

Rainforest Reserve and Arch Cape Forest
Ecological Road Assessment

Completed by Springboard Forestry LLC
Client: North Coast Land Conservancy
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Table of Contents

Introduction	6
Data	8
Fieldwork	9
Report Structure	11
Section 1 - Road Conditions and Basic Terminology	12
Terminology	13
Road Types	16
Road History and Construction	18
Common Road Issues	20
Standard Road Maintenance	23
Section 2- Road Segment Assessment	25
Map Legend	26
2.1 Segment Analysis - Arch Cape Forest	27
2.2 Segment Analysis - Rainforest Reserve	73
Section 3- Management Recommendations	113
Basic Maintenance	114
Road Abandonment	116
Road Decommissioning	118
Project List	120
3.1 Arch Cape Forest Projects	122

Table of Maps

Property Map	5
Segment Map Legend	26
Segment Maps	28-112
Basic Maintenance Roads	115
Abandoned and to be Abandoned Roads	117
Decommission Roads	119
Road Project Locations	121
Project Maps	123-136



GN

■ Gates	— Unknown	- - Abandoned	— <all other values>
Streams	— <all other values>	— Mainline	■ Property Boundary
Fpa Size	Roads	— Secondary	■ DWSA
— Large	Road Type	— Spur	
— Medium		— Spur	
— Small	- - Abandoned	— Trail / Other	



The full property includes the Arch Cape Forest (West) and the Rainforest Reserve (East). The Road Assessment included all roads on both properties, separated by ownership into section 2.1 and 2.2

Introduction

This ecological road assessment has been completed at the request of the North Coast Land Conservancy and the Arch Cape Domestic Water Supply District (hereafter referred to as the Arch Cape Forest). Funding for this assessment was provided by the Oregon Watershed Enhancement Board. Project work for the assessment was completed by Springboard Forestry (Ben Hayes, Thal Anderson, Oliver Curtis), and North Coast Land Conservancy (Melissa Reich, Amy Hutchmacker). Additional thanks to Mike Patterson and Kathleen Sayce (NCLC), Bryce Rodgers, Craig Sorter and Ami Kreider (ODF), Mike Sinnot (ODFW), Jason Smith (CB Fire) and Matt Gardner (ACWD) for their review and contributions.

The intention of this report is to assess the function and condition of the road infrastructure for the roughly 5,000 acres comprising the Rainforest Reserve (3,596 acres) and Arch Cape Forest (1,441 acres). While these are legally and operationally separate ownerships, they share road infrastructure based on the common ownership history. Both forests were previously owned by the same industrial and institutional owners and were only separated in 2021 / 2022 (CHECK), when North Coast Land Conservancy purchased the Rainforest Reserve from EFM, the previous owner. The Rainforest Reserve is largely reliant on the roads of the Arch Cape Forest for access, while the roads of the Rainforest Reserve have potential hydrological impacts on the source water procured from the Arch Cape Forest.

This assessment is intended not only to evaluate the function and maintenance needs of the road system, but also the implications of roads and road maintenance on the underlying ecology of the forest. The ecological implications of road maintenance are particularly unique given numerous unique plants and invertebrate habitat certain ditch lines and roadside seeps. The hydrological and

ecological complexity of the site will drive many future management decisions, from large scale (eg. what roads are maintained vs. decommissioned) to the minor (what time of year road brushing should take place during). These impacts must be balanced against prioritizing and maintaining a functional road system that provides sufficient access for management activities.

This ecological roads assessment supplements existing adopted forest and multi-resource management plans for both the Rainforest Reserve and Arch Cape Forest. A public access plan is currently under development with both landowners as partners and should be completed in September of 2023. The management plans outline future management activities that may or may not require road access.

Adjoining landowners hold easements allowing access to some parts of each property. These landowners are Lewis and Clark Timberland / Nuveen Natural Capital to the North, and Weyerhaeuser to the East and South. Some minor access is also provided to the property via Oregon Department of Forestry to the North.

Data

This road assessment relies on existing data from a range of sources. These sources include:

- Onion Peak Roads layer provided by NCLC and EFM, created by Stimson
- Onion Peak Culverts layer provided by NCLC and EFM, created by Stimson
- Rainforest Reserve Access and Easements - provided by NCLC
- Oregon BLM Statewide Roads
- Oregon Department of Forestry Statewide Roads
- Oregon Department of Forestry (data access) / Oregon Department of Fish and Wildlife Statewide Hydrology
- DOGAMI (landslide hazard and Lidar)

The base property-level road inventory and assessment data was generated by Stimson Lumber. This data generally agreed with ODF and BLM statewide roads data and appears to have not been updated since Stimson's ownership. The road and culvert data was updated in 2022 and 2023 as part of this ecological road assessment.

Fieldwork

Fieldwork for the ecological road assessment was completed between July 2022 and March 2023. Field visits included evaluation of road surface and runoff under dry and wet conditions. In addition, 410 of the 554 culverts on the property were visited, marked, and evaluated for the following variables:

- Ownership
- Road Name
- Inventory Date / Person
- Feature Type (cross drain, stream crossing, other)
- Culvert Type (round, open bottom, squish, other)
- Installation Year (update from Stimson data to reflect new culverts)
- Material (plastic, steel, aluminized steel, log puncheon)
- Diameter
- Length
- Erosion Level (ADD detail)
- Condition Rating (good, fair, poor, failed)
- Percent Open
- Stream Class
- Fill Height
- Fish Blockage (yes / no)
- Year Maintained
- Attention (flagged to watch, repair, replace, etc)

In addition, failed or failing culverts and road sections are identified for maintenance, replacement, or removal. In some cases, culvert replacement requires road engineering, which is beyond the scope of this assessment.

