.10	0.08	49.0	34.0	17.0	LOAM
0105S01880	Horizon A E-2	7.1	61.8	0.46	2.79	0.79	0.06	0.05	57.0	27.0	16.0	SANDY LOAM
0105S01881	Horizon A 2 E-2	7.3	37.6	0.45	2.72	0.66	0.09	0.07	57.0	27.0	16.0	SANDY LOAM
0105S01882	Horizon B E-2	7.5	30.3	0.25	1.62	0.46	0.14	0.14	53.0	31.0	16.0	SANDY LOAM
0105S01883	Horizon C E-2	7.6	27.9	0.27	1.44	0.53	0.10	0.11	64.0	24.0	12.0	SANDY LOAM
0105S01884	E-1	7.7	26.3	0.32	1.77	0.66	0.14	0.12	71.0	17.0	12.0	SANDY LOAM

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

1673 Terra Avenue
Sheridan, WY 82801

Report ID: 010501875

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm	TKN %
0105S01875	Near Creek Waste	43.6	33.3	12.3	0.07	0.06	1.14	14.3	14.1	0.02	0.11
0105S01876	Horizon B W-1	21.5	22.1	8.7	0.05	0.05	0.16	<0.02	5.82	<0.02	0.33
0105S01877	Horizon B 2 W-1	4.8	22.1	9.6	0.06	0.06	0.20	0.32	1.23	<0.02	0.05
0105S01878	By Well Waste	44.3	24.5	8.6	0.06	0.06	0.38	0.90	2.13	<0.02	1.47
0105S01879	Horizon A W-1	15.2	27.0	9.8	0.05	0.05	0.22	1.06	3.03	<0.02	0.13
0105S01880	Horizon A E-2	5.8	36.6	17.8	0.04	0.04	0.84	7.82	13.4	<0.02	0.28
0105S01881	Horizon A 2 E-2	20.4	23.3	9.4	0.05	0.05	0.26	1.68	2.03	<0.02	0.12
0105S01882	Horizon B E-2	16.5	19.4	8.5	0.04	0.04	0.18	0.76	0.90	<0.02	0.09
0105S01883	Horizon C E-2	13.5	18.1	5.1	0.05	0.05	0.12	0.32	0.72	<0.02	0.02
0105S01884	E-1	43.5	16.3	6.4	0.08	0.08	0.18	1.06	1.08	<0.02	0.03

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501875

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t	Sulfate-Sulfur %	Pyritic-Sulfur %	Organic-Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t
0105S01875	Near Creek Waste	33.5	0.76	23.7	23.6	-0.13					
0105S01876	Horizon B W-1	0.6	0.02	0.62	8.53	7.91					
0105S01877	Horizon B 2 W-1	0.7	<0.01	0.00	54.2	54.2					
0105S01878	By Well Waste	61.0	0.95	29.7	-0.09	-29.8	0.15	0.80	<0.01	25.0	-25.1
0105S01879	Horizon A W-1	1.7	0.03	0.94	17.2	16.2					
0105S01880	Horizon A E-2	5.3	0.05	1.56	35.6	34.1					
0105S01881	Horizon A 2 E-2	1.6	<0.01	0.00	109	109					
0105S01882	Horizon B E-2	0.7	<0.01	0.00	212	212					
0105S01883	Horizon C E-2	<0.1	<0.01	0.00	222	222					
0105S01884	E-1	0.5	0.01	0.31	247	246					

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501875

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01883	Horizon C E-2	7.6	27.9	0.27	1.44	0.53	0.10	0.11	64.0	24.0	12.0	SANDY LOAM
0105S01883D	Horizon C E-2	7.6	26.4	0.25	1.35	0.51	0.12	0.13	65.0	23.0	12.0	SANDY LOAM

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501875

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm	TKN %
0105S01883	Horizon C E-2	13.5	18.1	5.1	0.05	0.05	0.12	0.32	0.72	<0.02	0.02
0105S01883D	Horizon C E-2		18.5	5.2	0.05	0.05	0.12	0.38	0.49	<0.02	0.01

