United States Department of the Interior
Bureau of Reclamation

Tyler Creek Wasteway Stabilization

Environmental Assessment

Geology Appendix

Talent Division Rogue River Basin Project
Oregon

June 30, 2003

Lower Columbia Area Office
Portland, Oregon

Reclamation's November 30, 1993, Geologic Field Review

PN-230

NOV 3 0 1993

Memorandum

To: Regional Engineer

From: Regional Geologist

Subject: Geologic Field Review, November 15 and 16, 1993, Schoolhouse Creek Wasteway Channel, Green Springs Powerplant, Talent Irrigation District, Oregon (Geology)

INTRODUCTION

At the request of Mr. Steve Brawley, PN-430, I contacted Mr. Brian Person, Oregon Projects Coordinator, Bend Construction Office, to schedule a field review of the subject channel drainage in southern Oregon. One and one-half days, November 15 and 16, 1993, were spent onsite walking the area, documenting the exposed conditions by observation and camera, and discussing the past and present drainage conditions with both Brian and Mr. Holly Cannon, Talent Project Irrigation District Manager.

BACKGROUND

The Green Springs Powerplant has been shut down for rehabilitation since late May 1993. Water was diverted from the power tunnel into a wasteway diversion structure at the head of Schoolhouse Creek. From May 23 to July 12, 1993, 60 cfs flowed down the drainage. The flow was reduced to 30 cfs from July 12 to late October. The channel has carried no diversion water for the last two to three weeks.

I understand diversion flows down the drainage were initialed in 1987. Since this time the diversion has been used sparingly, until this spring. Normal drainage in the basin is from precipitation runoff, creating minimal stream flows. There is little documentation of the Schoolhouse Creek Channel prior to the spring of 1993. Mr Gary Steinbach, PN-251, did walk the channel on October 18, 1990. Color photographs were taken at selective locations, generally depicting channel conditions at that time.

The Rogue Valley Council of Governments retained an Engineering Geologist, Mr B.G. Hicks, to review the area for the purpose of providing an evaluation of the erosion and resultant potential impacts to the area. Mr. Hicks' study report is entitled, "Landslides, Erosion, and Hazards Along Tunnel, Schoolhouse, and Tyler Creeks, Tyler Creek Watershed, Jackson County, OR," and dated October 19, 1993.

Hicks' Report discusses the geology of the area, ancient landslides that occur in the area, recent channel erosion and landsliding that has occurred along Schoolhouse Creek, potential hazards of debris plugs, potential landslide instability, sedimentation transport, etc. He recommends: a more detailed engineering geology study for planning of future stabilization/revegetation; discontinued use of the wasteway outlet; alternative routes for wasteway discharge, and other items for consideration.

FIELD REVIEW RESULTS

The Schoolhouse Creek channel is generally armored with gravel to boulder-size rock debris. In situ exposures of hard to soft rock occur locally. Soil-like weathered and altered volcanic rocks are frequently exposed along the channel banks. Trees with and without root balls are both scattered and locally concentrated along the channel.

Schoolhouse Creek channel, from the diversion structure to the confluence of Tyler Creek, is about 2.3 miles in length. Most of this channel is normal in configuration and shows very little damage from running water. Along the upper portions of the creek, above elevation 3400, about 2,200 feet of intermittent channel bottom has been degraded by streamflows. Widened channel and oversteepened banks from 10 to 50 feet in height, generally less than 12 feet, occur along the channel. Localized concentrations of trees, wood debris, and brush occur. Undercut and oversteepened banks at some location have precipitated small landslides which have further impacted the present channel.

Land surface geomorphic features and geologic unit exposures indicate much of the ridge area between Tyler and Schoolhouse Creeks is underlain by ancient earthflow and landslide deposits. In exposure these materials are often soil-like and internally slickensided with varying percentages of hard rock fragments up to several feet in size. Much of Schoolhouse Creek channel above elevation 3400 is within erodible materials. The ancient earthflow and landslide deposits along Schoolhouse Creek have been stable in historic time as evidenced by numerous large trees (in excess of 100 years old) that exhibit no erratic growth patterns.