Full road decommissioning and road abandonment are likewise recommended based on the property management plans. Road segments are identified by name and logical maintenance length - typically from one spur to the next spur. As operational plans for the Arch Cape Forest are still in development, decommissioning and abandonment plans are preliminary and may be adjusted in the future.



Report Structure

This road assessment report is separated into three discreet sections. These sections are:

1. **Road Conditions and Basic Road Maintenance** – This section provides basic road types, general road issues, and standard road maintenance procedures. This section also outlines basic steps that the property managers and contractors can take to improve the ecological outcomes of maintenance activities.
2. **Road Segment Assessment Report** – This section provides a written report on road conditions by logical management segment (typically from spur to spur). Unless sub-spurs exist on spurs, or conditions of a spur change along the length of the road, spurs are reported as a single road. This segment identifies maintenance and decommissioning plans per segment.
3. **Management Recommendations** – This section provides a written summary of all major projects recommended for each property. This includes road decommissioning and major maintenance or construction. This does not include routine road brushing, grading, rock, and minor culvert replacement. This segment species projects by segment (s) and is again divided by ownership, with 3.1 covering the Arch Cape Forest and 3.2 covering the Rainforest Reserve.

Section 1 -

Road Conditions

Basic Terminology

This section is intended to provide a base level of understanding and terminology relating to road condition and maintenance. Many segments of road on the forests share characteristics in terms of construction, size, current condition, and necessary maintenance.

Terminology

Forest roads utilize a somewhat unique terminology. The following terminology may be useful:

Prism: the road prism is the overall opening within which the road exists - from edge to edge of excavated or disturbed soil associated with the road bed.

Road base: the road base is the underlying material on top of which a road is constructed. The road base is either native material (from the site) or some type of rock.

Crushed Rock: most roads in the system are surfaced with crushed rock 1.5" and smaller. Rock is size by the largest size through a screen and all smaller rock, eg 1.5" minus. Crushed rock is typically used on the surface, but may also be used for culvert installation or other purposes.

Pit Run: pit run rock is road base material that comes straight out of a rock pit without any screening.

In-slope: an in-slope road drains into a ditch on the uphill side of the road surface, with water draining through some form of cross drainage.

Out-slope: an out-slope road drains off the downhill side of the road surface and does not require cross drainage.

Cross Drain: a cross drain allows water to pass from the up-slope to down slope side of a road. Cross drains include culverts, rolling dips, log puncheons, and to some degree water-bars.

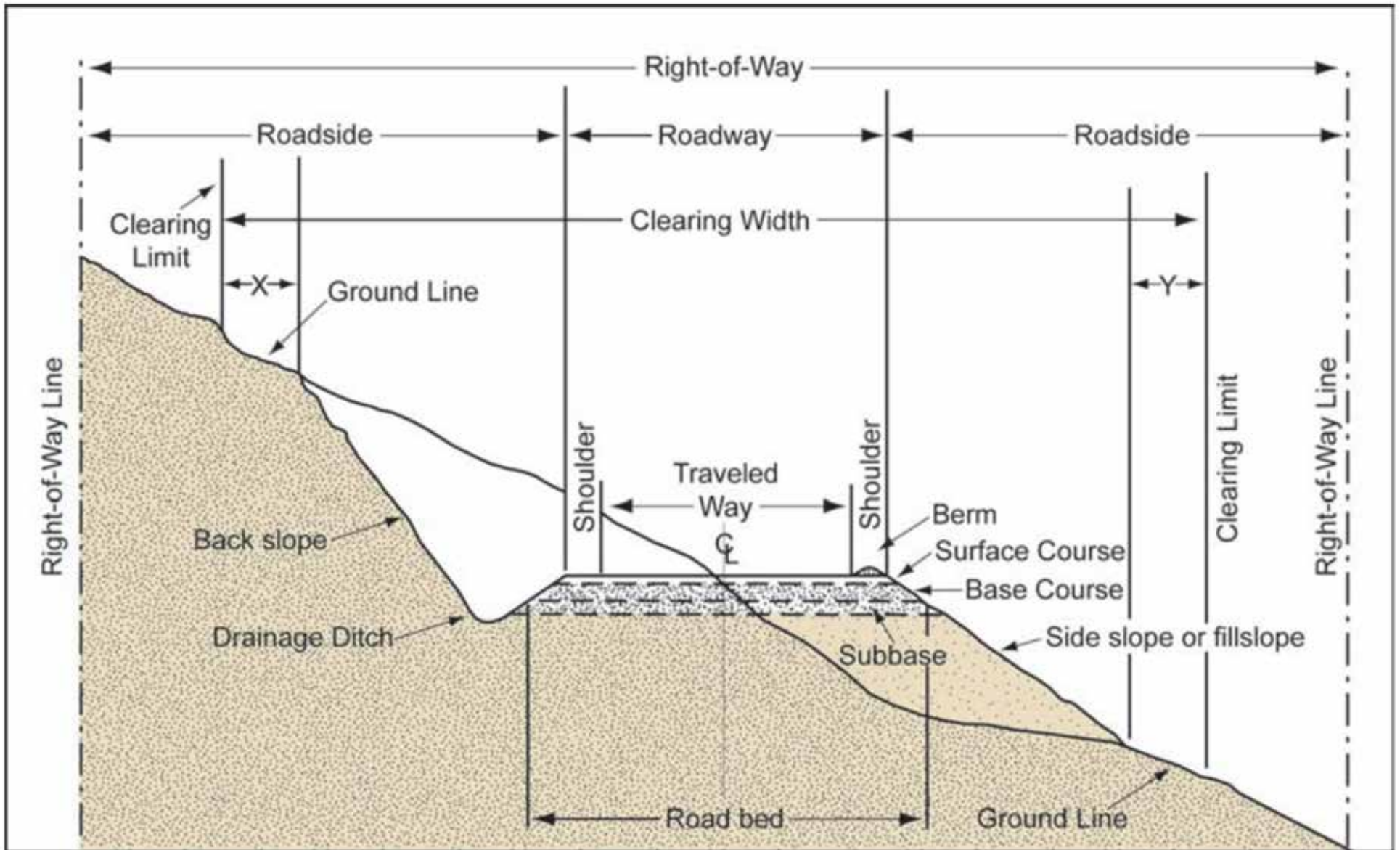
Culvert: A culvert is a pipe that passes beneath a road to pass water, either draining a ditch (cross drain) or for a stream.

