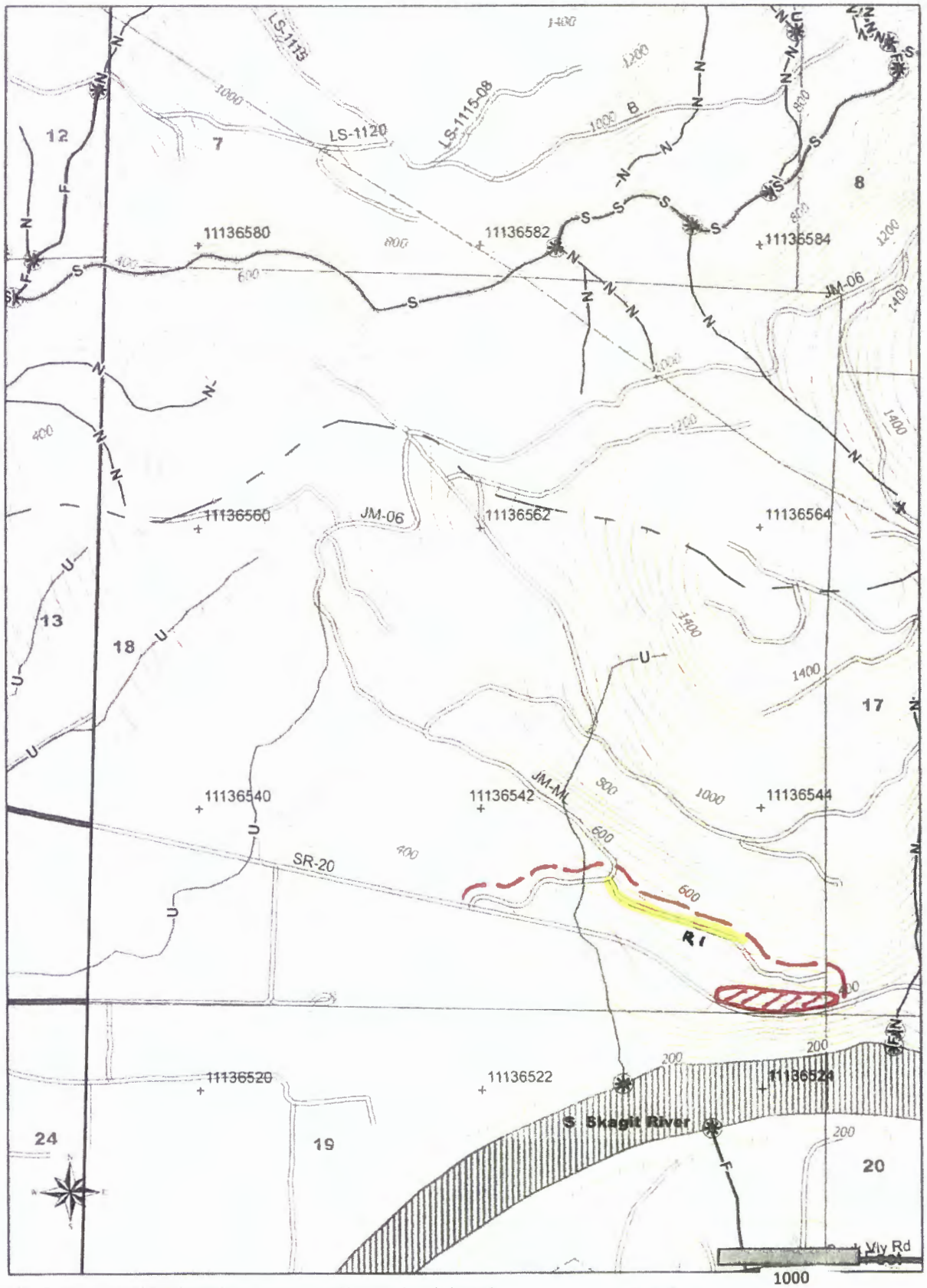
FOREST PRACTICE ACTIVITY MAP

TOWNSHIP 35 NORTH HALF 0, RANGE 09 EAST (W.M) HALF 0, SECTION 18

Application #: _____



Please use the legend from the FPA Instruction or provide a list of symbols used

Site Boundary

Danger Trees Removed

Road opened

Date. 7/25/2016 Time: 7 39 42 AM

NAD 83

Contour Interval: 40 Feet

Figure 1

Appendix D. Slope Stability Informational Form

Complete and attach this form to your FPA if you answered 'Yes' to FPA Question 11 or 12. Refer to WAC 222-16-050(1)(d) and Forest Practices Board Manual Section 16—*Guidelines for Evaluating Potentially Unstable Slopes* for definitions and descriptions of potentially unstable slopes or landforms.

1. What screening tools were used? ☒ Aerial Photo, ☒ LiDAR, ☐ Landslide Inventory, ☐ Landslide Hazard Zone Polygon, ☐ GIS/Other (describe):

2. Were there any features identified using the screening tools in #1 that did not exist in the field? If yes, describe:

No

3. a. What potentially unstable slopes or landforms were identified in the area of your forest practices activity? Check all that apply:

☐ Inner Gorge ☐ Groundwater recharge areas for glacial deep-seated landslides
☐ Bedrock Hollow ☐ Convergent Headwall ☐ Toe of deep-seated landslide
☐ Outer edges of meander bends
☒ Other (Deep-seated landslides or other features of potentially unstable slopes). Describe:

The active slide is situated on moderate gradient (<60%) planar slopes underlain by alluvial and/or glacial sediments (per published geologic map data). The steepest slopes occur at the headscarp and distal margin where the failure surface intercepts the cutbank of SR 20. The primary mode of movement is translational, and failure depth appears to be relatively shallow (not significantly deeper than tree rooting depth). Numerous danger trees adjacent to the cutbank within the slide were removed.

b. What activities may occur in potentially unstable slopes or landforms? Check all that apply:

☐ Timber harvest ☐ Road construction ☐ Suspending cables ☐ Yarding ☐ Tailholds

4. a. What potentially unstable slopes or landforms were identified around the area of your forest practices activity?
Check all that apply:

☐ Inner Gorge ☐ Groundwater recharge areas for glacial deep-seated landslides
☐ Bedrock Hollow ☐ Convergent Headwall ☐ Toe of deep-seated landslide
☐ Outer edges of meander bends
☒ Other (Deep-seated landslides or other features of potentially unstable slopes). Describe:

Same feature as 3.a. Parts of feature were not within the project boundary.

b. What activities may occur around potentially unstable slopes or landforms? Check all that apply:

☒ Timber harvest ☒ Road construction ☐ Suspending cables ☐ Yarding ☐ Tailholds

5. If any features identified in #3.a. and /or #4.a. were bounded out, describe the manner in which the boundary was determined:

None

6. Were areas of public use (which may include, but are not limited to: public roads, utilities, designated recreation areas, occupied structures, etc.) identified in or around the area of your proposed forest practices activity? Show these locations on the map in #8.