Without toe protection, additional degradation will occur to the Schoolhouse Creek channel under future diversion flows and with normal runoff. High flows resulting from a wet spring could be especially detrimental to the stability of the channel banks. Before this channel is utilized again, certain remediation should be considered.

RECOMMENDATIONS AND CONSIDERATIONS

- Immediately downstream of the upper Tyler Creek road bridge, left channel bank erosion has initiated upslope landslide instability for about 200 feet along the creek. This instability is evident immediately adjacent to Tyler Creek road. Toe protection and some channel bank resloping will be required to insure present and long-term integrity of the road.

- Channel segment from about elevation 4080 to 3760 has local intervals of excessive bank erosion and bank instability. Local toe protection is required and some fallen trees should be removed from the channel cross-section.

- From about elevation 3760 to 3400 appreciable channel degradation is evident. Unstable channel banks range from 10 to 50 feet high. Intermittent toe protection and some bank resloping will be required. Concentrations of tree debris do occur locally and should be removed.

- Most of the toe protection can be obtained from rock and trees within the channel section. Utilization of linear, segmented timber/rock crib structures would be ideal for erosional protection. For safety of personnel during construction, local channel bank resloping will be required.

- Before channel remediation and after channel remediation, thorough and detailed documentation of before and after conditions should be accomplished from the engineering and geotechnical perspective.

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Reclamation's August 7, 1997, Geotechnical Field Review

PN-3600
PRJ-10.00

AUG 0 7 1997

MEMORANDUM

To: Manager, Facilities Operations and Maintenance
Attention: PN-3248 (Green)

From: Brent H. Carter
Regional Geologist

Subject: Geotechnical Field Review, June 26, 1997, Tyler Creek Wasteway, Green Springs Powerplant, Talent Irrigation District, Oregon

INTRODUCTION

The purpose of the subject field review was to observe the site conditions along the Tyler Creek Wasteway Channel and provide geotechnical recommendations for restoration, rehabilitation, and/or relocation of the existing or alternate alignments. The field review was coordinated by Mr. Wes Green (PN-3248) on June 26, 1997. Other participants included Ms. Lesa Stark (PN-3429), Mr. Kraig Howe (PN-3908), and Wes Green all from the PN Regional Office, and Mr. Leo Busch (LCA-3200) from the Lower Columbia Area Office.

The onsite review was completed on the afternoon of June 26, walking the present alignment and potential alternate alignments. Existing site conditions were observed, sketched, and photographed. Previously established survey control on the ground by Reclamation crews was very helpful for location of observed site conditions. After the field session, the group briefed Mrs. Kathleen Garfas, concerned landowner, on some of the options for consideration of rehabilitation of the Tyler Creek Wasteway Channel.

BACKGROUND

I previously walked the Tyler Creek Channel with Mr. Brian Person, Oregon Projects Coordinator, Bend Construction Office, on November 15 and 16, 1993. The results of that field trip were documented in memorandum report dated November 30, 1993.

Since the November 1993 inspection, some stream channel degradation has continued. The Talent Irrigation District constructed a dike immediately downstream from station 56+64 to

divert the channel flow into an alternate channel to the north; thus, very little progressive erosion has occurred in the old channel from about station 57+00 to 65+50.

The Tyler Creek Wasteway Channel area is underlain with a varied sequence of volcanic rocks consisting of predominately pyroclastic types and some interbedded flows. Ancient to recent landslide deposits are common in the area. The principal interval of channel under study, from station 46+05 to 70+43, is chiefly within altered/weathered, fine-grained tuff breccias and tuffs with some volcanic flows. Landslide debris is common with older to recent scarps, depressions, and scags visible locally. The older and larger landslides have been stable in historic times and will be stable under the present climatic/seismic conditions. The more recent landslides are small and localized along the Tyler Creek channel and have been caused by lateral erosion by stream flow. Stream flows are a result of natural runoff and water diverted from the power tunnel.

