

Levels at Streamflow Gaging Stations--
A CD-ROM Based Training Class



Water Resources Investigations Report 02-7777
by
K. Michael Nolan, Nathan Jacobson, Robert Erickson, and Stanley Landon

[Next](#)

The basic piece of data collected at
gaging stations is **Stream Stage**



[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#)

[Navigation](#)
[Back](#) [Next](#)

Datum must be checked regularly



Surveying Crew from
Utah District Office



Benchmark



Gage Houses Settle

[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#)

[Navigation](#)
[Back](#) [Next](#)

Datum should be checked regularly (cont.)



Staff gage undercut by bank erosion



Play Stop Progress Volume

Navigation Back Next

Reference

- TWRI Book 3, Chapter A19, Levels at Streamflow Gaging Stations, by E. J. Kennedy is available as a "pdf" document.
- Provides details of all concepts discussed in this training class



Play Stop Progress Volume

Navigation Back Next

Frequency of Levels



- Current policy on frequency of levels outlined in OSW [memo 90.10](#)

Play Stop Progress Volume

Navigation Back Next

Leveling concepts

Foresights (FS)

- Used to establish the elevation of a new surveying point

Elevation of new point = Height of Instrument (HI) - Foresight (FS)

Backsights (BS)

- Used to establish height of instrument (HI)

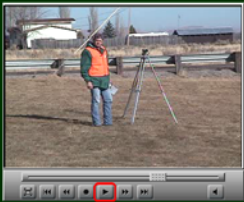
Height of Instrument = Elevation of known point + Rod Reading (RR)

Play Stop Progress Volume

Narration

Navigation Back Next

Leveling Concepts (cont.)



Click on button to start video

Backsight

Play Stop Progress Volume

Narration

Navigation Back Next

Leveling Concepts (cont.)

Backsight

Back Next

Leveling Concepts (cont.)

Example Level Notes

STATION	B.S.	HT. INST.	F.S.	ELEVATION	REMARKS
RM-1				3.927	
	5.124	9.051			Inst. At A, Establish H.I.
TP			1.764	7.287	Inst. At A, Determine elev. Of T.P.
	6.186	13.473			Inst. At B, Determine new H.I.
RM-2			2.162	11.311	Inst. At B, Determine elev.. RM-2

Play

Stop

Progress

Narration

Volume

Navigation

Back

Next

Leveling Concepts (cont.)

Turning

Play

Stop

Progress

Narration

Volume

Navigation

Back

Next

Turning

Back

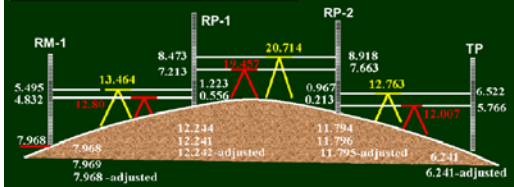
Next

Leveling Concepts - Circuits

Level Creek near Great Falls, Idaho

STATION	B.S.	HI, INST.	F.S.	ELEVATION	REMARKS
RM-1				7.968	
RP-1	4.832	12.800	0.566	12.244	
RP-2	7.213	19.457	7.663	11.794	
RP-3	0.213	12.007	5.766	6.241	
RP-2	6.522	12.763	0.967	11.796	
RP-1	8.918	20.714	8.473	12.241	
RM-1	1.223	13.464	5.495	7.969	

- Allowable closure = $0.003 \sqrt{n/2}$
 - In this example $0.003 \times 61/2$, or 0.007
 - Error of closure = 0.001, so level circuit was O.K.
- n = number of setups



Narration

Play Stop Progress Volume

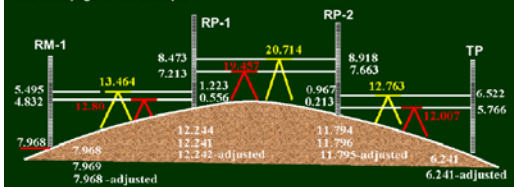
Navigation

Back Next

Elevations of surveyed points are adjusted by distributing the closure error. Differences in elevation between each pair of adjacent points are determined and the mean difference is used to compute each adjusted elevation. This procedure also identifies faulty readings and portions of a circuit that may need to be resurveyed. See next page for an example

Adjustments of elevations

Object	1st Diff	2nd Diff	Ave. Diff	Elev.
RM-1				7.968
RP-1	4.276	4.272	4.274	12.242
RP-2	-0.450	-0.445	-0.447	11.795
TP	-5.553	-5.555	-5.554	6.241



Narration

Play Stop Progress Volume

Navigation

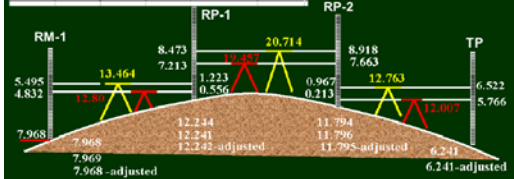
Back Next

Level Creek near Great Falls, Idaho

STATION	B.S.	HI, INST.	F.S.	ELEVATION	REMARKS
RM-1				7.968	
RP-1	4.832	12.800	0.566	12.244	
RP-2	7.213	19.457	7.663	11.794	
TP	0.213	12.007	5.766	6.241	
RP-2	6.522	12.763	0.967	11.796	
RP-1	8.918	20.714	8.473	12.241	
RM-1	1.223	13.464	5.495	7.969	

Concepts (cont.)

Object	1st Diff	2nd Diff	Ave. Diff	Elev.
RM-1				7.968
RP-1	4.276	4.272	4.274	12.242
RP-2	-0.450	-0.445	-0.447	11.795
TP	-5.553	-5.555	-5.554	6.241



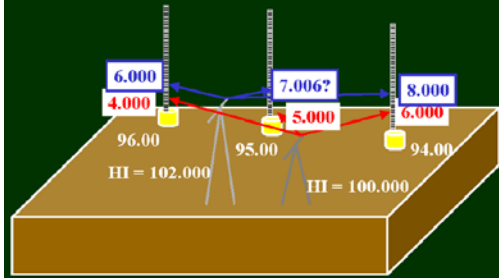
Narration

Play Stop Progress Volume

Navigation

Back Next

Closure when all side shots used? Is it Zero?



Play Stop Progress Volume

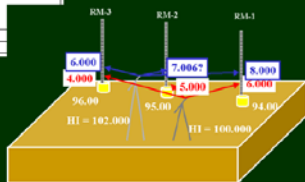
Navigation Back Next

Closure when all side shots used? Is it Zero?