Rolling Dip: A rolling dip is a long dip in the road surface with proper angle and rise to force water from the up-slope side to the down-slope side of the road.

Log Puncheons: Log puncheons are a unique and somewhat archaic cross drain structure built from logs underneath the road surface.

Water-Bar: A water bar is a groove or small (2" - 24") dip cut laterally across the road surface. Water bars should not be used for ditch relief, but are suitable for draining water off of a road surface. A large water bar that has accelerated erosion is shown below.





Source: USDA Forest Service Guidelines for Road Maintenance Levels (<https://www.fs.usda.gov/t-d/pubs/pdf/11771811.pdf>)

Road Types

Mainline: mainline roads typically originate at a gate or large intersection and provide access throughout the property. These roads typically have a large overall prism and are built for 4-season use. The road surface on mainline roads is crushed rock built on a significant base of pit run or other road base rock. (ADD MILEAGE).

Secondary: A secondary road forks off of a mainline road and may be terminal, or may provide access to additional spurs. Secondary roads have a crushed rock surface and may have a rock or native material road base. The secondary roads on the Rainforest Reserve and Arch Cape Forest were initially built for 4-season use, but most have not been maintained for at least 4 years.

Spur: Spur roads are small and short roads that access areas within an individual stand or forest management unit. Spurs may have a rock or native material surface- most on these forests have a rock surface and native material base, although some also have a rock base. Most spurs terminate at a "landing" where logs would be loaded on trucks during logging operations. Some spurs were built for 4-season use, but they have not been maintained since (INSERT YEAR).

Abandoned: Some spurs and secondary roads on the Rainforest Reserve and Arch Cape Forest have been abandoned for various reasons. Some of these roads were decommissioned with culverts removed, while others have temporary mitigation in place such as water bars, and others were abandoned with no mitigation taking place. Most of the abandoned roads are now elk trails and have large decommissioned stream crossings isolating them from the primary road system

Mainline



Secondary



Spur



Abandoned



Road History and Construction

The roads on the Rainforest Reserve and Arch Cape Forest were primarily constructed in a manner very common for the 1950s - 1970s. It appears that roads were constructed by Crown Zellerbach and Willamette Industries, with some more recent roads constructed by Stimson Lumber in the Eco-la Creek Bowl areas.

The roads are primarily cut into the slope with fill deposited downslope or end-hauled to areas where the road traverses a ridge and a suitable spoils site could be found. In many areas, large boulders and bedrock were blasted to either provide a suitable grade for the road, or to provide the actual road base. The most stark example of this type of road is the Angora Peak Rd, visible from Hwy 101 and fully blasted into basalt bedrock. Rather than a traditional cut and fill road construction, the roads appear to have a small cut with a very large amount of road base rock placed to create the road bed. The result is a road built primarily on a rock base and sitting above the surrounding ground. Interviews with road builders who were involved with the construction of the RR / ACF road system indicate that some areas received as much as 4' of road base and 12-18" of crushed rock for surfacing.

Almost all of the roads on the forests are in-sloped and were constructed with a shallow ditch. Cross drainage was provided either by ditch-relief culverts or with "log puncheons." Log puncheons are essentially logs stacked beneath the road in a manner that would allow water to move from the up-slope ditch to the downslope roadside.

Some limited areas of road were either outsloped or have slumped to the point where they have become outsloped. These include small areas of Dave's Spur and the Onion Peak Mainline past

the junction with Dave's Spur. Outsloped roads are designed to shed water to the downslope side without the use of a ditch or ditch relief culverts.

Culverts were replaced or added beginning in 2006, with many plastic culverts placed between 2006-2008. Another major period of road work occurred prior to harvests in the Ecola Creek bowl, including two large open-bottom stream crossings. Most recently, contractors re-aligned a portion of the HP19 road where it crosses Shark Creek. This re-alignment required installation of a squished culvert and construction of approximately ¼ mile of new road. Unfortunately this re-alignment was not engineered or designed for truck traffic and will require re-construction or a new re-alignment if any logging is planned.

Other than the HP19 Shark Creek re-alignment, very little road maintenance or brushing has taken place since 2018 or 2019. As a result, there is a significant backlog of basic maintenance that should be undertaken prior to major road reconstruction or decommissioning.