SR 20

7. Date of field review: January 22, 2016

Person(s) that conducted field review:

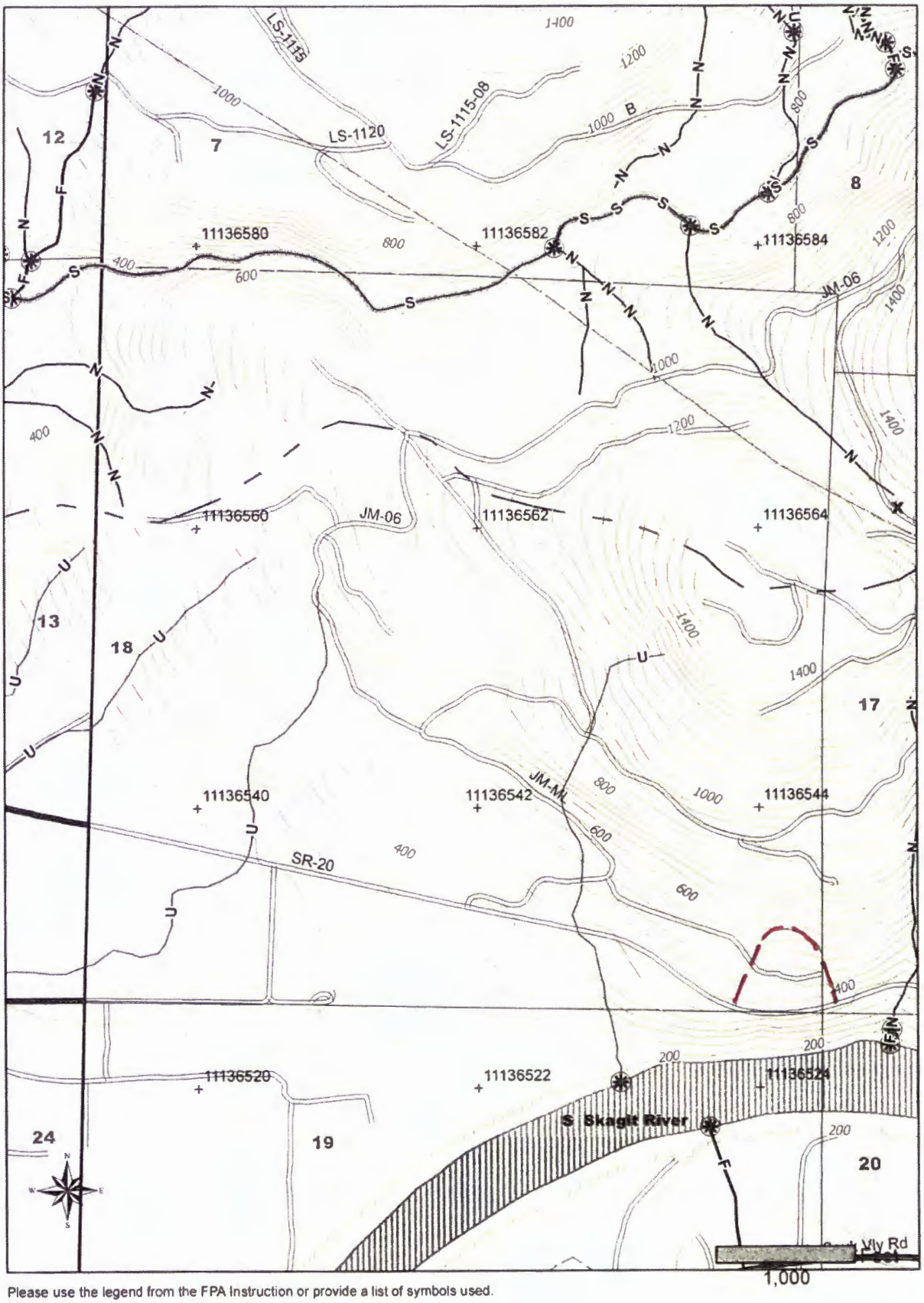
Name	Title/position
Gabriel Taylor, LEG	Engineer/Geologist
Ted Turner, LEG, QE, Weyerhaeuser	Engineering Geologist

8. Show all field reviewed areas for potentially unstable slopes or landforms on a map (may use a forest practices activity map, harvest map or GIS map – See example below). Show locations where areas of public use exist. **This map is intended to be developed by the field practitioner.**

FOREST PRACTICE ACTIVITY MAP /Review Areas for Unstable Slopes

TOWNSHIP 35 NORTH HALF 0, RANGE 09 EAST (W.M.) HALF 0, SECTION 18

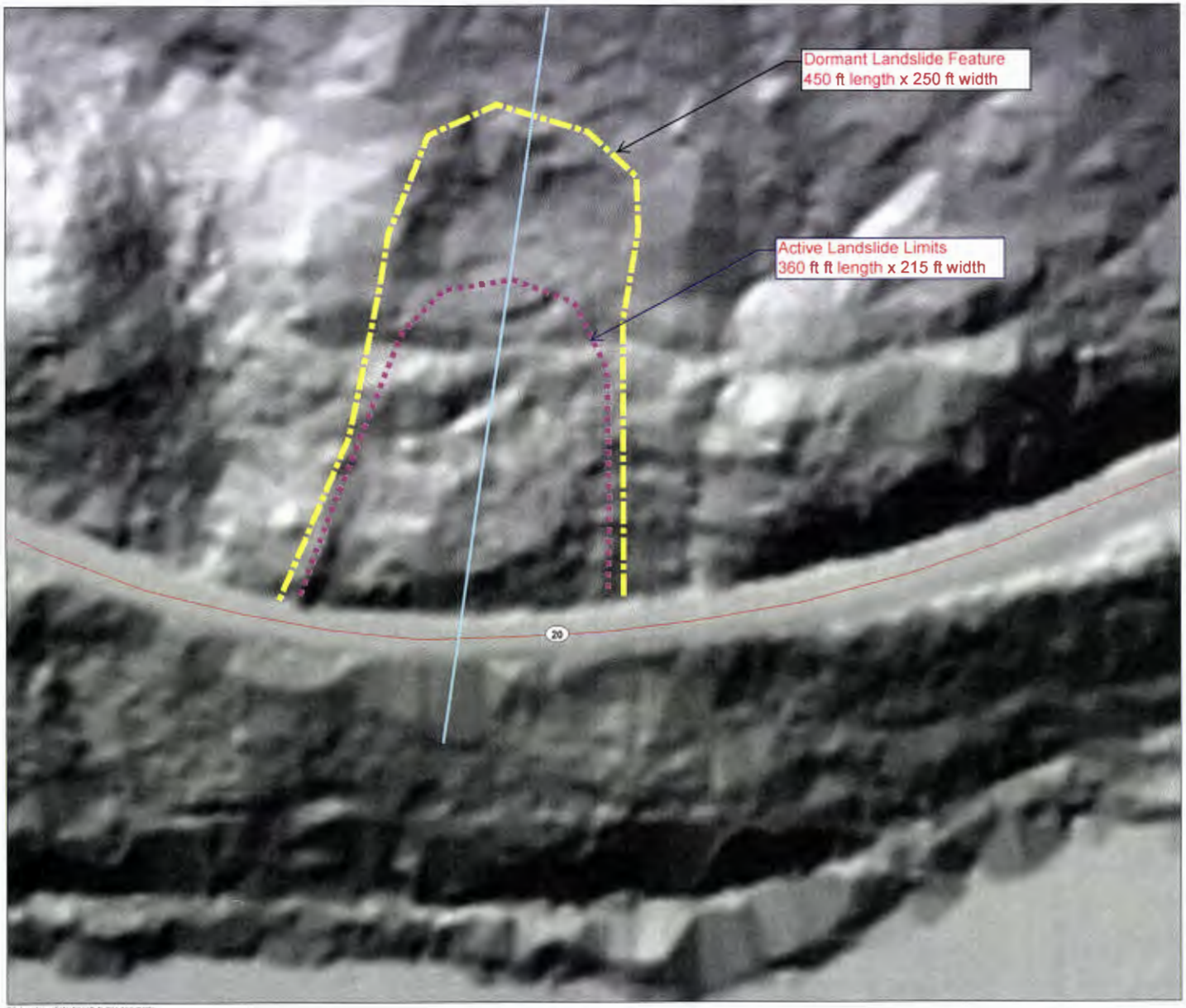
Application #: _____



Please use the legend from the FPA Instruction or provide a list of symbols used.

Field Reviewed Area

Date: 7/25/2016 Time: 7:39:42 AM
NAD 83
Contour Interval: 40 Feet



N

LEGEND

Figure 1

FEET
0 25 50 100 150 200
1:1,200
1 INCH = 100 FEET

JOB # XXXXXX STATE ROUTE XXX MILEPOST(S) XXX.XX - XXX.XX

SR 20 MP 92.8 Landslide

<>
<>

Washington State Department of Transportation
GEOTECHNICAL DIVISION

PREPARED BY First Last DATE Month XX, XXXX

SR20/MP92.7 Landslide
Washington State Department of Transportation

Site and Project Description:
This emergency action is located at MP92.7 on SR20 in Skagit County. It is located in T35N, R9E, S18, on the north side of SR20 on land owned by Weyerhaeuser Columbia Timberlands, LLC. (Figure 1) This area is forested with signs of logging in its recent history. Much of the growth seemed to be in the range of 1' DBH, indicating a recent logging history.