Station	B.S.	I.I.	F.S.	Elev	Remarks
RM-1				94.000	Corner
HI-1	6.000	102.000			
RM-2			5.000	95.000	
RM-3			4.000	96.000	
HI-2	6.000	102.000			
RM-2			7.006	94.994	
RM-1			8.000	94.000	

Notes would generally look like this and indicate no error of closure, yet it looks like the shot on RM-2 from HI-2 was bad!

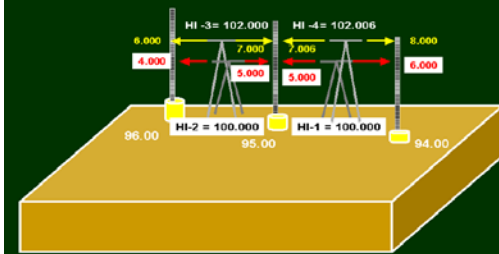
$94.000 - 94.000 = 0.000$
Therefore, closure error = 0.000



Play Stop Progress Volume

Navigation Back Next

Same reference marks surveyed NOT using side shots.



Play Stop Progress Volume

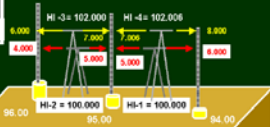
Navigation Back Next

Same reference marks surveyed NOT using side shots.

Station	I.S.	H.I.	P.S.	Elev	Remarks
BMM-1				94.000	Open
RM-1	6.000	100.000			
BMM-2			5	95.000	
RM-2	5.000	100.000			
RM-3			4	96.000	
RM-3	6.000	102.000			
BMM-2			7	95.000	
RM-4	7.000	102.000			
BMM-1			8	94.006	

$94.006 - 94.000 = 0.006$
Therefore, closure error = 0.006

OSW policy memo 93.12 clarifies acceptable use of side shots



Play

Stop

Narration

Progress

Volume

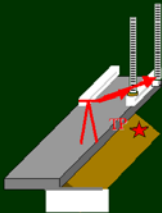
Navigation

Back

Next

Elevation adjustment when side shots are used

- Adjustment procedure distributes closure error to locations in circuit where they occurred.
- Side shots do not figure into closure error because they are not used to carry elevation between instrument setups.
- We suggest determining elevations of points surveyed by side shots as a simple average (see next slide) .



Play

Stop

Narration

Progress

Volume

Navigation

Back

Next

Notes showing how adjustment of elevations can be separated from side-shot elevations determined as simple averages.

ADJUSTMENT OF ELEVATIONS					
Object	1st Diff.	2nd Diff.	3rd Diff.	4th Diff.	Average Diff.
BMM1					13.210
RPM5	7.414	7.412			7.413
	6.249	6.249			6.249
RMM1					14.374
Only side-shots taken to objects below. Elevations are, therefore, averaged.					
1st Elev	2nd Elev				Avg Elev
Chertford	19.602	19.603			19.602
Upper Office	6.092	6.090			6.091
Lower Office	4.919	4.912			4.916
OS Water Surface	7.239	7.235			7.237

Play

Stop

Narration

Progress

Volume

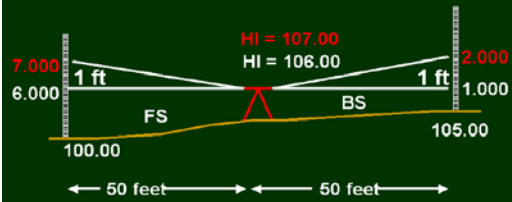
Navigation

Back

Next

Balanced Shots

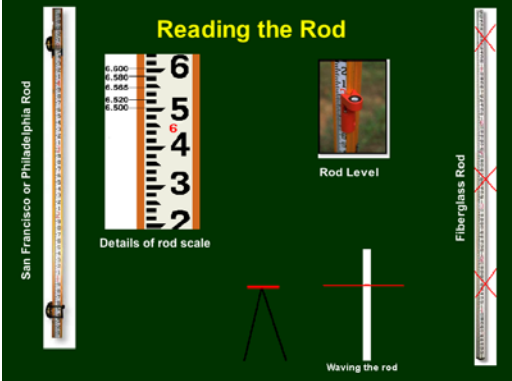
- When distances of backsights and foresights are balanced, correct elevation differences will be established even if line of sight of instrument is not horizontal
- Note that shots can not be balanced when side shots are taken.



[Play](#)
[Stop](#)
[Narration](#)
[Progress](#)
[Volume](#)

[Back](#)
[Next](#)

Reading the Rod



[Play](#)
[Stop](#)
[Narration](#)
[Progress](#)
[Volume](#)

[Back](#)
[Next](#)

Instrument Care and Maintenance



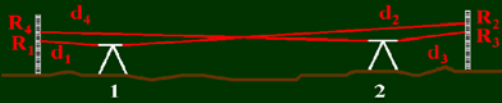
- Keep instrument in case while being transported inside field vehicles
- When mounted on tripod, carry under one arm with instrument in plain view
- Particular care should be taken when moving through brush or woods.
- Only carry over your shoulder when walking along roads or in open fields.

[Play](#)
[Stop](#)
[Narration](#)
[Progress](#)
[Volume](#)

[Back](#)
[Next](#)

Instrument Care and Maintenance Peg Test

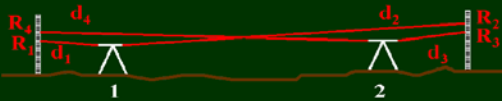
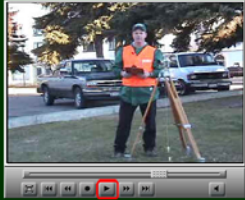
- Used to determine a level's collimation error factor "c", which is the inclination of a level's line of sight measured in feet per 100 feet of sight length



Play Stop Progress Volume

Navigation Back Next

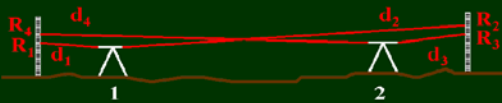
Peg Test - Example



Play Stop Progress Volume

Navigation Back Next

Peg Test - Example



Back Next

ddddd

Peg Test - Example


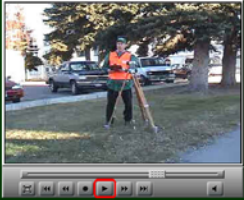


Diagram illustrating the first step of a peg test. A level is set up on a tripod (labeled 1) at a distance d_1 from a reference point R_1 . The ground profile is shown below the tripod.

Navigation controls: Play, Stop, Progress, Volume, Back, Next.

Peg Test - Example




Diagram illustrating the second step of a peg test. A level is set up on a tripod (labeled 1) at a distance d_1 from a reference point R_1 . The ground profile is shown below the tripod.