Common Road Issues

Roads within the Rainforest Reserve and Arch Cape Forest share a common set of issues, primarily resulting from a lack of regular maintenance. These issues are described in greater detail in the individual road segment reports, however an overview is provided here for common road and culvert issues. These are by no means exhaustive and roads fail or decay in a wide array of unique ways, some of which can be predicted and others cannot.

1. **Vegetation growth** - as of spring 2023, all of the roads in the Arch Cape Forest and Rainforest Reserve are overgrown to some degree. A standard road prism for these types forest roads would be 12' from road center or 5' out from the ditch line. Most of the roads have at least some growth extending into the actual driving surface, and many roads are completely filled with brush and small alders, as large as 4" DBH.
2. **Ditch sedimentation** - many ditches throughout the road system have filled with sediment, typically running either from the uphill cutbank or from the road surface. In some areas this sediment deposition has completely filled the ditch to the point where water is forced onto the road surface. These areas typically also have ditch relief culverts that are partially or fully plugged with sediment. The worst example of ditch and culvert sedimentation is the OP400C-10, which forks off of the Side 7 spur in the Ecola Creek bowl. Much of the Onion Peak Road also has severe ditch sedimentation, although it is unclear whether a ditch was ever fully established.
3. **W profile** - many roads within the network were built with a crown - meaning that the center of the road was higher than either shoulder, allowing water to run off. Over time, and without

grading or addition of new surface rock, tire ruts will develop and cause the road to change from a smooth crown to a W profile. In these W profile roads, the center hump rises while the tire tracks drop. Rock from the tire tracks is pushed outwards onto the shoulders of the road, which, along with sod growth, rise. The result is a road where water cannot escape the road surface. The eventual result is rutting, which can be seen HP19 Tie Road. In this case, water runs down the tire tracks on the road surface and erodes through the crushed rock surface, eventually exposing road base and potentially destroying the road. W profile roads also tend to mobilize fine sediment and transport it into streams and ditches.

4. **Slumping** - Road fill, base and surfaces should stay in generally the same location as they were when originally built. In an ideally constructed road, this material stays dry and stable, with water running through culverts and cross drains and spreading into the forest downslope from the road. In cases where sufficient drainage does not exist or the road was constructed on unstable material, the road base can become mobile and slump downhill. This typically occurs with a fault or fracture in the road surface at each end, and a segment of road moving down the hill. In most cases where this has taken place in the network, the road is built on fill which has become saturated as a result of poor drainage. In some cases, it appears that the slumping section is moving on a base of solid bedrock which presents additional challenges. Slumping is a major issue that can be either simple or very complicated to manage.

5. **Culvert Obstruction** - In any situation where a culvert transports water to the downhill side of a road, it also passes some amount of sediment, either suspended in the water or moving along the base of the ditch or stream. This mobilized sediment can, especially in undersized culverts, obstruct the culvert. Typically this occurs on the upslope side of the culvert and can be fixed with simple cleaning. On culverts with insufficient slope or flat outflow areas, the outflow or middle of the culvert can become obstructed. This is more difficult to clean and may require either blasting the sediment out with water (often from a fire wagon) or utilizing a vacuum truck. Properly built and regularly maintained culverts should not require this kind of re-opening.

6. **Culvert Erosion / Shotgun** - Culvert outflows often experience erosion or “shotgunning.” This condition occurs when a culvert sticks out from the road fill and causes erosion to cut either down into the fill, or back under the culvert. There are a number of mitigation measures that may help, including armoring the outflow with rip-rap boulders, adding a plastic flume, adding additional ditch relief up-slope, or trimming and re-directing the culvert outflow. In all cases, the sooner that culvert erosion is caught the more successful management will be.

7. **Culvert Failure**- Culverts have a finite lifespan and do regularly fail. This can occur with full obstruction, with a rusted bottom, as a result of tree roots, or due to erosion. Failed culverts are often older, improperly located, or lack maintenance. These culverts must be replaced, or removed and replaced with new, better-located culverts.



Standard Road Maintenance

This section includes steps for basic road maintenance that a landowner would expect to undertake on a well-maintained forest road network. Larger maintenance projects are also often required, and are discussed in subsequent report sections.

1. **Road Brushing** - using a mower or other machine-mounted brushing head is a common step for maintaining an open road prism. Brushing should take place every 3-5 years (variable depending on other vegetation control such as herbicide) and should fully open the road prism. A standard prism width on primary and secondary roads is 12' from road center or 5' from ditch line (whichever is greater) up 12-14' from the road height. For greatest efficacy, road brushing should take place immediately after the spring growing season, in May - early June. While this timing is best for decreasing plant vigor following brushing, it also presents ecological issues in terms of nesting and breeding seasons. Road brushing not only makes roads driveable, but also keep tree roots from extending into the road surface and ditches, destroying culverts and ditches.
2. **Culvert and Ditch Cleaning** - Well maintained culverts and ditches should efficiently pass water from the up-slope side of a road to the down-slope side. To do this, ditches must have a clear gradient and direct flow into culverts. Culverts must have a clean inlet and outlet, not be plugged with sediment or vegetation. Cleaning culverts and ditches can be done by hand with a shovel and hand tools, or with a small excavator or backhoe and a smooth-edge ditching bucket.
3. **Road Grading and Rock** - Roads should have a clear crown and in- or out-slope with shoulders that smoothly slope away from the road. If a road has sufficient surface rock, this shape can be

maintained with a grader or blade runner type machine. In many cases, the surface rock has been pushed onto the shoulders. In some cases, a skilled grader operator can pull this shoulder rock back onto the surface, blend it with the surface rock, and re-establish the road shape. In most cases however, new additional crushed rock, typically 1.5' minus, is required for re-shaping the road. This addition of new rock will cover the road base and allow for proper grading. A properly graded road will shed water into the ditch or down-slope road shoulder.