Situation:
On January 21, 2016, about 2.5 acres of hillside slid onto SR20 forcing the closure of SR20. Due to the critical nature of this roadway for community connectivity it was imperative that the road be protected and travel restored as soon as possible. With the continued movement of the soils above the roadway it meant that the hillside needed to be stabilized quickly to ensure the safety of the workers and the traveling public.

Analysis:
The primary cause of the slide seemed to be recent rains and a drainage that was directed in the middle of the slide area (Figure 2). This appeared to liquefy the soils causing its movement. It was determined that the drainage needed to be redirected outside the slide area in order to dry and stabilize this area.

Actions:
For the safety of workers, the area was cleared, as much of the timber had become dislodged and was moving in the slide action (Figure 3). At the top of the slide it was estimated we removed about 58 evergreens all virtually the same size (plantation growth), about 1' at DBH. It was estimated that this contained about 2,500 BF. Lower on the slope, but above the roadway, about a dozen evergreens, a combination of Western Red Cedar and Douglas Fir, 20" to 24" DBH were removed.

Once the area was made safe for access, a 400' long by 15' wide access road was constructed atop a decommissioned access road. A temporary pipe was placed north of the work/slide area to divert the stream away from the slide/work area. A new channel was constructed at this location for the permanent diversion of the stream. The channel was about 15' wide with a 3' flat bottom and 2:1 side slopes. (Figure 4) This new channel then outlet to an existing channel on the east side of the slide area. All exposed areas were stabilized and emergency work was completed on February 4th.

Closure:
On January 28th we were able to open the roadway to one lane of travel and on February 4th the Contractor left the work area. Two-way traffic was restored to the area the week of March 28th.

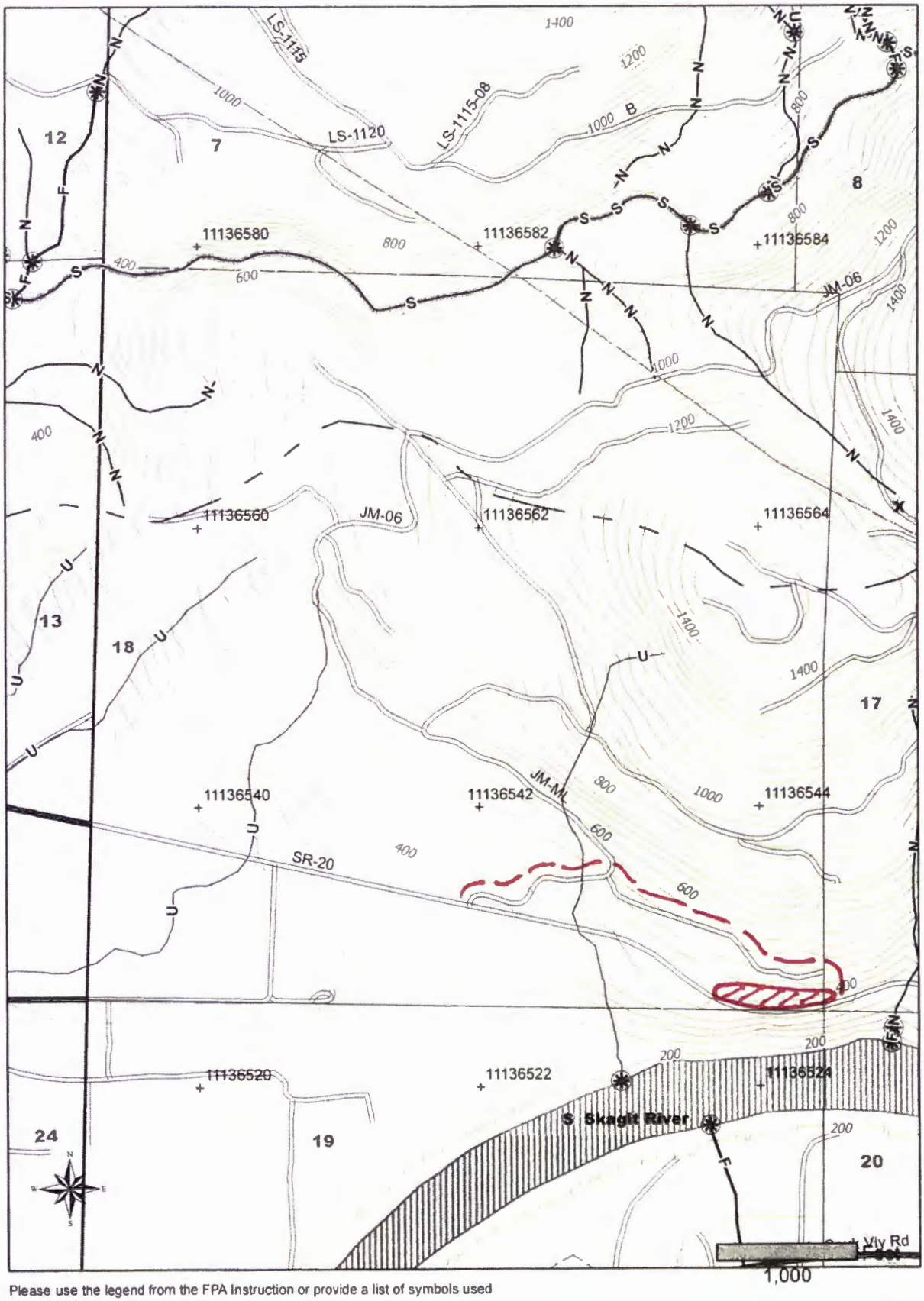
To date Washington State Department of Transportation teams have continued to remove material that continues to deposit in the existing ditches. With the drier spring weather the amount of material moved has decreased.

Further evaluation has noted a failure plane of granular material about 10' sitting atop a layer of bedrock. Ongoing analysis shows the landslide is occurring within alluvial fan deposits derived from glacial sediments and glacial deposits. The WSDOT is seeking funding in order to build a structure to key this material in place and protect the roadway.

FOREST PRACTICE ACTIVITY MAP

TOWNSHIP 35 NORTH HALF 0, RANGE 09 EAST (W.M.) HALF 0, SECTION 18

Application #: _____



Please use the legend from the FPA Instruction or provide a list of symbols used

Site Boundary

Danger Trees Removed

Date: 7/25/2016 Time: 7:39:42 AM

NAD 83

Contour Interval: 40 Feet

Figure 1

Legend:
Site Boundary:
Drainage Pathway:
Revised Drainage Pathway:
Sensitive Area:
20
© 2016 Google
2002
Interwest Construction, Inc.
SR 20, MP 92.7, Slide Repair
Project Site Map

Figure 2

Figure 3.