FIELD OBSERVATIONS AND RECOMMENDATIONS

The present Tyler Creek channel is generally armored with rock and tree debris. Alluvial bars composed of a heterogenous mixtures of rock and organic materials are common. These channel constrictions create erratic stream flow patterns which divert channel flow laterally, causing bank erosion. Insite bedrock exposures occur locally and were chiefly observed in the alternate channel from about station 0+75 to 8+50 and downstream of station 65+00. Soil-like altered/weathered volcanics are frequently exposed along the existing channel. Most of these soil materials are landslide deposits which have not moved in historic times. Toppled trees with and without root balls are scattered and locally concentrated in the channel as a result of bank undercutting. Observations of specific sections of the channel are discussed by station interval as shown on the attached drawing.

STATION 46+05 to 57+00: Representative channel conditions in this interval are shown in Photographs No. 1 through No. 6. Lateral channel erosion is common along most of this area with steep, eroded bank slopes from 2 feet to 17 feet in height. Much of the channel bottom is armored or partially armored with rock debris with frequent toppled trees and organic clusters of roots and shrubs as shown on the attached drawing.

Alluvial bars with rock and trees have created channel constrictions, causing stream flows to move laterally eroding and undercutting the channel banks. No inplace bedrock was exposed in this interval of channel.

RECOMMENDATIONS: Channel modification is required to stabilize this section of channel. All alluvial bars, debris bars, and downed trees should be removed and incorporated into side-slope toe protection and channel armoring. About 80 percent of the channel will need to have channel bank toe protection to stop lateral erosion. By mechanized channel modification, most of the toe protection can be obtained from rock and tree debris now within the channel. Some additional outside rock (estimated at 30 cu. yds. of 6 - 12 inch sizes) could be needed

where average rock sizes are small or very little rock exists in the channel. Where steep channel side slopes exceed 10 feet in height, some channel bank resloping to 1.5:1 will be required.

About 50 percent of the channel bottom will require work to adequately mantle the invert with rock protection. Most of this rock exists in the channel but an estimated 10 cu. yds. will be required to fill-in voids where very little rock now exists.

Back station from 57+00, for about 150 feet, large blocks of rock have created an energy dissipation for the stream flow and very minor lateral erosion has occurred. Refer to Photograph No. 6. Very little channel modification will be required in this area.

STATION 57+00 to 65+73 (old channel alignment): Deep channel degradation has occurred in this interval of the wasteway. During my visit in November 1993, near vertical unstable channel banks were observed to heights of 40 to 50 feet; refer to Photographs Nos 9 and 10. Present (1997) observations show the higher banks with near vertical slopes failed by landslide movement and erosion to a stable slope of about 1.5:1 or flatter. The present conditions are shown in Photographs Nos 7 and 8.

No inplace rock was observed in this stretch of the wasteway channel and very little hard rock occurs in the altered/weathered volcanic materials exposed along the eroded channel bluffs.

RECOMMENDATIONS: This portion of the channel has not been utilized for wasteway discharges for several years. Because of the deep section of soil-like volcanic materials (landslide materials) and lack of rock in this area, rehabilitation of the wasteway would be very costly. All debris would need to be removed from the channel and large quantities of rock would need to be hauled in and placed for channel protection. In order to provide long term stability of the oversteepened slopes, present slopes should be cut back to 1.5 to 1 or flatter.

STATION 65+73 to 70+43: This portion of the wasteway channel is along the contact of *in situ* volcanic materials to the north (right side of the channel) and landslide materials to the south (left side of the channel). Some lateral erosion has occurred locally, but most of the channel bottom is mantled with rock debris or protected with exposed bedrock.

RECOMMENDATIONS: Localized channel modification is required to stabilize this section of channel. Alluvial bars and downed trees should be removed and incorporated into side-slope toe protection and channel armoring. Most of the rock for toe protection and channel armoring can be obtained from the channel section. Steep channel side slopes in excess of 10 feet high should be resloped to 1.5:1 or flatter.