Navigation controls: Back, Next.

Peg Test - Example


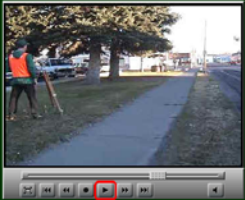


Diagram illustrating the third step of a peg test. A level is set up on a tripod (labeled 1) at a distance d_1 from a reference point R_1 . A second reference point R_2 is shown at a distance d_2 from the tripod. The ground profile is shown below the tripod.

Navigation controls: Play, Stop, Progress, Volume, Back, Next.

ddddd

Peg Test - Example

Back Next

Peg Test - Example

- Moving to second instrument location

Play Stop Progress Volume

Navigation Back Next



Peg Test - Example

- Moving to second instrument location

Back Next

Peg Test - Example

- Taking third shot

[Play](#)
[Stop](#)
 Narration


Progress

 Volume

Navigation
 [Back](#)
[Next](#)

Peg Test - Example



- Taking third shot



[Back](#)
[Next](#)

Peg Test - Example

- 100 ft. foresight, R4

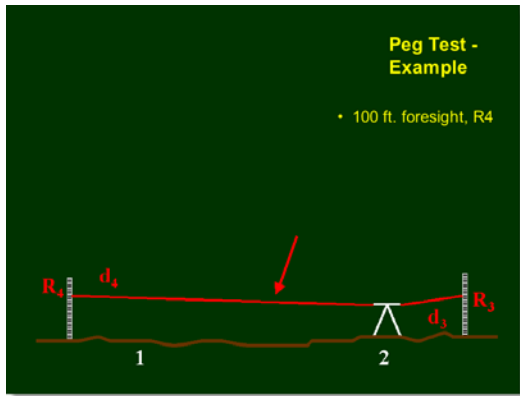
[Play](#)
[Stop](#)
 Narration

Progress

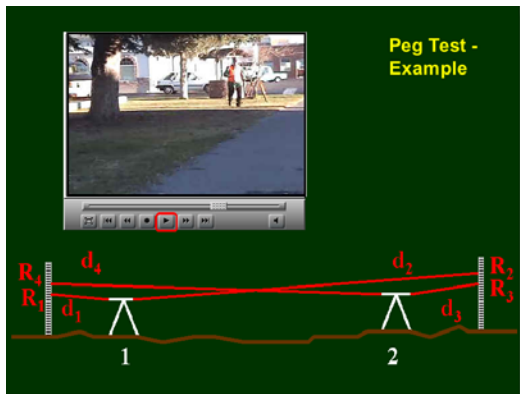
 Volume

Navigation
 [Back](#)
[Next](#)

ddddd

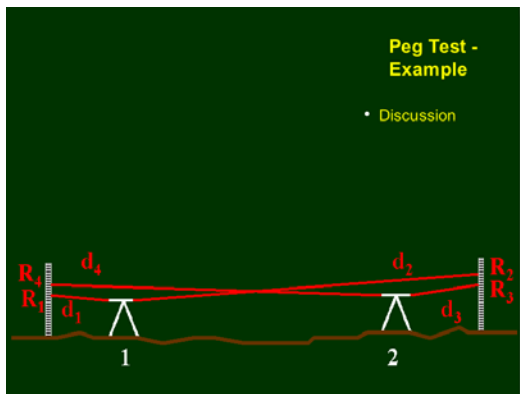


[Back](#) [Next](#)



[Play](#) [Stop](#) [Progress](#) [Volume](#)

[Back](#) [Next](#)



[Back](#) [Next](#)

ddddd

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

PEDESTAL TEST OF ENGINEER'S LEVEL

Date: November 9, 1999

Tested by: R. Erickson (operator), S. Landon (test.)

Last test date: 10/09/99

c found: <0.001

Fixed scale: ☐

c not found: <0.001

Pin test: ☒

TEST AS FOLLOWS:

$$\frac{(R_1 - R_2) - (R_3 - R_4) \times 100}{(R_1 - R_2) - (R_3 - R_4)}$$

$$\frac{(4.051 - 4.110) - (3.995 - 4.161 \times 100)}{(4.051 - 4.110) - (3.995 - 4.161 \times 100)}$$

$$\frac{0.161 - 0.156}{0.001 - 0.001}$$

1

4.051

20

2

3.995

100

3

4.110

20

4

4.161

100

R₄

d₄

d₁

d₂

d₃

R₃

R₂

20 ft.

80 ft.

20 ft.

Play

Stop

Progress

Volume

Narration

Navigation

Back

Next

Example - N. Fk. Teton R. at Teton, ID

Views from Right Bank

Flow

BM 1

RM 1

TP

RP 5

W.W.L.

See Station Description

Play

Stop

Progress

Volume

Narration

Navigation

Back

Next

Example - N. Fk. Teton R. at Teton, ID

View from Left Bank

RP 5

2,7

3,6

1,8

4,5

BM 1

Play

Stop

Progress

Volume

Narration

Navigation

Back

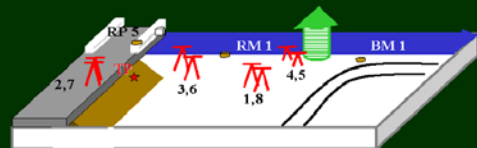
Next

ddddd

Example - N. Fk. Teton River (cont.)

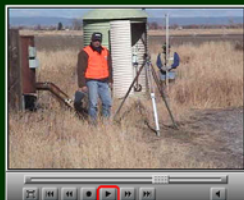


View from Left Bank

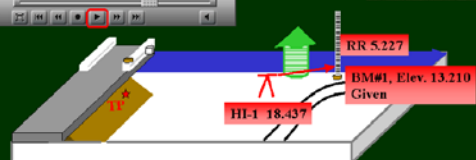


[Back](#) [Next](#)

Example - N. Fk. Teton River (cont.)



Backsight to obtain instrument height

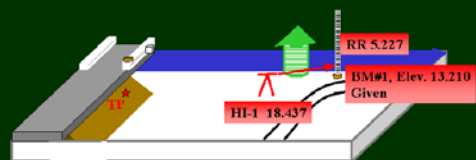


[Play](#) [Stop](#) [Progress](#) [Volume](#)

[Back](#) [Next](#)

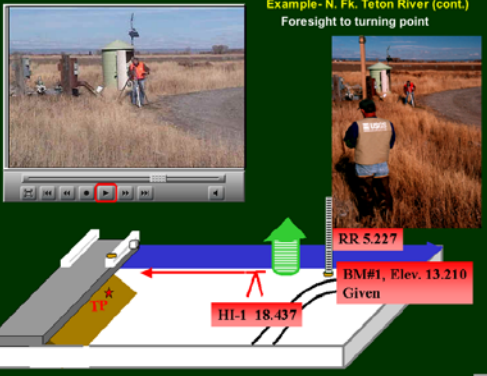
Example - N. Fk. Teton River (cont.)