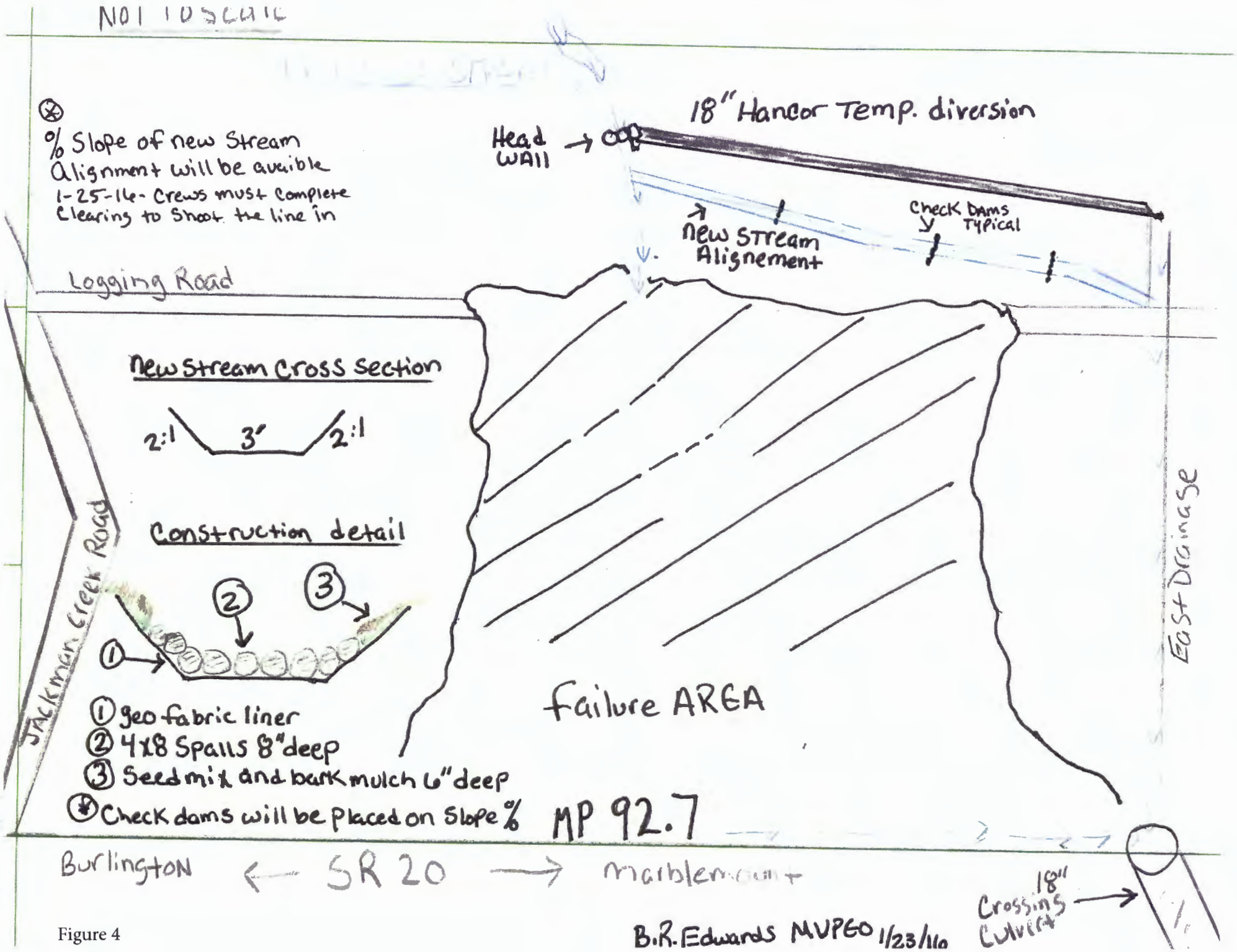

NOT TO SCALE
⊛
% Slope of new Stream Alignment will be avaible
1-25-16- Crews must complete Clearing to Shoot the line in
18" Hancor Temp. diversion
Head WAll
New Stream Alignement
Check Dams Typical
Logging Road
New Stream Cross Section
2:1
3'
2:1
Construction detail
1
2
3
Jackman Creek Road
East Drainage
Failure AREA
① geo fabric liner
② 4x8 Spalls 8" deep
③ Seed mix and bark mulch 6" deep
⊛ Check dams will be placed on Slope %
MP 92.7
Burlington
SR 20
Marblemount
18" Crossing Culvert
B.R. Edwards MVPEO 1/23/16

Figure 4

Marbled Murrelet Form

Western Washington Forest Practices Application/Notification

Complete this form only if you are harvesting timber (including salvage) or constructing roads. Do not complete this form if you have an HCP for marbled murrelets.

Answer every question.

1. ☒ No ☐ Yes For this FPA/N, has a protocol survey(s) been completed that includes:
   - Harvest units (and within 300 ft on your ownership), **or**
   - Salvage units (and within 300 ft on your ownership), **or**
   - Any area of proposed road construction (and within 300 ft on your ownership)?

If 'Yes', fill out the table and check the appropriate findings below.

Survey ID (Name or Unit #)	Township, Range, & Section	Survey was approved by WDFW (Attach approval letter from WDFW)	Survey was disapproved by WDFW and is being resubmitted with this FPA/N (Explain below)	Survey has been submitted to WDFW and survey approval is unknown (Explain below)	Survey is complete but has not yet been submitted to WDFW (Submit survey with FPA/N)
		☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections
		☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections
		☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections	☐ Occupancy ☐ Presence ☐ No Detections

Explanation:

WDFW data was queried using GIS. No marbled murrelet detections are located within 0.25 of the project. The nearest detection is more than 3 miles from the site. Habitat dominated by conifer saplings and hardwoods-not suitable for nesting.

2. ☒ No ☐ Yes ☐ Unknown Will you harvest, salvage, or construct roads within 0.25 miles of an occupied site?

3. ☒ No ☐ Yes ☐ Unknown Will you fly helicopter(s) over or within 0.25 miles of an occupied site?

4. ☒ No ☐ Yes Will you harvest *live* trees in a buffer of an occupied site?

   If Yes, describe the leave trees and buffer widths you will leave. *NOTE: If you leave less than required in WAC 222-16-080(1) (h) (v) this is a Class IV-Special and an Environmental Checklist is required*

Description of managed buffers:

N/A

5. ☒ No ☐ Yes Are there nesting platforms within any harvest unit (including salvage and road construction) that are within 300 feet that:

- Are not located within a surveyed area, **and;**
- Have a minimum of 2 platforms per acre, **and**;
- Are located within 7 or more acres of contiguous habitat, **and;**
- Have a least 40% (number not volume) of the dominant and co-dominant trees made up of Douglas-fir, western hemlock, western red cedar, or Sitka spruce?

If "Yes", complete the table below for those areas.

Name or # (as shown on map) of delineated stands of contiguous habitat	Delineated stand acres	Nesting platforms per acre	Number of trees 32 inches dbh or greater with platforms	Platform Assessment Method Field Sampling Method, Sample Plot Method, 100% Cruise Method, Inventory Model Method, or Other
			NA	NA-mainly small conifers 1" dbh removed
				Habitat not suitable for nesting per USFWS criteria

6. ☒ No ☐ Yes Are there areas within this forest practice or within 300 feet that:

- Are not surveyed, **and**;
- Are not listed in question 5, **and;**
- Have trees that are at least 32 inches dbh

If "Yes", list the forest practice unit numbers from your activity map. Provide brief description of current stand conditions. Such as tree species composition, stand age (if known), and maximum tree size (dbh).

Harvest Unit #(s)_____ ☐ Within the Unit ☐ Within 300 feet of the Unit

Description:

Harvest Unit #(s)_____ ☐ Within the Unit ☐ Within 300 feet of the Unit

Description:

Harvest Unit #(s)_____ ☐ Within the Unit ☐ Within 300 feet of the Unit

Description:

7. If you answered yes to question 1, 4, or 5, include a map (separate from your map that shows your harvest units and/or road construction) *See the instructions for the information required on each map.*

Washington State
Department of Transportation

Memorandum

September 20, 2016

TO: David Chamberlain
Weyerhaeuser Columbia Timberlands
500 Metcalf Street, Building F-5E
Sedro Wooley, WA 98284

FROM: T.M. Allen / T.C. Badger and G.L. Taylor
WSDOT Geotechnical Office, MS: 47365

SUBJECT: SR 20 MP 92.7 Emergency Landslide
Evaluation of Emergency Forest Practices Work

INTRODUCTION

This memorandum presents our summary and evaluation of the forest practice-related activities of the emergency landslide stabilization work conducted in late January through early February of 2016 on the Weyerhaeuser property located upslope of SR 20, east of the town of Concrete, in the vicinity of MP 92.7. The emergency work was required due to landslide reactivation and highway-related impacts resulting from unusually wet weather.

This memorandum is intended to address the requirements of WAC 222-10-030(1), as related to forest practice activities on potentially unstable slopes or landforms.

SITE CONDITIONS

The site is located in the southeast corner of Section 18 of T35N, R9E in Skagit County, Washington (Figure 1). The site consists of a slope above SR 20 that is thinly forested with alder, cottonwood, vine maple, and cedar. The subject slope is generally inclined at 10° to 15°, forming a relatively flat bench below the steeper mountainside situated upslope and to the north. The subject slope is situated above a highway cut slope, which is inclined at approximately 35° to 45° and is between approximately 15 and 20 feet in height. The Skagit River is approximately 325 feet south of (and 190 feet below) SR 20.