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501875

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 04/06/05

Set #0105S01875
Report Date: 04/19/05

Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t	Sulfate-Sulfur %	Pyritic-Sulfur %	Organic-Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t
0105S01883	Horizon C E-2	<0.1	<0.01	0.00	222	222					
0105S01883D	Horizon C E-2	<0.1	<0.01	0.00	219	219					

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501744

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01744	12-3-04A	6.6	46.0	1.59	8.44	7.19	1.25	0.45	88.0	8.0	4.0	SAND
0105S01745	12-3-04B	6.9	46.1	1.68	8.49	7.01	1.15	0.41	84.0	12.0	4.0	LOAMY SAND
0105S01746	12-6-04A	7.0	41.4	1.80	9.31	7.77	1.25	0.43	86.0	10.0	4.0	LOAMY SAND
0105S01747	12-6-04B	6.7	40.0	1.98	10.7	8.98	1.45	0.46	84.0	10.0	6.0	LOAMY SAND
0105S01748	12-07-04A	6.8	42.9	2.04	11.2	9.19	1.16	0.36	87.0	9.0	4.0	LOAMY SAND
0105S01749	12-07-04B	6.9	43.1	1.86	9.94	8.10	1.07	0.35	88.0	8.0	4.0	SAND
0105S01750	12-9-04A	6.8	37.3	2.50	14.8	11.3	1.27	0.35	84.0	10.0	6.0	LOAMY SAND
0105S01751	12-9-04B	6.9	38.5	2.36	14.5	11.0	1.20	0.33	84.0	12.0	4.0	LOAMY SAND
0105S01752	12-16-04A	7.3	37.8	2.64	16.4	12.9	1.37	0.36	86.0	10.0	4.0	LOAMY SAND
0105S01753	12-16-04B	7.1	40.2	2.19	12.5	10.5	1.16	0.34	86.0	9.0	5.0	LOAMY SAND
0105S01754	12-29-04	7.1	39.7	1.56	6.96	7.39	1.31	0.49	86.0	10.0	4.0	LOAMY SAND
0105S01755	12-20-04A	7.2	37.3	2.01	11.5	9.52	1.11	0.34	84.0	12.0	4.0	LOAMY SAND
0105S01756	12-20-04B	7.1	37.6	2.35	14.3	11.3	1.26	0.35	86.0	10.0	4.0	LOAMY SAND
0105S01757	12-21-04A	6.9	40.6	1.89	10.0	8.89	1.14	0.37	87.0	9.0	4.0	LOAMY SAND
0105S01758	12-21-04B	7.2	37.6	1.87	10.1	8.93	1.12	0.36	84.0	12.0	4.0	LOAMY SAND

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501744

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Selenium ppm	TKN %
0105S01744	12-3-04A	24.3	17.5	4.9	0.07	0.01	0.48	0.20	0.04	0.79
0105S01745	12-3-04B	22.9	17.6	4.7	0.07	0.02	0.40	0.14	0.04	0.56
0105S01746	12-6-04A	19.5	20.3	5.2	0.07	0.02	0.50	0.12	0.04	0.96
0105S01747	12-6-04B	20.2	22.1	5.1	0.08	0.02	0.38	0.10	0.04	0.53
0105S01748	12-07-04A	27.6	16.1	4.3	0.06	0.01	0.54	0.12	0.08	0.83
0105S01749	12-07-04B	32.6	16.6	4.6	0.07	0.02	0.44	0.10	0.06	0.55
0105S01750	12-9-04A	36.9	21.9	4.9	0.08	0.03	0.48	0.10	0.08	0.42
0105S01751	12-9-04B	30.2	17.6	5.1	0.07	0.02	0.46	0.10	0.08	0.79
0105S01752	12-16-04A	35.3	17.7	4.8	0.07	0.02	0.40	0.08	0.06	0.31
0105S01753	12-16-04B	35.2	18.6	5.2	0.07	0.02	0.36	0.12	0.06	1.16
0105S01754	12-29-04	14.7	22.1	4.6	0.08	0.03	0.42	0.08	0.02	0.39
0105S01755	12-20-04A	30.6	19.2	4.7	0.07	0.03	0.26	0.06	0.04	0.67
0105S01756	12-20-04B	32.4	17.8	4.7	0.07	0.02	0.36	0.08	0.04	0.59
0105S01757	12-21-04A	33.1	20.0	4.7	0.08	0.03	0.36	0.10	0.04	0.40
0105S01758	12-21-04B	31.1	18.5	4.7	0.07	0.03	0.42	0.08	0.04	0.86

These results only apply to the samples tested.