Backsight to obtain instrument height



[Back](#) [Next](#)

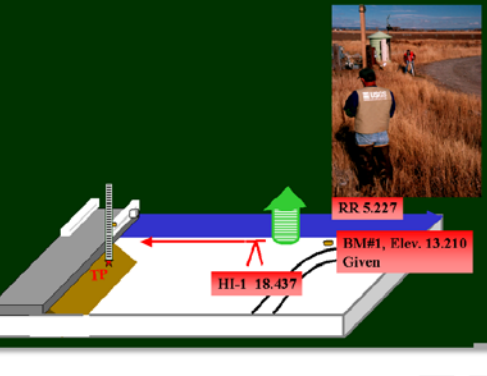
Example- N. Fk. Teton River (cont.)
Foresight to turning point



Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)
Foresight to turning point



Back Next

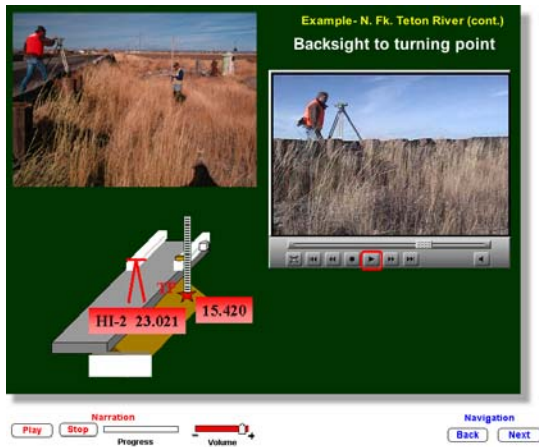
Computations Example- N. Fk. Teton River (cont.)

STATION	B.S.	HT	INST.	F.S.	ELEVATION	REMARKS
BM #1					13.210	
HI-1	5.227	18.437		3.017	15.420	Turn on mark
HI-2	7.601	20.001				
RP #5				2.397	20.624	
checkbar				3.419	19.602	19.606 visual reading-counter
HI-3	2.939	18.369		7.601	15.420	turn on point
RM #1				3.984	14.376	
HI-4	1.686	16.060				
Upper orifice nut				9.968	6.092	
Lower orifice nut				11.141	4.919	
OS water surface				8.821	7.239	Recorder reads 7.23

Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)
 Backsight to turning point

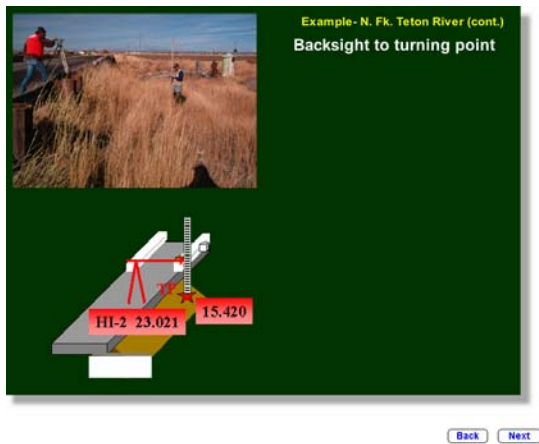


HI-2 23.021 15.420

Play Stop Progress Volume

Navigation Back Next

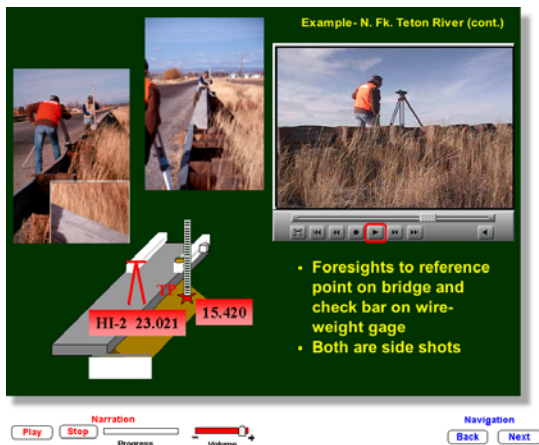
Example- N. Fk. Teton River (cont.)
 Backsight to turning point



HI-2 23.021 15.420

Back Next

Example- N. Fk. Teton River (cont.)



HI-2 23.021 15.420

- Foresights to reference point on bridge and check bar on wire-weight gage
- Both are side shots

Play Stop Progress Volume

Navigation Back Next

ddddd

Example- N. Fk. Teton River (cont.)

- Foresights to reference point on bridge and check bar on wire-weight gage
- Both are side shots

[Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)

Computations

North Fork Teton River at Teton, Idaho

STATION	B.S.	HT. INST.	F.S.	ELEVATION	REMARKS
BM #1				13.210	
HI-1	5.227	18.437			
			3.017	15.420	Turn on mark
HI-2	7.601	23.021			
RP #5			2.397	20.624	
checkbar			3.419	19.602	19.586 visual reading-counter
			7.001	15.420	turn on point
HI-3	2.939	18.359			
RM #1			3.984	14.375	
HI-4	1.685	16.060			
				16.060	Direct read on w.wt. Gage
Upper orifice nut			9.968	6.092	
Lower orifice nut			11.141	4.919	

[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#) [Navigation](#) [Back](#) [Next](#)

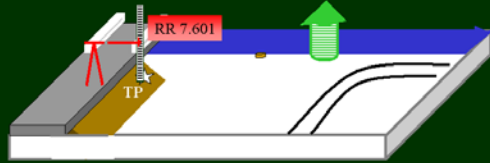
Example- N. Fk. Teton River (cont.)

- Foresight back down to turning point

[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#) [Navigation](#) [Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)

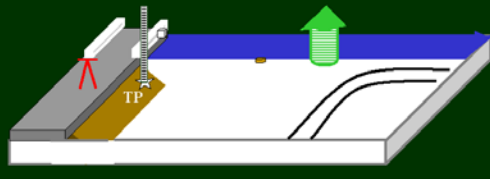
- Foresight back down to turning point



[Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)

- Backsight to TP to determine new HI

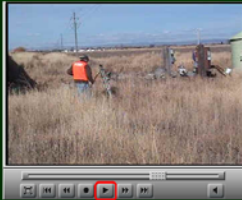


[Play](#) [Stop](#) [Progress](#) [Volume](#)

[Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)

- Foresight to determine elevation of benchmark that represents RM#1



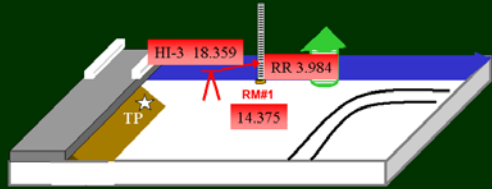
[Play](#) [Stop](#) [Progress](#) [Volume](#)

[Back](#) [Next](#)

ddddd

Example- N. Fk. Teton River (cont.)