STATION 0+00 TO 8+43 (ALTERNATE ALIGNMENT): The alternate alignment of the wasteway is the currently utilized channel. The diversion point is at about station 57+90 on the old alignment.

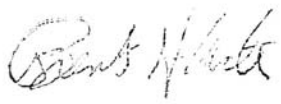
An estimated 75 percent of the alternate alignment has exposed bedrock in the channel section. Some lateral channel erosion has occurred locally as shown in Photograph No. 11. Also, alluvial bars, debris bars, and fallen trees are common.

RECOMMENDATIONS: Some channel modification with associated channel and side-slope protection will be required for long term channel stability. Alluvial bars and toppled trees should be removed and incorporated in the channel protection. Bedrock exposures and concentrations of loose rock debris in the channel will satisfy most of the channel protection needs. However, about 200 feet of channel will require an estimated 10 cu. yds. of additional rock. Over steepened channel slopes with heights over 10 feet should be flattened to 1.5:1.

CONCLUSIONS

The Tyler Creek Wasteway Channel within the Garfas' property boundary can be rehabilitated satisfactorily with expected discharge flows to 60 cfs. Natural runoff could exceed these flows and could cause future erosion damage to the channel.

Channel modification, as discussed under recommendations, will be required in specific intervals of the wasteway. It is recommended the central portion of the old alignment, from station 57+90 to 65+73 be abandoned as a wasteway and the alternate alignment to the north be incorporated into the active wasteway channel. Oversteepened slopes along the old alignment recommended for abandonment should be flattened for long term stability and safety considerations. All potentially unstable trees should be downed.



Attachments - Photographs 1 through 11
Drawing

cc: Manager, Facility O&M, Lower Columbia Field Office, Bend OR
Attention: LCA-3200 (Busch)

WBR:BCarter:dj:8/7/97:208-378-5230
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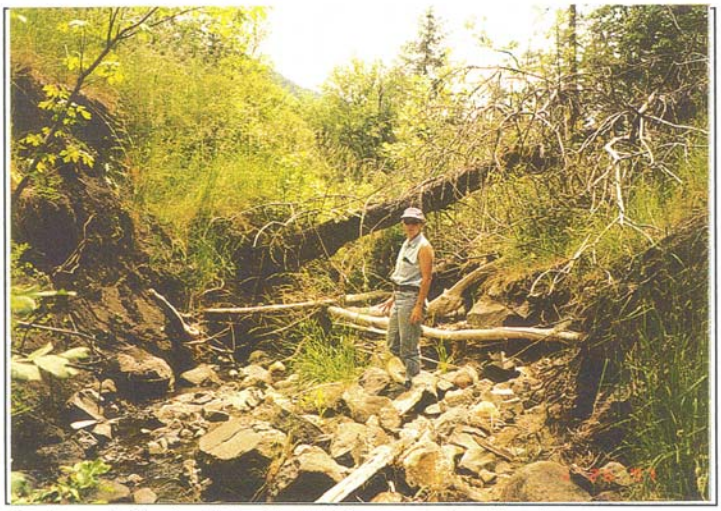
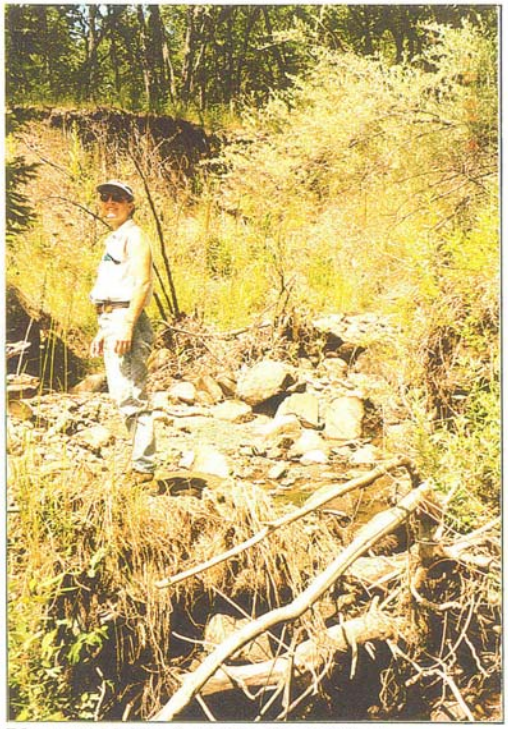
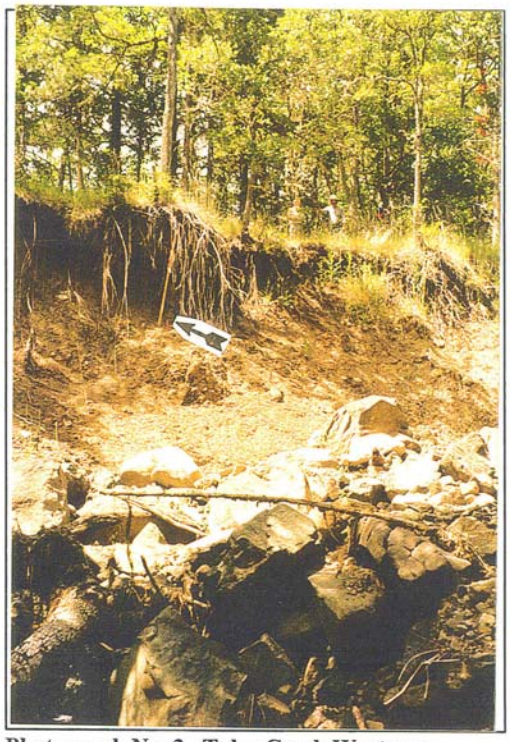