Section 2 - Road Segment Assessment

This section provides summary information for each road segment on the Rainforest Reserve and Arch Cape Forest. These segments are either delineated from spur to spur, or by logical maintenance segment (for instance in an area with a slump). Each segment also indicates the responsible landowner, any parties with existing access easements, and future project work required beyond basic road maintenance.

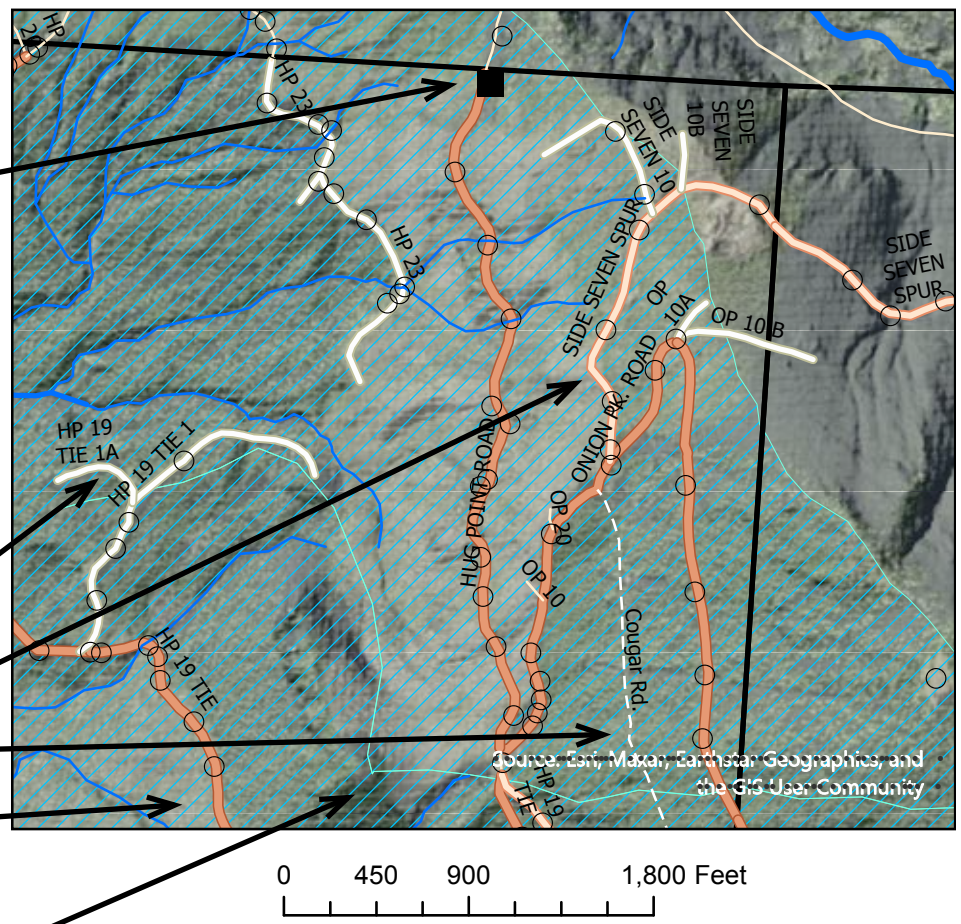
Many roads on the property have both a common-use name and a name or number in the road database. Both are included wherever they are known. In addition, each description includes a map and any relevant photos. Every segment of known road in the property is included in the following section. The descriptions begin at the Hug Point Gate and include all roads on the Arch Cape Forest followed by those on the Rainforest Reserve. Some exceptions exist, such as where a road from the Arch Cape Forest crosses onto the Rainforest Reserve for a distance less than .25 miles. Any recommended road stewardship is included in a red side-bar and the road maintenance class and length are indicated below the segment name. The section is split into 2.1 (Arch Cape Forest) and 2.2 (Rainforest Reserve)

Map Legend

Each segment includes a mini map zoomed in to the specific road segment. The maps include the following elements:

- Culverts
- Gates
- Streams
- Fpa Size
- Large
- Medium
- Small
- Unknown
- <all other values>
- Roads
- Road Type
- - Abandoned
- - Abandoned
- Mainline
- Secondary
- Spur
- Spur
- Trail / Other
- <all other values>
- ▬ Property Boundary
- ▨ DWSA

EXAMPLE MAP



Section 2.1 -

Road Segment Assessment

ARCH CAPE FOREST ROADS

Segment 1

Name: Hug Point Road - HP Gate to HP16

Length: 1031'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Lewis and Clark, NCLC, Weyerhaeuser

In DWSA: No

The Hug Point road is the primary access to both the Arch Cape Forest and Rainforest Reserve. This is an in-sloped road with a slight W profile. The ditches are vegetated and intact with multiple culverts. A water line and multiple fenced water system components exist along the road. A water line appears to run in the north-side ditch where two valve access boxes are marked with blue paint and carsonite markers. A property kiosk just inside the gate has not been maintained or updated as of spring 2023. The gate and pull-out are well maintained and heavily used.

Management Recommendations: Culverts should be cleared, being careful to not damage buried water system components. Road should receive light grading to re-establish crown and remove roadside berms. Brushing planned summer 2023.