Two small streams flow into the site from upslope (Figure 2). The smaller western stream flows from a small upslope gully, into the project area where no channel was apparent, and into the subject landslide. The larger eastern stream flows through a well-defined channel from upslope of the project area, across a decommissioned (or otherwise unpassable) Weyerhaeuser gravel road, down the slope near the eastern margin of the landslide, and into the SR 20 ditch.

A gravel Weyerhaeuser road, connecting to Jackman Creek Rd. to the west, traverses the slope approximately 275 feet north of (and 80 feet above) SR 20 and becomes unpassable (where a cross-culvert was removed) at the eastern stream crossing.

Based on geotechnical borings WSDOT drilled to develop stabilization designs and regional geologic mapping (Tabor and others, 2003) (Figure 3), the landslide is underlain by landslide debris and colluvium, underlain by Vashon-aged glacial deposits and meta-sedimentary rocks of the Chilliwack Group. Landslides have been mapped within the Vashon-aged glacial deposits in the vicinity of the subject landslide (Heller, 1979; Ladd and Stettler, 2001).

Landsliding at this site was observed by WSDOT Maintenance during December 2015 following unusually wet weather in November and December. Debris and trees from the landslide toe began spilling off the bench and over the highway cut slope into the ditch and onto the highway. WSDOT Maintenance began clearing landslide debris from the ditch on the north side of SR 20 during December and continued to do so throughout the winter.

The rate of landslide movement and landslide debris accumulation in the SR 20 ditch increased markedly over the month of January and resulted in a full highway closure on January 22, 2016, after approximately 40 cubic yards of landslide debris and several trees fell across the highway and severed the overhead utility lines.

WSDOT engineering geologists evaluated the landslide on January 22, 2016. The landslide was field-mapped and measured as approximately 250 feet in width and approximately 300 feet in length (Figure 2). The landslide toe was identified midway up the cut slope directly above SR 20. The landslide headscarp, which exhibited up to 3 feet of vertical offset, was identified approximately 50 feet north of the Weyerhaeuser road. A small stream was observed flowing directly into the apex of the landslide headscarp and continuing downslope along the right lateral landslide margin, and then dispersing over the ground surface on the lower portion of the landslide. No indications of active ground deformation or slope movement were observed upslope of the active landslide area shown in Figure 3 or downslope of SR 20. Lidar imagery and geologic field-mapping indicated that the active landslide was situated within an older landslide feature (Figure 3).

DESCRIPTION OF EMERGENCY WORK

The WSDOT Geotechnical Office provided short-term landslide mitigation recommendations to WSDOT's Northwest Region. These short-term landslide mitigation recommendations, which were provided verbally via phone conferences, were the initial portion of a phased approach to the emergency management of the subject landslide and highway closure. The short-term landslide mitigation recommendations were: to remove potentially hazardous trees above SR 20 and within approximately 40 feet of the cut slope brow, to construct a debris containment area in the westbound lane of SR 20 using concrete barrier, and to divert the western

stream, which was flowing into the landslide headscarp, into the adjacent stream channel identified approximately 200 feet to the east. The intent of these short-term landslide mitigation recommendations was to arrest or reduce landslide movement and to contain debris that continued to impact the highway, so that WSDOT could reopen one lane of SR 20 to emergency vehicles as soon as possible, and eventually reopen at least one lane of SR 20 to public traffic.

A series of straw-bale check dams were installed on the highway surface downslope of the landslide debris, in order to reduce sedimentation entering the nearby inlet/culvert beneath SR 20. Removal of potentially hazardous trees and stream diversion work commenced in late January. The stream diversion work extended into February 2016. During the stream diversion work, the stream water was temporarily collected from the small upslope gully into an 18-inch pipe. The stream water remained clear, bypassed the work area, and was discharged into the stream channel located approximately 200 feet to the east (Figure 4). After the temporary stream diversion work was complete, the permanent diversion channel was excavated to a depth of 3 feet, lined with a geotextile and covered with 8 inches of quarry spalls. The remaining portion of the affected site was then covered with 6 inches of mulch and seeded (Figure 5). A hand-drawn detail for work is attached (Figure 6).

During the management of this emergency highway closure and implementation of the above-described short-term landslide mitigation recommendations, WSDOT employed best management practices to minimize or prevent sedimentation in public waterways.

Although landslide movement continued throughout the winter, the rate and character of landslide debris accumulation on SR 20 became manageable and one lane of traffic was opened to public traffic in early February, 2016. Both lanes of SR 20 were reopened to public traffic in early April, 2016.

GEOTECHNICAL INVESTIGATION

In February 2016, WSDOT began a geotechnical investigation to characterize the landslide for the purpose of developing long-term landslide mitigation design options. The investigation consisted of geologic field mapping, review of pertinent geologic literature and geotechnical records, review of available lidar imagery, drilling four geotechnical test borings, collection of subsurface samples, laboratory testing of selected samples, installation of two slope inclinometers and two piezometers, and a brief monitoring period of those instruments (Figure 7). Monitoring of piezometers and slope inclinometers was discontinued in May 2016. It is our understanding that the geotechnical instrumentation is still active and on site.

Test borings indicated that the landslide ground surface is underlain by heterogeneous deposits of sandy silt with gravel, sandy lean clay, and silty gravel. These deposits of unconsolidated materials were between approximately 25 and 40 feet thick, where encountered in the test borings, and were underlain by meta-sedimentary bedrock. During the drilling of test boring H-3si-16 (the only test boring drilled within the

active landslide limits), landslide debris was encountered to a depth of approximately 10 feet below the ground surface.

Groundwater was monitored in piezometers H-1p-16 and H-2p-16 between February and May of 2016. Groundwater was measured at depths of approximately 22 and 10 feet below the ground surface in H-1p-16 and H-2p-16, respectively. This shallow unconfined aquifer is interpreted to be perched on bedrock and is thought to saturate the majority of the overlying unconsolidated deposits, especially in the lower portion of the landslide and during the wet portion of the year. During January 2016, ponded and flowing water was observed on the ground surface across much of the lower portion of the landslide. The role/contribution of surface water flowing into the landslide relative to groundwater potentially elevating and saturating the unconsolidated soil is poorly understood at this time.

CLASS IV SPECIAL APPLICATION STATEMENT

The following are responses addressing Washington Administrative Code 222-10-030 (1) (a,b,c):

a) It is very unlikely that the above-described work will exacerbate existing movement of the landslide, or contribute to movement of any potential adjacent unstable slopes or landforms. In fact, this work was conducted to mitigate existing instability.

b) It is unlikely that this work resulted in sediment or debris being delivered to any public resources in a manner that would threaten public safety. The emergency activities sought to mitigate these impacts.

c) The above-described work was conducted to improve stability of the landslide and the risks associated with ongoing movement.

CLOSURE

This memorandum has been prepared to assist Weyerhaeuser and the Washington State Department of Natural Resources in the evaluation of the above-described emergency construction activity as it relates to forest practices. It should not be used, in part or in whole, for other purposes without contacting the WSDOT Geotechnical Office for a review of the applicability of such reuse. This report should not be construed as a warranty of ground conditions.

REFERENCES

Heller, P.L., 1979, Map showing landslides and relative slope stability of Quaternary deposits of the Lower Skagit and Baker valleys, North Cascades, Washington: U.S. Geological Survey, Open-File Report 79-963.

Ladd, D. and Stettler, D., 2001, Landslide Mapping - SR 20 Concrete Vicinity, Skagit County, Washington: Landau Associates.

Tabor, R.W., Haugerud, R.A., Hildreth, Wes, and Brown, E.H., 2003, Geologic map of the Mount Baker 30- by 60-minute quadrangle, Washington: U.S. Geological Survey, Miscellaneous Investigations Series Map I-2660, scale 1:100,000.

If you have any questions or require further information, please contact Tom Badger at (360) 709-5461 or Gabriel Taylor at (360) 709-5586.