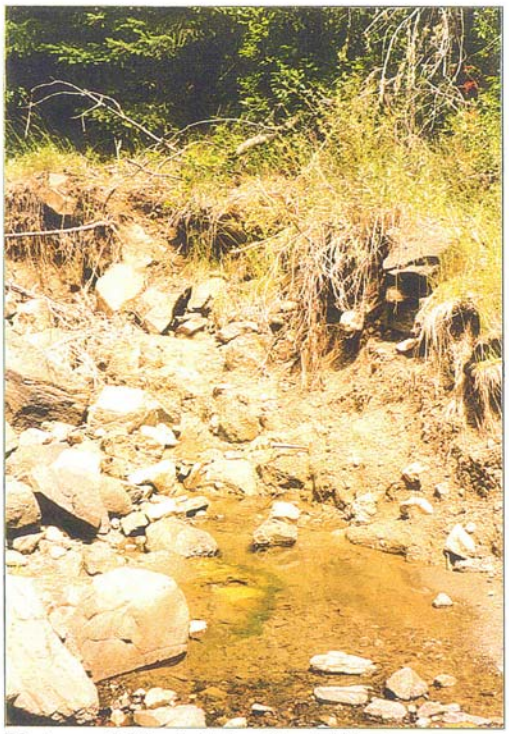
Photograph No. 1. Tyler Creek Wasteway. Looking downstream (southwest) near Station 47+33. Angular volcanic rock mostly 8 to 18 inches in size mantles channel bottom. Lateral cutting of banks is in progress. Note undercut tree toppled into channel.
USBR Photograph by B.H. Carter, 6/26/97.



Photograph No. 2. Tyler Creek Wasteway. Photograph taken near Station 50+80 looking northeast, upstream. Background erosional slope is about 15 feet high. Lateral erosion in this area is caused from channel organic and rock debris blockage and bar buildup.
USBR Photograph by B.H. Carter, 6/26/97.