0 125 250 500 Feet

Segment 2

Name: HP16

Length: 204'

Type: Spur

Maintenance Class - Abandon

Owner: ACF

Easements: None

In DWSA: No

HP16 is the first short spur to the S of the Hug Point Mainline. This is a short spur with no culverts, fully grown in with blackberries and alder. This spur appears to have a rock base with significant vegetation growth. The road crown and ditch are intact, and carry no water. The road could be re-opened in the future if needed.

Management Recommendations: The road is slowly decommissioning itself due to lack of maintenance. Continued abandonment has minimal risk and no downsides. Recommendation is to not maintain the road unless needed for future management activities.



0 75 150 300 Feet

Segment 3

Name: Hug Point Road - HP16 to HP17

Length: 97'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Lewis and Clark, NCLC, Weyerhaeuser

In DWSA: No

The Hug Point Mainline continues as the primary property access. The road is well surfaced with some brush growth. The ditch is vegetated and has some siltation. Culverts are choked by vegetation and the down-slope shoulder has a slight hump.

Management Recommendations: The road requires grading and ditch re-establishment. Ditches could be re-established with a small excavator.



0 70 140 280 Feet

Segment 4

Name: HP17

Length: 2879'

Type: Spur

Maintenance Class - Maintain

Owner: ACF

Easements: None

In DWSA: No

HP17 is the second spur extending S of the Hug Point Mainline. This is a long spur that accesses multiple young stands outside of the drinking water source area. There are recent culvert improvements on this spur. The spur is rock surfaced with significant overgrowth.

Management Recommendations: The road is overgrown and requires brushing. The crown is intact and sod has grown over the road surface. The recommendation is to maintain the sod surface until the road is needed for active management. At that point the sod could be removed and the road re-surfaced with crushed rock. The road should be brushed to keep Alder from growing in the road surface and damaging culverts.



0 245 490 980 Feet

Segment 5

Name: Hug Point Road - HP17 to HP18

Length: 518'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Lewis and Clark, NCLC, Weyerhaeuser

In DWSA: No

The Hug Point Mainline continues as the primary property access. As with lower segments, the road is well surfaced with some brush growth. The ditch is vegetated and has some siltation - increasing further uphill on the segment. In some areas the ditch has completely filled due to collapsing upslope banks. There is also a pronounced hump on the downslope side due to grading. It is unclear how thick the crushed traction rock on the road is- grading may expose some road base in areas.

Management Recommendations: The road requires grading and ditch re-establishment. Depending on the grading results, it may require a traction coat of 1.5" minus crushed rock. Ditches should be re-established with a small excavator. Ditch re-establishment should either leave a vegetated area above cross drains and creeks as a sediment filter, or install settling ponds (3'x3'x3') uphill of culverts (not at the culvert inlet).



0 75 150 300 Feet

Segment 6

Name: HP18 (A, B, A1, A1, B1, B2)

Length: 2060

Type: Spur(s)

Maintenance Class - Maintain

Owner: ACF

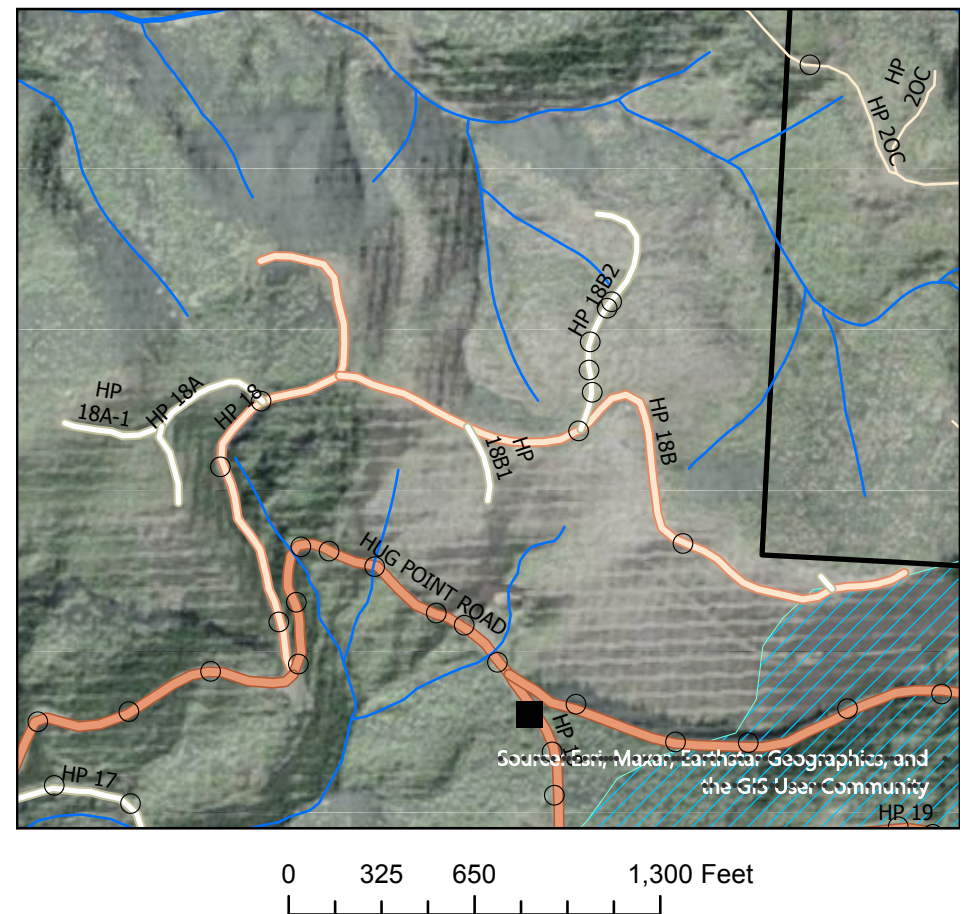
Easements: None

In DWSA: No

HP18 includes multiple short spurs to landings. The entire system, especially A and associated landings, are overgrown with small alder. The end of HP18B has large waterbars, not driveable with a pickup truck but traverseable with an ATV. The entire road system of Spur HP18 is built on a rock base with good traction rock on the surface, well established ditches, and good overall road design. These roads were likely upgraded and maintained during the last harvests on Spur 18, roughly 6 years ago, but the roads have not been brushed or maintained since. These are all dead-end spurs.