State of Washington
Engineering Geologist
114
Licensed Geologist
9/20/16

Thomas C. Badger

Prepared By:
Thomas C. Badger, L.E.G., P.E.
Chief Engineering Geologist

State of Washington
Engineering Geologist
2869
Licensed Geologist
9/20/2016

GABRIEL TAYLOR

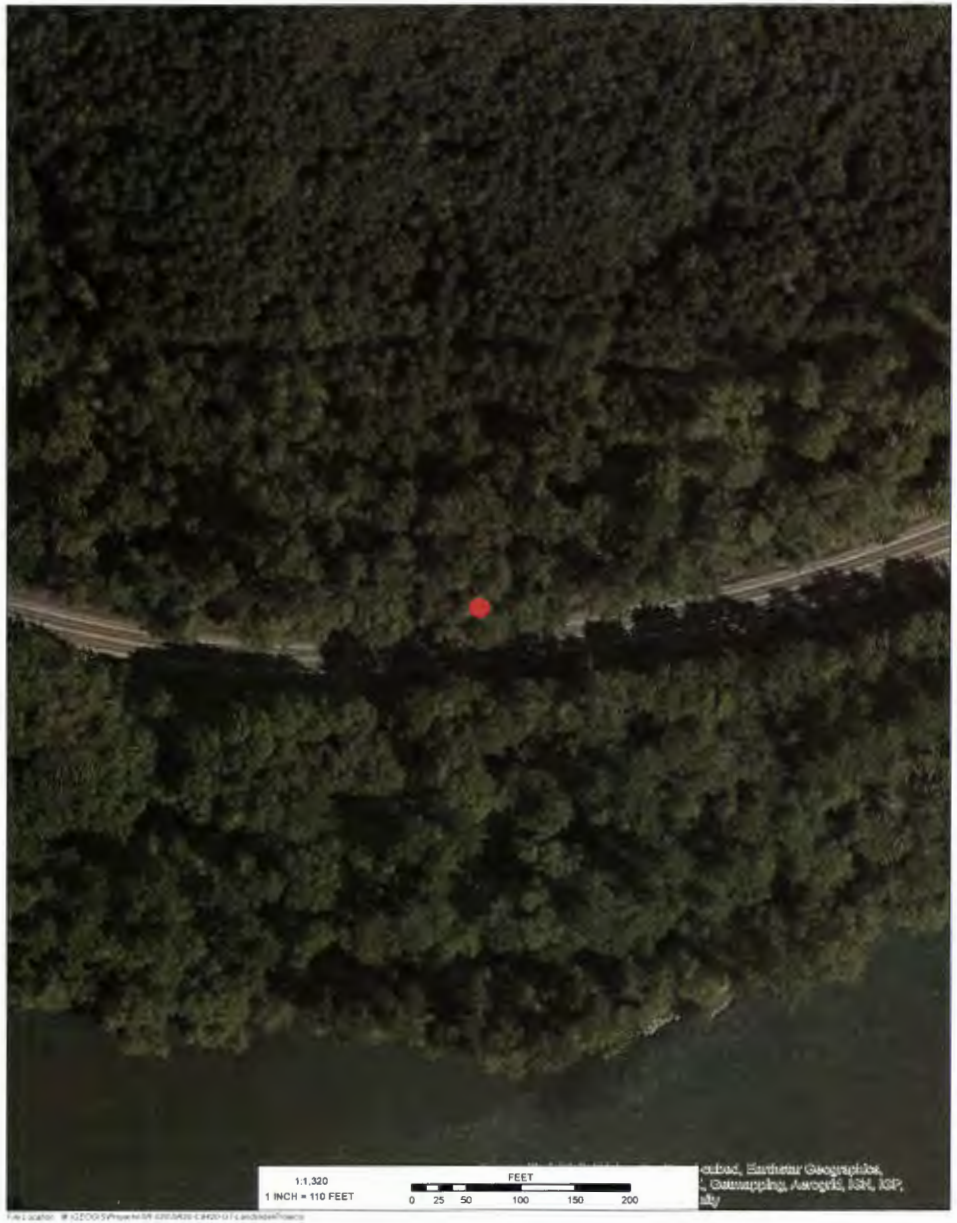
Prepared By:
Gabriel L. Taylor, L.E.G.
Engineering Geologist

Agency Approval Authority:
Tony M. Allen, P.E.
State Geotechnical Engineer

Attachments:
Figures

TMA:tcb&glt

cc: Shane Spahr, NWR Project Engineer, Burlington Project Office, NB82-210
George Carlson, NWR Environmental Services, Burlington Project Office, NB82-210



LEGEND

- Site
- Milepost Markers
- WSDOT Regions
- County Boundaries (1:500K)

N

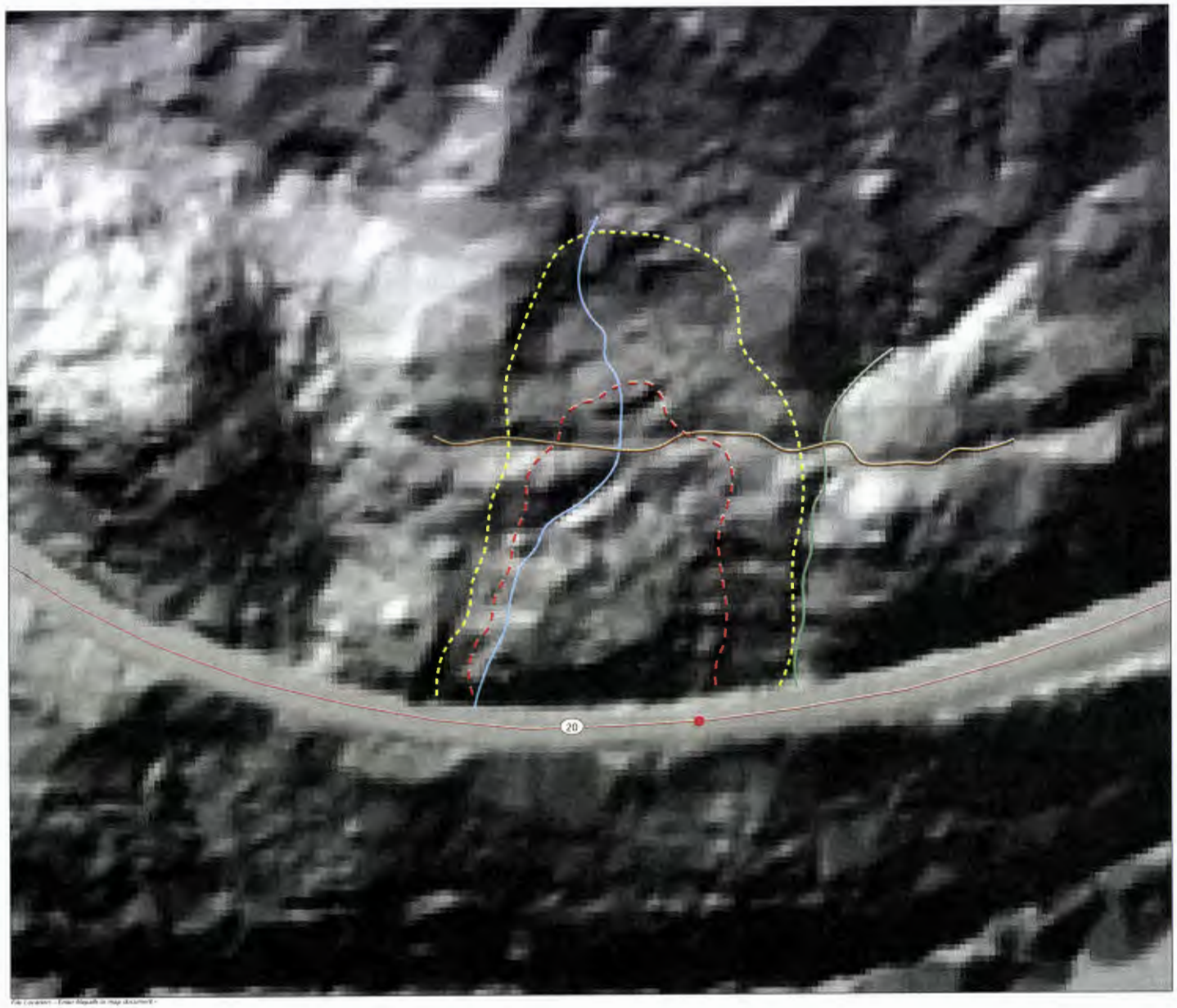
JOB # C-8423	STATE ROUTE 20	MILEPOST 92.8