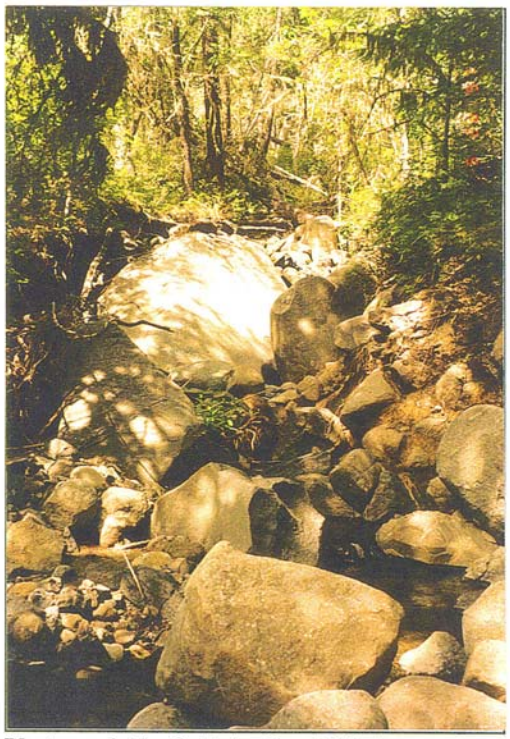


Photograph No. 3. Tyler Creek Wasteway. Eroded slope in altered/weathered volcanics from 10 to 17 feet high. Slope materials are soil-like. No *in situ* bedrock is exposed, but channel bottom is mantled with large angular cobbles to boulder size rocks. Stake with red ribbon and pole with flag on right side of right-of-way boundary. View is looking across Station 50+90 to the northeast. **USBR Photograph by B.H. Carter, 6/26/97.**

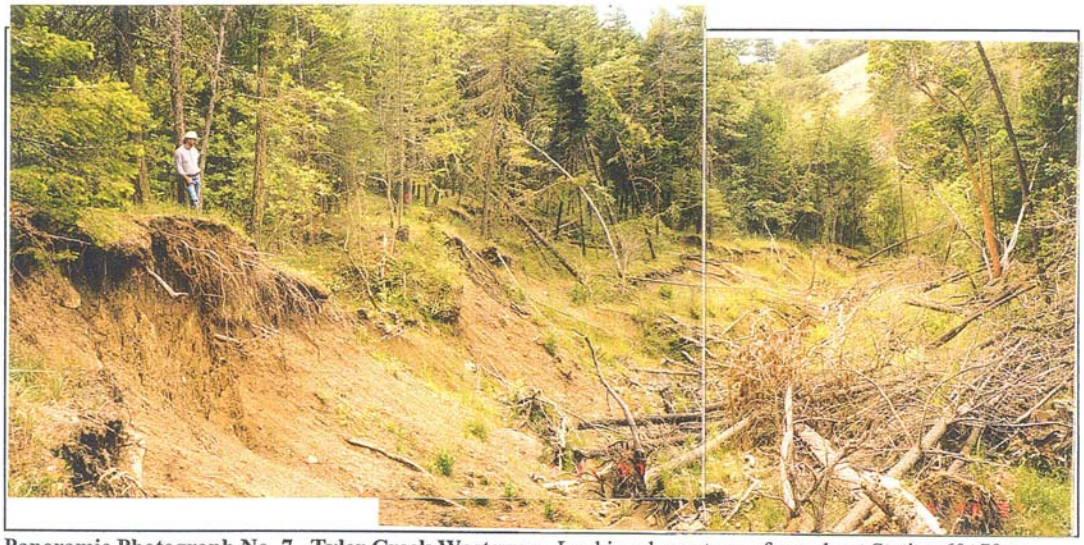


Photograph No. 4. Tyler Creek Wasteway. Station 53+13, looking east at eroded channel bottom and eroded side slope underlain with altered/weathered, fine-grained volcanics with hard, angular clasts (gravel to boulder-size) eroding from volcanics and being deposited in channel. Channel is partially veneered with rock in this area. Note geology pick for scale.
USBR Photograph by B.H. Carter, 6/26/97.