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Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t
0105S01744	12-3-04A	71.5	0.61	19.1	18.0	-1.06
0105S01745	12-3-04B	70.1	0.64	20.0	18.2	-1.81
0105S01746	12-6-04A	64.1	0.69	21.6	19.9	-1.67
0105S01747	12-6-04B	62.7	0.69	21.6	20.5	-1.02
0105S01748	12-07-04A	65.6	0.70	21.9	20.0	-1.83
0105S01749	12-07-04B	64.2	0.71	22.2	21.6	-0.60
0105S01750	12-9-04A	57.6	0.64	20.0	17.3	-2.71
0105S01751	12-9-04B	56.0	0.65	20.3	18.6	-1.74
0105S01752	12-16-04A	60.7	0.55	17.2	21.2	4.04
0105S01753	12-16-04B	54.0	0.56	17.5	21.6	4.06
0105S01754	12-29-04	51.5	0.52	16.2	31.2	15.0
0105S01755	12-20-04A	51.9	0.56	17.5	21.2	3.66
0105S01756	12-20-04B	51.8	0.56	17.5	20.3	2.78
0105S01757	12-21-04A	52.7	0.55	17.2	32.3	15.1
0105S01758	12-21-04B	52.2	0.50	15.6	31.4	15.8

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Date Received: 03/23/05

Set #0105S01744
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Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01759	12-22-04A	7.2	38.2	1.89	10.1	9.36	1.31	0.42	84.0	12.0	4.0	LOAMY SAND
0105S01760	12-22-04B	7.3	39.5	1.88	9.21	9.00	1.27	0.42	84.0	12.0	4.0	LOAMY SAND
0105S01761	1-4-05A	7.3	40.8	1.40	6.79	6.24	1.29	0.51	86.3	8.7	5.0	LOAMY SAND
0105S01762	1-7-05A	7.6	40.1	2.54	17.0	11.2	1.38	0.37	90.0	6.0	4.0	SAND
0105S01763	1-13-05A	7.5	36.4	2.40	14.5	11.7	1.76	0.49	87.0	9.0	4.0	LOAMY SAND
0105S01764	1-14-05A	7.3	39.0	2.89	21.0	13.2	1.52	0.37	88.0	8.0	4.0	SAND
0105S01765	1-15-05A	7.2	39.9	2.85	20.7	13.0	1.35	0.33	86.0	10.0	4.0	LOAMY SAND
0105S01766	2-9-05A	7.5	43.1	1.26	4.60	5.58	1.67	0.74	84.0	12.0	4.0	LOAMY SAND
0105S01767	2-10-05A	7.5	43.9	1.15	4.13	4.86	1.57	0.74	88.0	8.0	4.0	SAND
0105S01768	2-11-05A	7.6	42.5	1.13	3.88	4.72	1.76	0.85	91.0	7.0	2.0	SAND
0105S01769	2-28-05A	7.5	40.4	1.40	5.66	5.85	1.64	0.68	89.0	7.0	4.0	SAND
0105S01770	3-1-05A	7.5	39.1	1.18	4.13	4.79	1.63	0.77	85.0	9.0	6.0	LOAMY SAND
0105S01771	3-2-05A	7.4	36.9	1.69	5.58	7.10	1.82	0.72	83.0	11.0	6.0	LOAMY SAND
0105S01772	3-3-05A	7.4	38.5	1.41	5.69	6.07	1.67	0.69	83.0	11.0	6.0	LOAMY SAND
0105S01773	3-8-05A	7.7	40.0	1.09	3.15	4.13	2.11	1.11	85.0	9.0	6.0	LOAMY SAND