- Foresight to determine elevation of benchmark that represents RM#1



Back Next

Computations

Example- N. Fk. Teton River (cont.)

North Fork Teton River at Teton, Idaho

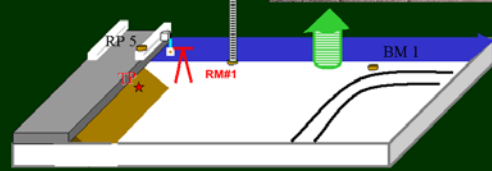
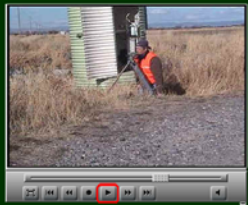
STATION	B.S.	HT. INST.	F.S.	ELEVATION	REMARKS
BM #1				13.210	
HI-1	5.227	18.437			
			3.017	15.420	Turn on mark
HI-2	7.601	23.021			
RP #5			2.397	20.624	
				19.586	visual
check bar			3.440	10.602	reading
			7.601	15.420	turn on point
HI-3	2.939	18.359			
RM #1			3.984	14.375	
HI-4	1.685	16.060			
				16.060	Direct read on w.w.t. Gage
Upper orifice nut			9.968	6.092	
Lower orifice nut			11.141	4.919	

Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Backsight to RM#1



Play Stop Progress Volume

Navigation Back Next

Computations

Example- N. Fk. Teton River (cont.)

North Fork Teton River at Teton, Idaho

STATION	B.S.	HT. INST.	F.S.	ELEVATION	REMARKS
BM #1				13.210	
HI-1	5.227	18.437			
			3.017	15.420	Turn on mark
HI-2	7.601	23.021			
RP #5			2.397	20.624	
checkbar			3.419	19.602	19.586 visual reading
			7.601	15.420	turn on point
HI-3	2.939	18.359			
RM #1			3.984	14.375	
HI-4	1.685	16.060			
				16.060	Direct read on w.w.t. Gage
Upper orifice nut			9.968	6.092	
Lower orifice nut			11.141	4.919	

Play Stop Narration Progress Volume
Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Foresights to upper and lower orifice

Play Stop Narration Progress Volume
Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Foresights to upper and lower orifice

Back Next

ddddd



Example- N. Fk. Teton River (cont.)

- Discussion of how elevation of water surface is used





Play

Stop


Progress

Volume

Navigation


Back

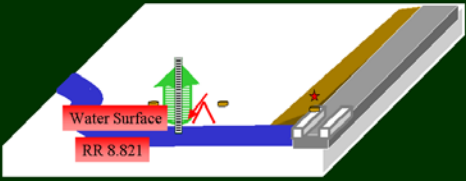
Next



Example- N. Fk. Teton River (cont.)

- Discussion of how elevation of water surface is used





Play

Stop

Progress

Volume

Navigation

Back

Next



Example- N. Fk. Teton River (cont.)

- Discussion of how elevation of water surface is used





Play

Stop

Progress

Volume

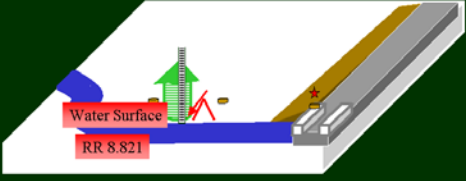

Navigation

Back

Next

Example- N. Fk. Teton River (cont.)

- Discussion of how elevation of water surface is used



Water Surface
RR 8.821

Back Next

ComputationsExample- N. Fk. Teton River (cont.)

STATION	B.S.	HT. INST.	F.S.	ELEVATION	REMARKS
BM #1				13.210	
HI-1	5.227	18.437	3.017	15.420	Turn on mark
HI-2	7.601	23.021			
RP #5			2.397	20.624	19.585 visual
checkbar			3.410	19.602	reading
			7.601	15.420	turn on point
HI-3	2.939	18.359			
RM #1			3.984	14.375	
HI-4	1.685	16.060			Direct read on
				16.060	nut cage
Upper orifice nut			9.068	6.092	
Lower orifice nut			11.141	4.919	
OS water surface			8.821	7.239	Recorder reads 7.23

Upper orifice nut
Lower orifice nut
OS water surface

Play Stop Progress Volume

Narration

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Establishing a turning point in preparation for starting back through level circuit.
- Instrument broken down after T.P. established and new HI established to start back through level circuit.



Turning Point

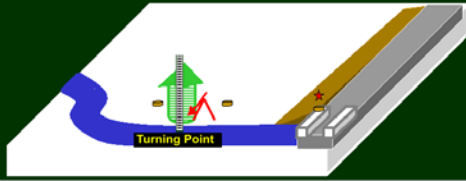
Play Stop Progress Volume

Narration

Navigation Back Next

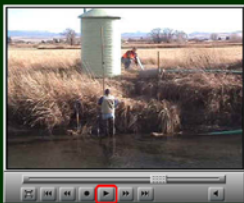
Example- N. Fk. Teton River (cont.)

- Establishing a turning point in preparation for starting back through level circuit.
- Instrument broken down after T.P. established and new HI established to start back through level circuit.

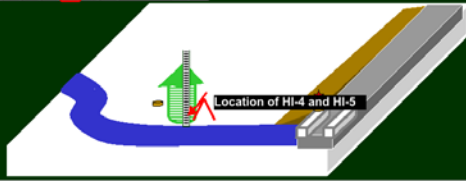


[Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)



- Starting back through the level circuit
- Shooting water surface elevation the second time (FS)



[Play](#) [Stop](#) [Progress](#) [Volume](#) [Narration](#) [Navigation](#) [Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)

- Starting back through the level circuit
- Shooting water surface elevation the second time (FS)



[Back](#) [Next](#)

Computations

Example- N. Fk. Teton River (cont.)