Management Recommendations: The road is overgrown and requires brushing. The crown is intact and ditches are well established- no grading is necessary. The water bars at the end of HP18B are well built and should be re-established if they are removed for brushing. Brushing and plucking of alders is necessary to

maintain culverts and the road base. Some culverts are > 50% obstructed, but all appear easy to clean and re-open. Short spurs (A1, B2) can be abandoned, since there are no culverts, an re-opened on an as-needed basis.



Segment 7

Name: Hug Point Road - HP18 to HP19

Length: 418'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Lewis and Clark, NCLC, Weyerhaeuser

In DWSA: No

The Hug Point Mainline continues as the primary access, passing a large closed rock pit. The road is well surfaced with some brush growth. The ditch is vegetated and has heavy siltation. In some areas the ditch has completely filled due to collapsing upslope banks. There is also a pronounced hump on the downslope side due to grading. As with other segment, grading may expose road base material.

Management Recommendations: The road requires grading and ditch re-establishment. It may require a traction coat of 1.5" minus crushed rock. Ditches should be re-established with a small excavator. Ditch re-establishment should either leave a vegetated area above cross drains and creeks as a sediment filter, or install small settling ponds (3'x3'x3') uphill of culverts (not at the culvert intake).



0 115 230 460 Feet

Segment 8

Name: Hug Point Road - HP19 - Property Line

Length: 2619'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

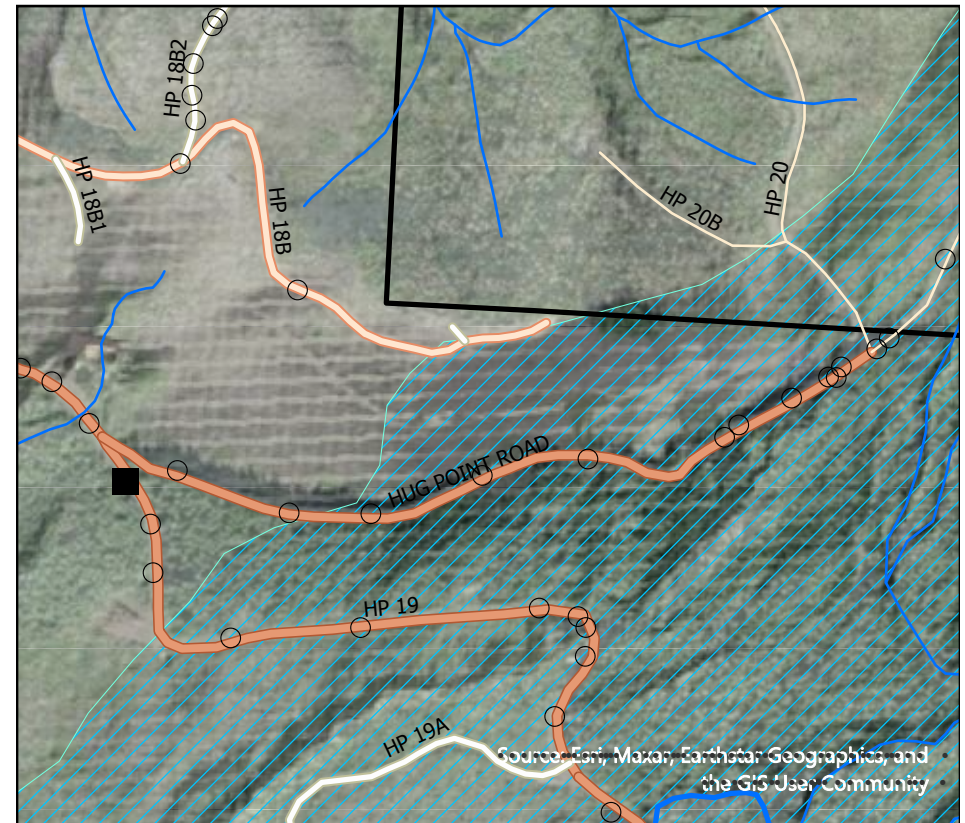
Easements: Lewis and Clark

In DWSA: Upper portion only

The Hug Point Mainline past the HP 19, only providing access to a small area of the ACF, to Lewis and Clark Timberlands, to the HP23 (which dead-ends on the ACF) and eventually to the Onion Peak Rd. The road is well surfaced with some brush growth. In the middle of this segment is a large slump that shows continued evidence of down-slope movement. The slump is approximately 150' long and is the result of multiple springs in the slope feeding a culvert that was perched approximately 3' above the bottom of a settling pond. This saturated the fill and caused the road failure. In addition, the segment needs 2 additional culverts added, culverts, re-opened, ditches re-established, and minor grading.