FIGURE 1: SITE VICINITY

Landslide
SR 20 MP 92.8

Washington State Department of Transportation
GEOTECHNICAL OFFICE

PREPARED BY Tracy Trople DATE September 14, 2016



LEGEND

- Active Landslide Feature (Approximate)
- Older Landslide Feature (Approximate)
- Weyerhaeuser gravel road
- Stream flowing into landslide
- Stream adjacent to landslide

N

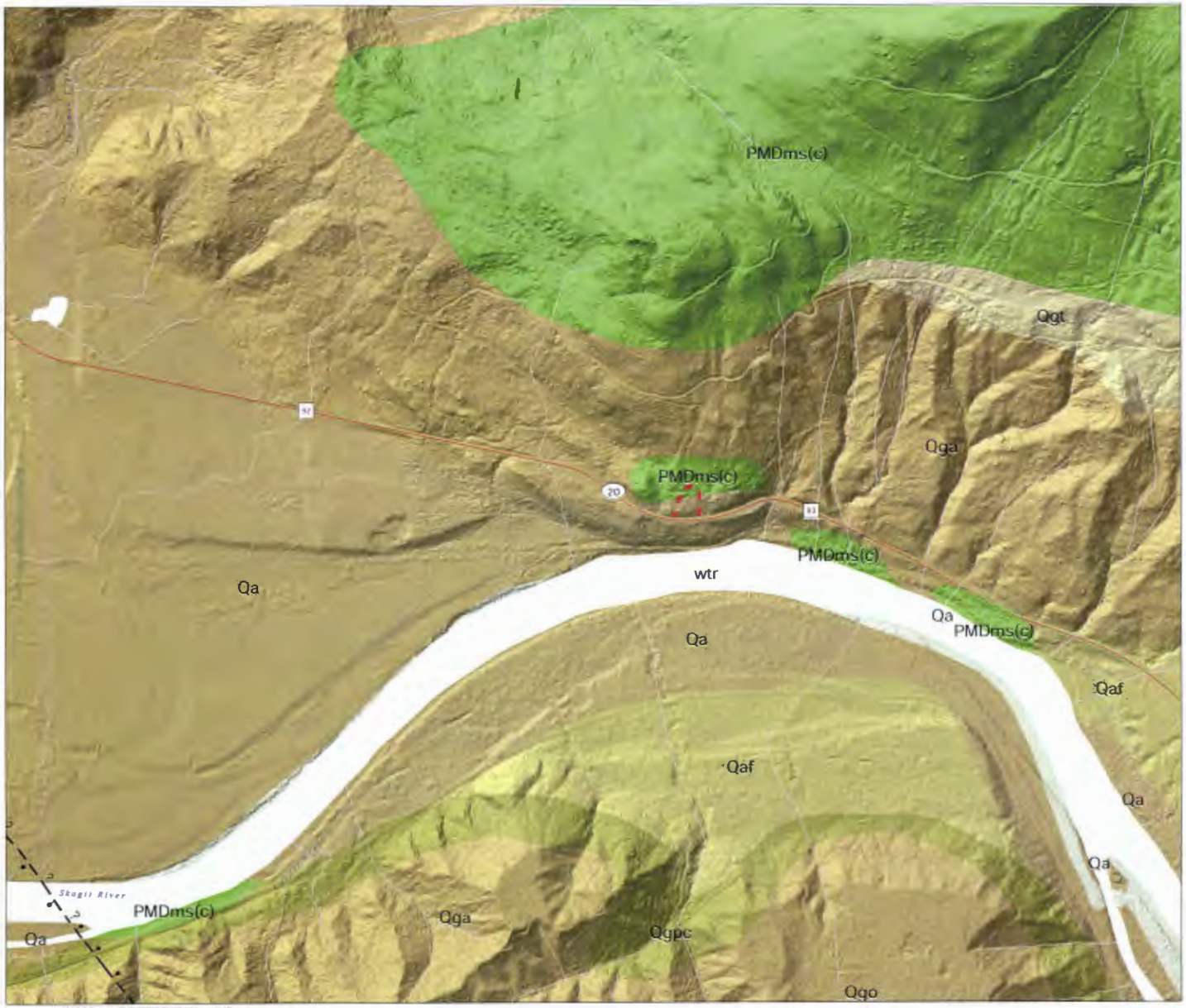
FEET
0 25 50 100 150 200
1:1,200
1 inch = 100 feet

JOB # C8423 STATE ROUTE 20 MILEPOST(S) 92.7

FIGURE 2: LANDSLIDE MAPPING

Washington State Department of Transportation
GEOTECHNICAL DIVISION

PREPARED BY Gabriel Taylor, L.E.G. DATE 03/30/2016



Legend

N

Active Landslide

Milepost Markers

Faults 100K

Normal fault - Identity or existence questionable, location approximate. Bar and ball on downthrown block [47]

State Route

Waterbodies

Rivers & Streams

Geologic Units 100K

Holocene

Qaf - alluvial fan deposits

Qgpc - continental glacial drift, pre-Fraser, and nonglacial deposits

Holocene-Pleistocene

Qa - alluvium

Pleistocene

Qga - advance continental glacial outwash, Fraser-age, mostly Vashon Stade in western WA; unnamed in eastern WA

Qgo - continental glacial outwash, Fraser-age, mostly Vashon Stade in western WA; unnamed in eastern WA

Qgt - continental glacial till, Fraser-age, mostly Vashon Stade in western WA; unnamed in eastern WA

Permian - Devonian

PMDms(c) - metasedimentary rocks, Chilliwack Group of Cairnes (1944)

Other

wtr - water

Base topography: USGS LiDAR 2006

100K Geology: Washington State Department of Natural Resources, Division of Geology and Earth Resources, 2010.