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Selenium ppm	TKN %
0105S01759	12-22-04A	10.4	19.0	4.6	0.07	0.02	0.48	0.16	0.04	0.40
0105S01760	12-22-04B	11.4	18.1	4.8	0.07	0.02	0.48	0.22	0.04	0.83
0105S01761	1-4-05A	4.6	20.1	5.3	0.11	0.06	0.52	0.12	0.02	0.48
0105S01762	1-7-05A	48.7	21.6	4.6	0.08	0.02	0.50	0.20	0.02	0.96
0105S01763	1-13-05A	6.1	22.8	5.1	0.08	0.02	0.50	0.16	0.04	0.28
0105S01764	1-14-05A	59.7	20.5	5.1	0.08	0.02	0.34	0.16	0.02	0.73
0105S01765	1-15-05A	60.9	19.2	5.5	0.07	0.02	0.40	0.14	0.02	0.74
0105S01766	2-9-05A	1.9	14.9	6.6	0.10	0.03	0.46	0.16	0.02	0.59
0105S01767	2-10-05A	2.8	23.8	6.3	0.09	0.02	0.38	0.16	0.02	0.64
0105S01768	2-11-05A	2.5	21.8	6.7	0.10	0.03	0.34	0.14	0.02	0.85
0105S01769	2-28-05A	3.8	21.6	6.9	0.10	0.03	0.44	0.24	0.02	0.54
0105S01770	3-1-05A	3.5	22.1	6.6	0.10	0.04	0.42	0.14	0.02	0.56
0105S01771	3-2-05A	3.1	21.8	6.9	0.10	0.03	0.48	0.16	0.02	0.89
0105S01772	3-3-05A	3.7	22.2	7.1	0.10	0.04	0.50	0.16	0.02	0.33
0105S01773	3-8-05A	3.7	19.8	7.4	0.12	0.04	0.66	0.20	0.02	0.42

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
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Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t
0105S01759	12-22-04A	53.5	0.53	16.6	26.9	10.4
0105S01760	12-22-04B	52.7	0.55	17.2	26.7	9.52
0105S01761	1-4-05A	61.9	0.49	15.3	20.7	5.42
0105S01762	1-7-05A	60.7	0.54	16.9	25.2	8.31
0105S01763	1-13-05A	49.3	0.48	15.0	38.1	23.1
0105S01764	1-14-05A	57.5	0.53	16.6	28.5	11.9
0105S01765	1-15-05A	57.7	0.55	17.2	27.1	9.90
0105S01766	2-9-05A	67.1	0.54	16.9	18.0	1.10
0105S01767	2-10-05A	72.9	0.51	15.9	18.1	2.16
0105S01768	2-11-05A	71.5	0.52	16.2	14.3	-1.93
0105S01769	2-28-05A	63.7	0.51	15.9	21.9	6.00
0105S01770	3-1-05A	58.7	0.53	16.6	22.4	5.80
0105S01771	3-2-05A	53.7	0.50	15.6	22.8	7.15
0105S01772	3-3-05A	54.2	0.47	14.7	20.5	5.85
0105S01773	3-8-05A	57.1	0.47	14.7	31.0	16.4

These results only apply to the samples tested.

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Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01774	3-9-05A	7.5	38.8	1.10	3.47	4.23	1.78	0.91	87.0	9.0	4.0	LOAMY SAND
0105S01775	3-10-05A	7.6	39.2	1.13	3.31	4.10	2.11	1.09	80.0	14.0	6.0	LOAMY SAND
0105S01776	3-11-05A	7.6	38.3	1.40	4.72	5.20	2.53	1.14	82.0	14.0	4.0	LOAMY SAND
0105S01777	3-15-05A	7.8	41.0	0.73	1.73	2.00	1.91	1.40	86.0	10.0	4.0	LOAMY SAND

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Selenium ppm	TKN %
0105S01774	3-9-05A	4.2	20.0	7.3	0.13	0.06	0.72	0.14	0.02	0.43
0105S01775	3-10-05A	5.1	26.2	7.0	0.12	0.04	0.56	0.16	0.02	0.69
0105S01776	3-11-05A	4.6	25.2	6.6	0.12	0.02	0.60	0.16	0.02	0.59
0105S01777	3-15-05A	5.7	28.5	6.0	0.12	0.04	0.64	0.18	0.02	0.56