Photograph No. 5. Tyler Creek Wasteway. Looking downstream (southwest) at channel mantled with hard, volcanic gravel to boulder-size materials; Station 54+34. Channel area is well armored with tree/rock bar causing flow obstruction and lateral migration of streamflow.
USBR Photograph by B.H. Carter, 6/26/97.



Photograph No. 6. Tyler Creek Wasteway. Looking upstream (northeast) or back station, from Station 57+00. Large blocks of hard, volcanic rocks to 2 cubic yards in size have created energy dissipation of the streamflow. Very little to no lateral bank erosion has occurred in this interval of the stream channel.
USBR Photograph by B.H. Carter, 6/26/97.



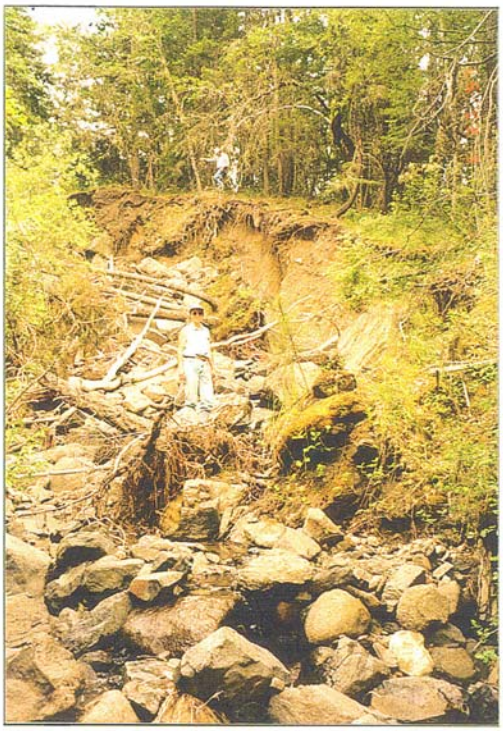
Panoramic Photograph No. 7. Tyler Creek Wasteway. Looking downstream from about Station 60+70 to 64+40. Photograph shows acute erosion in altered/weathered fine-grained volcanics with very few hard rock clasts exposed. Toppled trees are a result of bank undercutting. Note landslide topography in center of photograph. Maximum height of eroded bluffs is about 40 feet.
USBR Photograph by B.H. Carter, 6/26/97.

Photograph No. 8. Tyler Creek Wasteway. Looking upstream from Station 64+40 at 30-foot high erosional wall of channel. Numerous toppled trees are to the left and undercut trees are to the right.
USBR Photograph by B.H. Carter, 6/26/97.