FEET

0 250 500 1,000 1,500 2,000

1:12,000

1 INCH = 1,000 FEET

JOB # C-8423 STATE ROUTE 20 MILEPOST 92.8

FIGURE 3: GEOLOGY MAP

Landslide
SR 20 MP 92.8

Washington State Department of Transportation
GEOTECHNICAL OFFICE

PREPARED BY Tracy Trople DATE September 14, 2016

JOB # C8423 STATE ROUTE 20 MILEPOST(S) 92.7

FIGURE 4: TEMPORARY STREAM DIVERSION

Washington State Department of Transportation
GEOTECHNICAL DIVISION

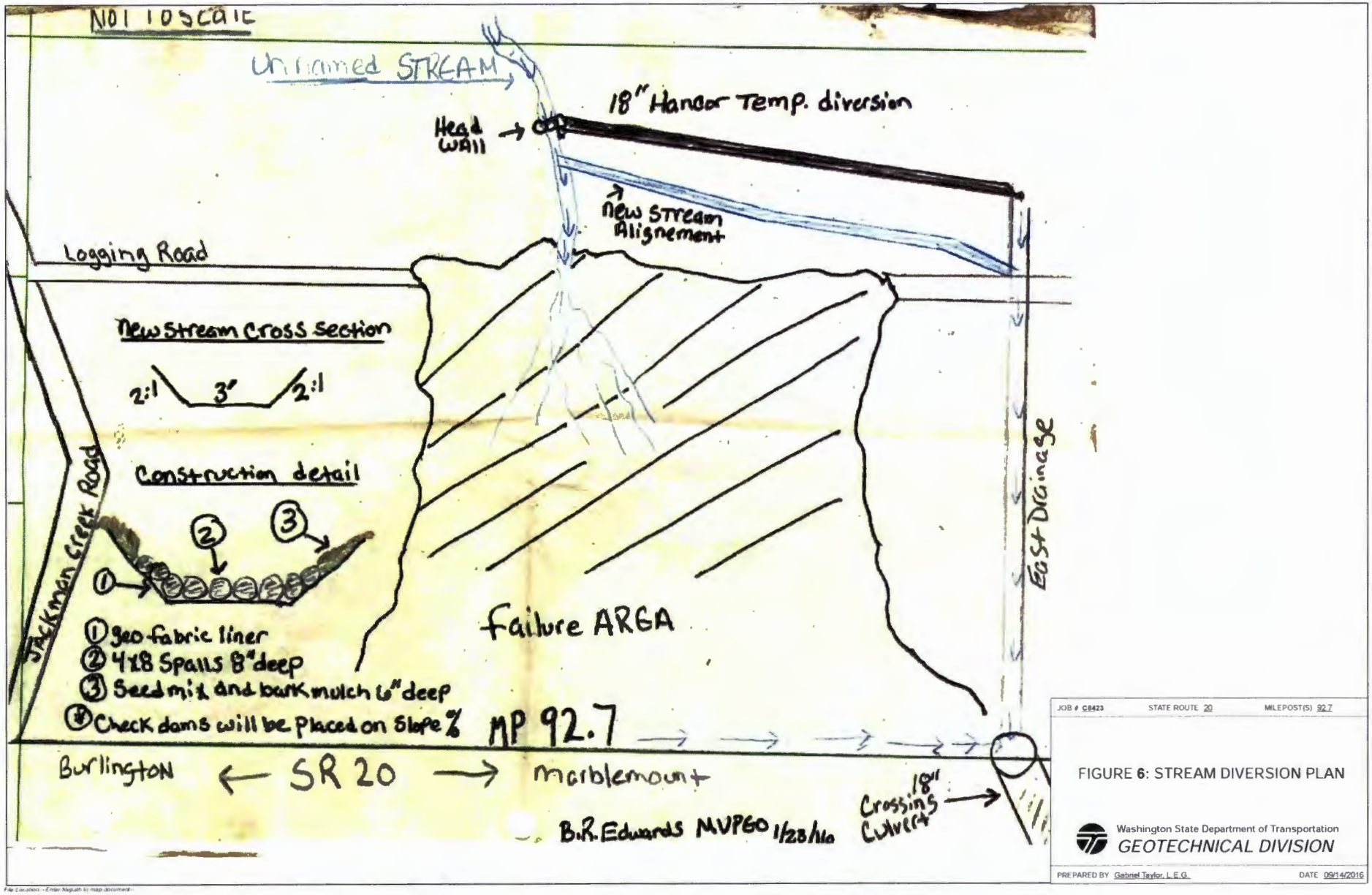
PREPARED BY Gabriel Taylor, L.E.G. DATE 09/14/2016

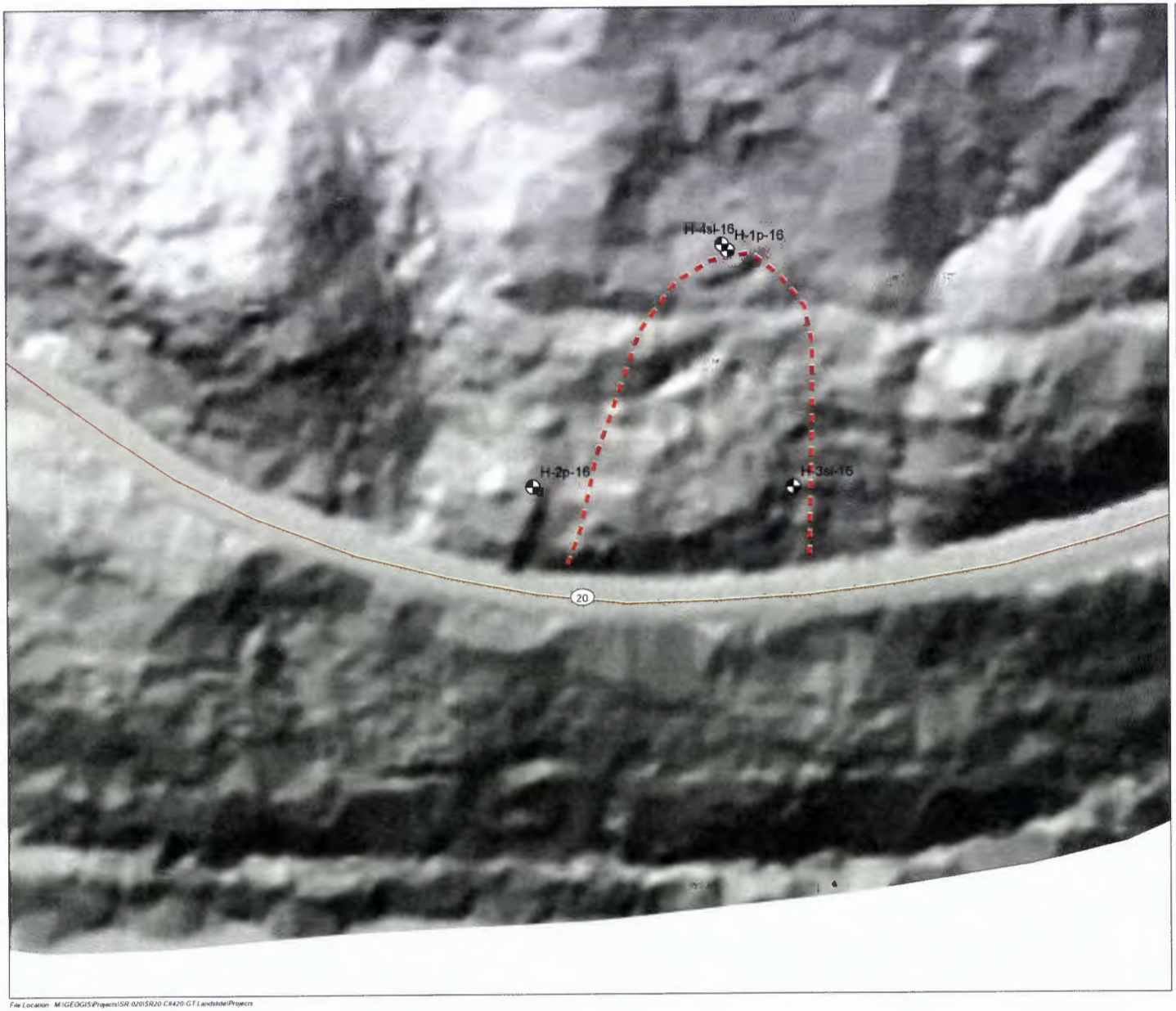
JOB # C8423 STATE ROUTE 20 MILEPOST(S) 92.7

FIGURE 5: PERMENANT STREAM DIVERSION

Washington State Department of Transportation
GEOTECHNICAL DIVISION

PREPARED BY Gabriel Taylor, L.E.G. DATE 09/14/2016


NOT TO SCALE
Unnamed STREAM
18" Hanger Temp. diversion
Head WALL
New Stream Alignement
Logging Road
New Stream Cross Section
2:1
3'
2:1
Construction detail
1
2
3
1 geo-fabric liner
2 4x8 Spalls 8" deep
3 Seed mix and bark mulch 6" deep
4 Check dams will be placed on Slope %
Jackman Creek Road
Failure AREA
East Drainage
MP 92.7
Burlington
SR 20
Marblemount
18" Crossing Culvert
B.R. Edwards MVPGO 1/28/16
JOB # C8423
STATE ROUTE 20
MILEPOST(S) 92.7
FIGURE 6: STREAM DIVERSION PLAN
Washington State Department of Transportation
GEOTECHNICAL DIVISION
PREPARED BY Gabriel Taylor, L.E.G.
DATE 09/14/2016



Legend

- Borings020516
- Active Landslide
- State Route
- Waterbodies

N

100K Geology: Washington State Department of Natural Resources, Division of Geology and Earth Resources, 2010.

FEET
0 25 50 100 150 200

1:1,200
1 INCH = 100 FEET

JOB # C-8423 STATE ROUTE 20 MILEPOST 92.8

FIGURE 7:
GEOTECHNICAL INVESTIGATION

Landslide
SR 20 MP 92.8

Washington State Department of Transportation
GEOTECHNICAL OFFICE

PREPARED BY Tracy Trople DATE September 14, 2016

File Location: M:\GEOGIS\Projects\SR 020\SR20-C8420-GT Landslide\Projects