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Client Project ID: Dugout Canyon Mine
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Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t
0105S01774	3-9-05A	56.5	0.49	15.3	23.7	8.38
0105S01775	3-10-05A	54.9	0.48	15.0	20.4	5.42
0105S01776	3-11-05A	58.6	0.50	15.6	22.4	6.79
0105S01777	3-15-05A	67.5	0.52	16.2	14.1	-2.19

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Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR	Sand	Silt	Clay	Texture
		s.u.	%	dS/m	meq/L	meq/L	meq/L		%	%	%	
0105S01761	1-4-05A	7.3	40.8	1.40	6.79	6.24	1.29	0.51	86.3	8.7	5.0	LOAMY SAND
0105S01761D	1-4-05A	7.1	37.9	1.70	8.34	7.48	1.49	0.53	85.0	12.5	2.5	LOAMY SAND
0105S01770	3-1-05A	7.5	39.1	1.18	4.13	4.79	1.63	0.77	85.0	9.0	6.0	LOAMY SAND
0105S01770D	3-1-05A	7.5	38.6	1.07	3.64	4.24	1.47	0.74	89.0	5.0	6.0	SAND
0105S01772	3-3-05A	7.4	38.5	1.41	5.69	6.07	1.67	0.69	83.0	11.0	6.0	LOAMY SAND
0105S01772D	3-3-05A	7.5	41.2	1.16	4.51	4.68	1.35	0.63	85.0	9.0	6.0	LOAMY SAND
0105S01774	3-9-05A	7.5	38.8	1.10	3.47	4.23	1.78	0.91	87.0	9.0	4.0	LOAMY SAND
0105S01774D	3-9-05A	7.5	40.7	0.96	2.83	3.43	1.49	0.84	87.0	7.0	6.0	LOAMY SAND

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501744

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	Coarse Fragments %	Field Capacity %	Wilt Point %	Available Sodium meq/100g	Exchangeable Sodium meq/100g	Boron ppm	Nitrogen Nitrate ppm	Selenium ppm	TKN %
0105S01761	1-4-05A	4.6	20.1	5.3	0.11	0.06	0.52	0.12	0.02	0.48
0105S01761D	1-4-05A		22.1	5.1	0.11	0.05	0.56	0.12	0.02	0.33
0105S01770	3-1-05A	3.5	22.1	6.6	0.10	0.04	0.42	0.14	0.02	0.56
0105S01770D	3-1-05A		20.9	6.1	0.09	0.03	0.50	0.16	0.02	0.38
0105S01772	3-3-05A	3.7	22.2	7.1	0.10	0.04	0.50	0.16	0.02	0.33
0105S01772D	3-3-05A		18.6	6.1	0.08	0.02	0.58	0.18	0.02	0.54
0105S01774	3-9-05A	4.2	20.0	7.3	0.13	0.06	0.72	0.14	0.02	0.43
0105S01774D	3-9-05A		16.9	6.7	0.12	0.06	0.52	0.20	0.02	0.36

These results only apply to the samples tested.

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Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

Report ID: 010501744

1673 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report
Canyon Fuel Co
Dugout Mine
P.O. Box 1029
Wellington, UT 84542

Client Project ID: Dugout Canyon Mine
Date Received: 03/23/05

Set #0105S01744
Report Date: 04/08/05

Lab Id	Sample Id	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t
0105S01761	1-4-05A	61.9	0.49	15.3	20.7	5.42
0105S01761D	1-4-05A	59.2	0.49	15.3	22.6	7.34
0105S01770	3-1-05A	58.7	0.53	16.6	22.4	5.80
0105S01770D	3-1-05A	58.1	0.53	16.6	22.1	5.59
0105S01772	3-3-05A	54.2	0.47	14.7	20.5	5.85
0105S01772D	3-3-05A	54.2	0.45	14.1	21.0	6.93
0105S01774	3-9-05A	56.5	0.49	15.3	23.7	8.38
0105S01774D	3-9-05A	56.9	0.49	15.3	23.2	7.93

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

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