H-3	2.939	18.369		
RM #1			3.984	14.376
H-4	1.685	16.060		
				16.060 Direct read on w. wt. Gage
Upper orifice nut			9.969	6.092
Lower orifice nut			11.141	4.919
OS water surface			8.821	7.239
			8.971	7.089
H-6	8.867	15.956		
OS water surface			8.721	7.235
Lower orifice nut			11.041	4.915
Upper orifice nut			9.866	6.090

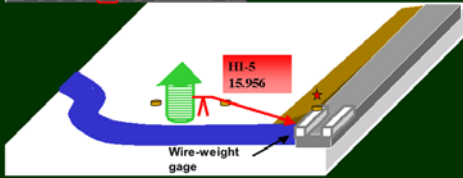
Play Stop Progress Volume

Navigation Back Next



Example- N. Fk. Teton River (cont.)

- Foresight to wire-weight gage.
- Lower wire-weight to center hair. Wire-weight reading should equal instrument height

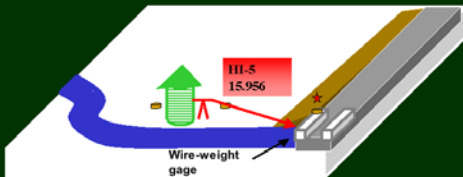


Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

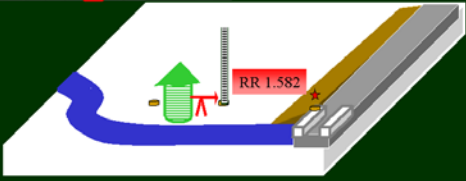
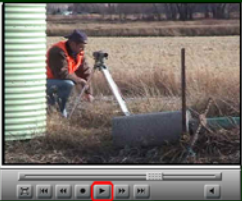
- Foresight to wire-weight gage.
- Lower wire-weight to center hair. Wire-weight reading should equal instrument height



Back Next

Example- N. Fk. Teton River (cont.)

• Foresight to RM-1

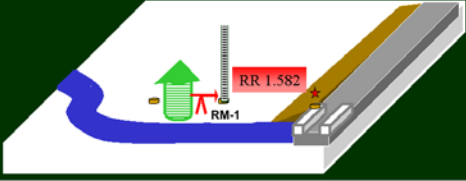


Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

• Foresight to RM-1



Back Next

Example- N. Fk. Teton River (cont.)

Computations

HI-5	8.867	15.956		
OS water surface			8.721	7.235
Lower orifice nut			11.041	4.915
Upper orifice nut			9.866	6.090
				Direct read on w.wt. Gage
				15.950
RM #1			1.582	14.374

Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Backsight to RM 1



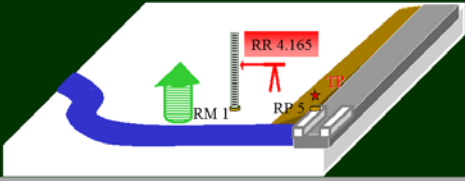

RR 4.165 HI-6 18.539 RM 1 RPS

Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Backsight to RM 1



RR 4.165 RM 1 RPS

Back Next

Example- N. Fk. Teton River (cont.)

- Foresight to turning point




RR 4.165 RM 1 RPS

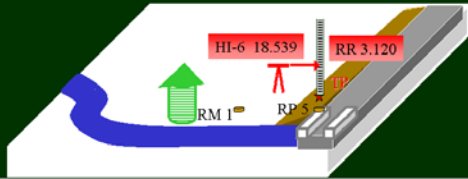
Play Stop Progress Volume

Navigation Back Next

dddd

Example- N. Fk. Teton River (cont.)

- Foresight to turning point



Back Next

Example- N. Fk. Teton River (cont.)

Computations

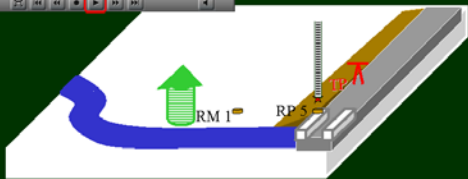
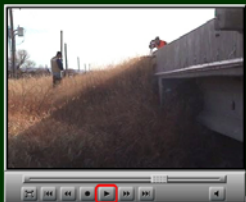
HI-5	8.867	15.956		
OS water surface			8.721	7.235
Lower orifice nut		11.041	4.915	
Upper orifice nut		9.866	6.090	
			15.950	Direct read on w.wt. Gage
RM #1			1.302	14.3/4
HI-6	4.165	18.539	3.120	15.419 Turn on mark

Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Backsight to turning point

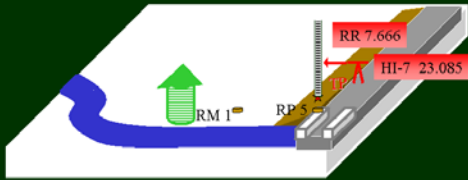


Play Stop Progress Volume

Navigation Back Next

Example- N. Fk. Teton River (cont.)

- Backsight to turning point

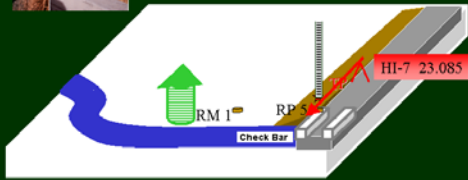


[Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)



- Foresights to:
1. Wire-weight gage
 2. RP#5

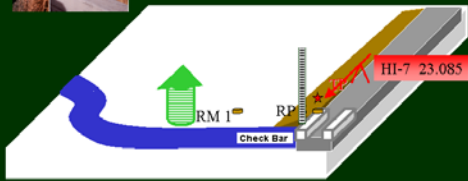


[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#) [Back](#) [Next](#)

Example- N. Fk. Teton River (cont.)



- Foresights to:
1. Wire-weight gage
 2. RP#5



[Play](#) [Stop](#) [Narration](#) [Progress](#) [Volume](#) [Back](#) [Next](#)

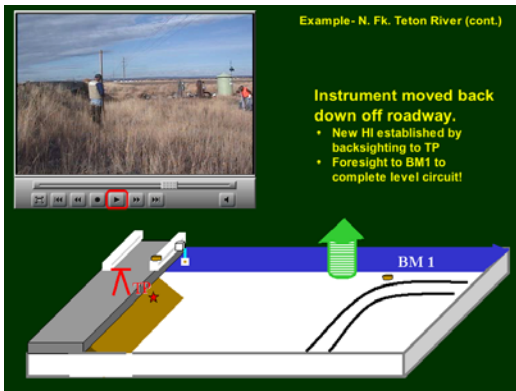
ddddd

Computations

HI-6	4.165	18.539			
			3.120	15.419	Turn on mark
HI-7	7.666	23.095			
checkbar			3.482	19.603	19.506 visual reading
RP #5			2.462	20.623	Chiseled X on bridge
			7.665	15.420	Turn on mark

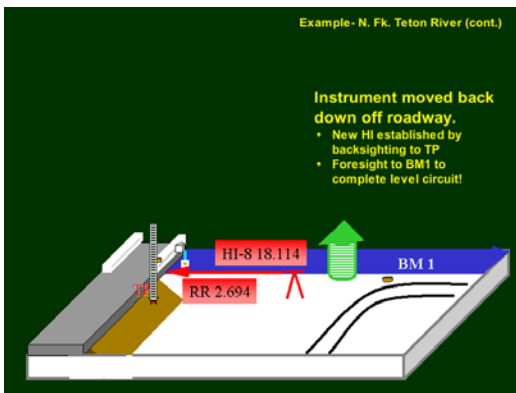
Play Stop Narration Progress Volume

Navigation Back Next



Play Stop Narration Progress Volume

Navigation Back Next



Back Next

Example- N. Fk. Teton River (cont.)