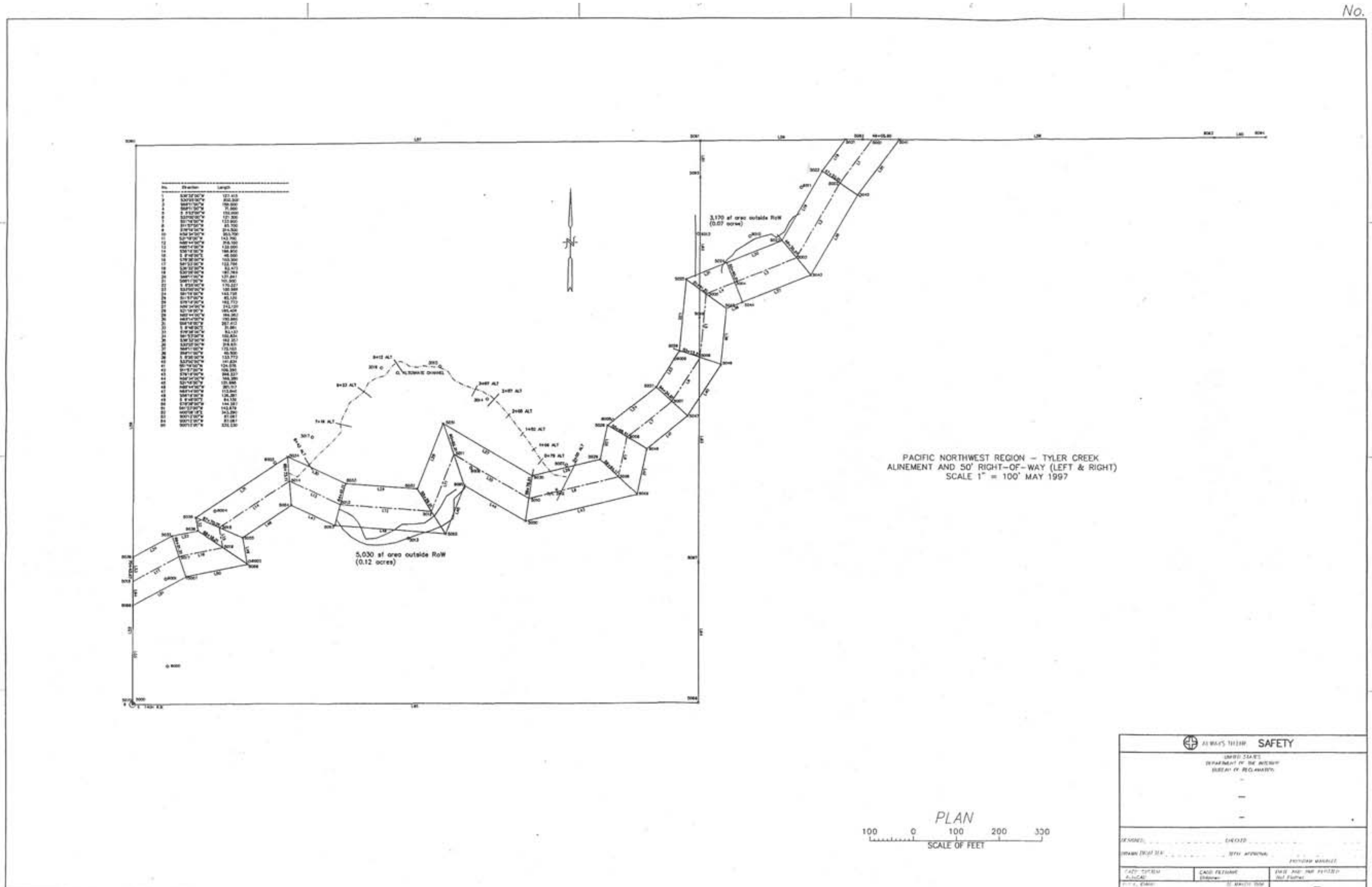
Photograph No. 9. Tyler Creek Wasteway. This photograph was taken in November 16, 1993 when the recent channel erosion had formed near vertical bluff to 40 feet in height. In comparison with Photograph No. 8 taken in 1997, note the bluff exposures have migrated upslope producing flatter slopes.

USBR Photograph by B.H. Carter, 11/16/93.

Photograph No. 10 Tyler Creek Wasteway. Looking downstream of Station 62+26, November 1993. Channel bank about 50 feet high in near vertical exposure. Panoramic Photograph No. 7, taken in 1997, shows this area failed back in flatter slope by landslide movement.
USBR Photograph by B.H. Carter, 11/16/93.



Photograph No. 11. Tyler Creek Wasteway. Control Point 3015, alternate channel, looking upstream to the east. Channel bottom is mantled with heavy rock, but stream is migrating laterally into soft, fine-grained, altered/weathered volcanics. **USBR Photograph by B.H. Carter, 6/26/97.**


3,170 sf area outside RoW
(0.07 acres)
5,030 sf area outside RoW
(0.12 acres)
ALTERNATE CHANNEL
PACIFIC NORTHWEST REGION – TYLER CREEK
ALINEMENT AND 50' RIGHT-OF-WAY (LEFT & RIGHT)
SCALE 1" = 100' MAY 1997
PLAN
100 0 100 200 300
SCALE OF FEET
ALWAYS THINK SAFETY
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
No.
No.