Foresight to BM1

- Second reading on BM1
- This completes the level circuit!

Play Stop Progress Volume

Narration

Navigation Back Next

Example- N. Fk. Teton River (cont.)

Foresight to BM1

- Second reading on BM1
- This completes the level circuit!

Back Next

Completed notes from N. Fk. Teton R.

STATION	BS	IFS	FS	LEV. VALUE	REMARKS
BM 1				18.114	
18-1	5.227	18.437		13.209	
18-2	7.681	23.821	2.292	16.139	Turn on mark
18-3					
check					18.588 visual reading
18-4	2.829	18.299	2.681	15.618	Turn on point
18-5					
18-6	1.695	16.069		14.374	Direct read on w. mt. flag
18-7					
18-8	4.365	18.525	1.582	14.374	
18-9	7.686	23.866	3.528	16.438	Turn on mark
18-10					
check					18.588 visual reading
18-11	2.829	18.299	2.681	15.618	Turn on point
18-12					
18-13	1.695	16.069		14.374	Direct read on w. mt. flag
18-14					
18-15	4.365	18.525	1.582	14.374	
18-16	7.686	23.866	3.528	16.438	Turn on mark
18-17					
check					18.588 visual reading
18-18	2.829	18.299	2.681	15.618	Turn on point
18-19					
18-20	1.695	16.069		14.374	Direct read on w. mt. flag
18-21					
18-22	4.365	18.525	1.582	14.374	
18-23	7.686	23.866	3.528	16.438	Turn on mark
18-24					
check					18.588 visual reading
18-25	2.829	18.299	2.681	15.618	Turn on point
18-26					
18-27	1.695	16.069		14.374	Direct read on w. mt. flag
18-28					
18-29	4.365	18.525	1.582	14.374	
18-30	7.686	23.866	3.528	16.438	Turn on mark
18-31					
check					18.588 visual reading
18-32	2.829	18.299	2.681	15.618	Turn on point
18-33					
18-34	1.695	16.069		14.374	Direct read on w. mt. flag
18-35					
18-36	4.365	18.525	1.582	14.374	
18-37	7.686	23.866	3.528	16.438	Turn on mark
18-38					
check					18.588 visual reading
18-39	2.829	18.299	2.681	15.618	Turn on point
18-40					
18-41	1.695	16.069		14.374	Direct read on w. mt. flag
18-42					
18-43	4.365	18.525	1.582	14.374	
18-44	7.686	23.866	3.528	16.438	Turn on mark
18-45					
check					18.588 visual reading
18-46	2.829	18.299	2.681	15.618	Turn on point
18-47					
18-48	1.695	16.069		14.374	Direct read on w. mt. flag
18-49					
18-50	4.365	18.525	1.582	14.374	
18-51	7.686	23.866	3.528	16.438	Turn on mark
18-52					
check					18.588 visual reading
18-53	2.829	18.299	2.681	15.618	Turn on point
18-54					
18-55	1.695	16.069		14.374	Direct read on w. mt. flag
18-56					
18-57	4.365	18.525	1.582	14.374	
18-58	7.686	23.866	3.528	16.438	Turn on mark
18-59					
check					18.588 visual reading
18-60	2.829	18.299	2.681	15.618	Turn on point
18-61					
18-62	1.695	16.069		14.374	Direct read on w. mt. flag
18-63					
18-64	4.365	18.525	1.582	14.374	
18-65	7.686	23.866	3.528	16.438	Turn on mark
18-66					
check					18.588 visual reading
18-67	2.829	18.299	2.681	15.618	Turn on point
18-68					
18-69	1.695	16.069		14.374	Direct read on w. mt. flag
18-70					
18-71	4.365	18.525	1.582	14.374	
18-72	7.686	23.866	3.528	16.438	Turn on mark
18-73					
check					18.588 visual reading
18-74	2.829	18.299	2.681	15.618	Turn on point
18-75					
18-76	1.695	16.069		14.374	Direct read on w. mt. flag
18-77					
18-78	4.365	18.525	1.582	14.374	
18-79	7.686	23.866	3.528	16.438	Turn on mark
18-80					
check					18.588 visual reading
18-81	2.829	18.299	2.681	15.618	Turn on point
18-82					
18-83	1.695	16.069		14.374	Direct read on w. mt. flag
18-84					
18-85	4.365	18.525	1.582	14.374	
18-86	7.686	23.866	3.528	16.438	Turn on mark
18-87					
check					18.588 visual reading
18-88	2.829	18.299	2.681	15.618	Turn on point
18-89					
18-90	1.695	16.069		14.374	Direct read on w. mt. flag
18-91					
18-92	4.365	18.525	1.582	14.374	
18-93	7.686	23.866	3.528	16.438	Turn on mark
18-94					
check					18.588 visual reading
18-95	2.829	18.299	2.681	15.618	Turn on point
18-96					
18-97	1.695	16.069		14.374	Direct read on w. mt. flag
18-98					
18-99	4.365	18.525	1.582	14.374	
19-00	7.686	23.866	3.528	16.438	Turn on mark

Admissible closure error = $0.003 \times 6.000 \times 2.82 = 0.005$

Play Stop Progress Volume

Narration

Navigation Back Next

WRD-ID-7
(May 93)

UNITED STATE
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

SUMMARY AND ADJUSTMENTS OF GAGING STATION LEVELS

STATION: North Fork Teton River at Teton, Idaho
DATE: Nov. 9, 1999

Purpose and Conclusions:
Routine station levels run from BM#1. Found RPP#5 at elev. 20.623 ft. (0.013 ft. high). The wire-weight check bar was found at elev. 19.602 ft. (0.014 ft. high). BM#1 was found at elev. 14.374 ft. (0.014 ft. high). The upper office was found at elev. 6.090 ft. and the lower office was found at elev. 4.916 ft. The water surface was at 7.736 with the data logger reading 7.72 ft. No changes.

ADJUSTMENT OF ELEVATIONS

Object	1st Off.	2nd Off.	3rd Off.	4th Off.	Average Off.	Elevation
BM#1						13.210
RPP#5	7.414	7.412			7.413	20.623
	6.249	6.249			6.249	14.374
BM#1						

Only side-shots taken to objects below. Elevations are, therefore, averaged

1st Elev.	2nd Elev.	Ave. Elev.
Check bar	19.602	19.602
Upper Office	6.092	6.090
Lower Office	4.919	4.916
GS Water Surface	7.239	7.235

Computations

Adjustments

Play

Stop

Narration

Progress

Volume

Navigation

Back

Next

Computations

Gage and recorder summaries

Primary Reference Gage		Primary Recorder	
Found	Left	Found	Left
Check bar	19.602	W.S. Elev.	7.236
		Gage Reading	7.23
Check bar visually read	19.595	Correction	0

STAFF SECTION		Instrument No. 1A-33290	
		Date of Peg Test	11/9/99
		Tape reading on rod used	
		Base	Weather
		1.00	1.00
		4.0	4.00
		5.0	5.00
		6.0	6.00
		9.0	9.00

Sheet 1. of 1. Comp. By HQJ. Chk. By Jg. Date 11-18-99

Play

Stop

Narration

Progress

Volume

Navigation

Back

Next

Computations

Historic Summary of Levels

RESULTS OF GAGING STATION LEVELS									
Station_13055100_North Fork Teton River re. Teton, Idaho.									
Date of Levels	Party Chief	BM#1	BM#2	RPP#5	Checkbar	Upper Office	Wet on end of lower office	BM#1	
Aug. 21, 1999	K. Taylor	+10.210	12.914		19.807	6.192			
June 8, 1997	K. Taylor	+10.210	No longer in use	20.608	19.597				
April 24, 1997	K. Erickson	+10.210		20.606	19.599	6.206	5.406		
June 23, 1998	K. Erickson	+10.210		20.606	19.600				
Aug. 98	K. Erickson	+10.210		20.610	19.593			14.374	
Nov. 1997	K. Erickson	+10.210		20.610	19.602	6.090	4.916	14.374	
Nov. 1999	K. Erickson	+10.210		20.610	19.602	6.090	4.916	14.374	

Play

Stop

Narration

Progress

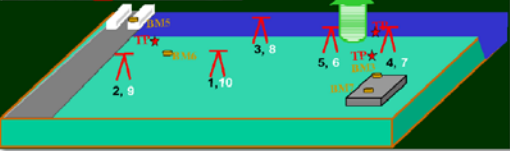
Volume

Navigation

Back

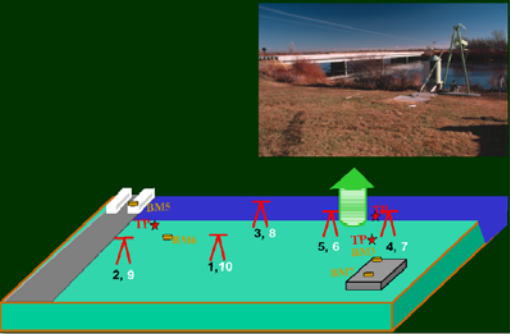
Next

Example of stilling well site - Henrys Fork near Rexburg, Idaho



Play Stop Narration Progress Volume Navigation Back Next

Example of stilling well site - Henrys Fork near Rexburg, Idaho

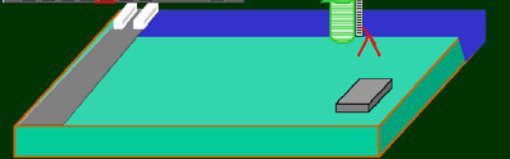


Back Next

Example of stilling well site - Henrys Fork near Rexburg, Idaho



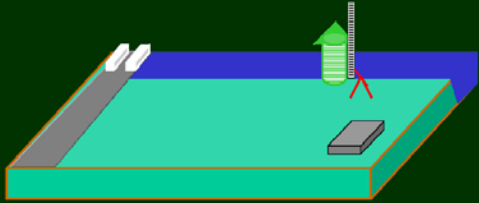
• Shooting to outside staff gage



Play Stop Narration Progress Volume Navigation Back Next

Example of stilling well site - Henrys Fork near Rexburg, Idaho

- Shooting to outside staff gage



[Back](#) [Next](#)

Example of stilling well site - Henrys Fork near Rexburg, Idaho



- Establishing turning point so instrument can be moved to a place where the inside of gage house can be seen

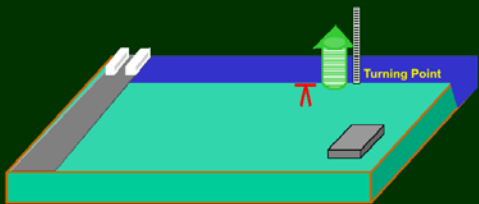


[Play](#) [Stop](#) [Progress](#) [Volume](#)

[Back](#) [Next](#)

Example of stilling well site - Henrys Fork near Rexburg, Idaho

- Establishing turning point so instrument can be moved to a place where the inside of gage house can be seen



[Back](#) [Next](#)

Example of stilling well site - Henrys Fork near Rexburg, Idaho

Shooting inside stilling well

Play Stop Progress Volume

Navigation Back Next

Example of stilling well site - Henrys Fork near Rexburg, Idaho

Shooting inside stilling well

Play Stop Progress Volume

Navigation Back Next

Equipment

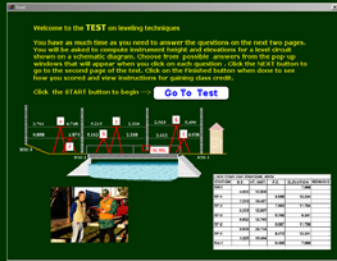
- Instrument with recent 2-peg test completed
- Tripod
- Philadelphia or similar rod (not fiberglass)
- Station Description with level summary sheet
- Rod level
- Rod target
- Pocket rod
- Turning point base
- Level note sheets
- Pencils
- Calculator
- Clipboard
- Waders
- Personal Flotation Device
- Flagging
- Hammer
- Nails
- Brush cutters
- Pocket level
- Spray paint
- Steel tape
- Wire brush
- Shovel

Play Stop Progress Volume

Navigation Back Next

Test

- Your supervisor may require you to take the test and print out the results before you are given credit for this training class
- Remember, class is listed as training class SW7777-4c with the National Training Center of the U. S. Geological Survey



Play Stop Narration Progress Volume

Navigation Back Next

Acknowledgements

[Back](#)