Management Recommendations: The major fill failure on the Hug Point Road needs to be removed, a new 24" culvert installed, and new fill established. While the fill is saturated, this is primarily due to water flowing past

an 18" ditch relief culvert approximately 50' uphill from the failure. In addition, the segment needs 2 additional 18" culverts added, culverts re-opened, ditches re-established, and minor grading. Estimated cost for the large culvert replacement is \$15,000, due primarily to the large quantity of fill that will need to be end-hauled to another location. A rock source exists approximately 200' downhill from the slump on the N side of the Hug Point Road. Rock from this source may be clawed from the slope and utilized for the re-construction of the culvert.



Segment 9

Name: HP20

Length: Approx 610' on ACF

Type: Spur

Maintenance Class - Brush Once, Abandon

Owner: ACF

Easements: None

In DWSA: No

HP20 extends N from the Hug Point Road onto Lewis and Clark Timberland. It then forks with HP20C re-entering the ACF and HP20 eventually going through Oregon Department of Forestry lands and back onto the ACF. These are short spurs with no culverts that have become overgrown. They were last used for PCT access on the N end of the property (the one area that received PCT treatment under Stimson ownership).

Management Recommendations: These roads are only short spurs - they are rock surfaced but overgrown. It is recommended to include these roads in preliminary brushing summer 2023. This will expose any potential road failure points or issues. Assuming no issues, these roads could be abandoned without decommissioning.



0 210 420 840 Feet

Segment 10

Name: HP23

Length: 2217'

Type: Spur

Maintenance Class - Maintain

Owner: ACF

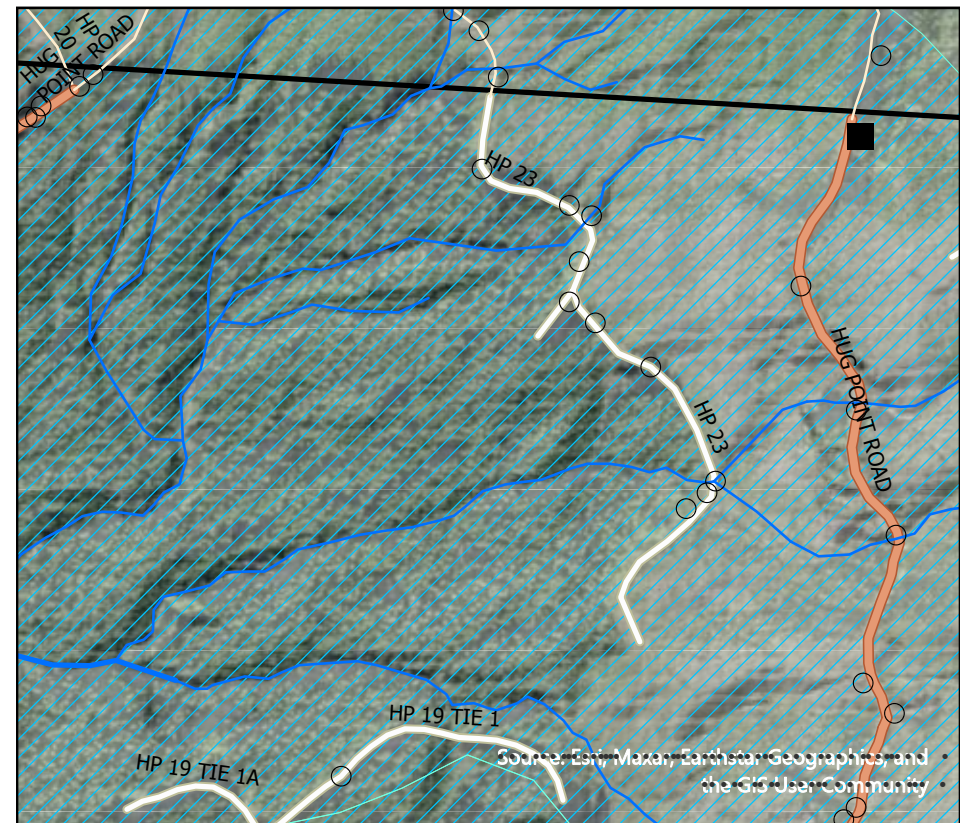
Easements: None

In DWSA: Yes

HP23 is a long spur accessing young stands on the ACF via an initial 912' of the road that exists on Lewis and Clark land. An unlocked farm gate exists on HP23 near the property line. This is an important spur to maintain in the near term as the stands accessed from this road could experience future management. This spur also could be tied to the HP19 TIE1 - which is only 500' SW across upper Shark Creek.

Management Recommendations: The road is heavily overgrown and requires brushing. There are alder in the road that may require plucking. The gate is useable but has not been locked historically. The gate does require additional signage. The road surface is sod covered and should remain this way unless increased road use is anticipated. Tying this road to the HP19 Tie would circumvent the use of both the Hug Point Road above HP23 to access Onion Peak Rd and the Shark Creek Crossing re-build on the HP19. The HP19 Tie would

however require re-alignment at the junction with HP 19 to make this possible. This tie would cross Shark Creek where it is only a small verified non-fish stream. The building of this tie would have the advantage of crossing a smaller stream, utilizing fewer high-risk mid-slope roads, and avoiding the use of the Shark Creek crossing that does not have sufficient curve widening for truck traffic. This option requires further analysis, particularly related to future harvest plans.



0 265 530 1,060 Feet

Segment 11

Name: Hug Point Road - Property Line to Onion Peak Rd (Eg Sketchy Road)

Length: 3543'

Type: Secondary

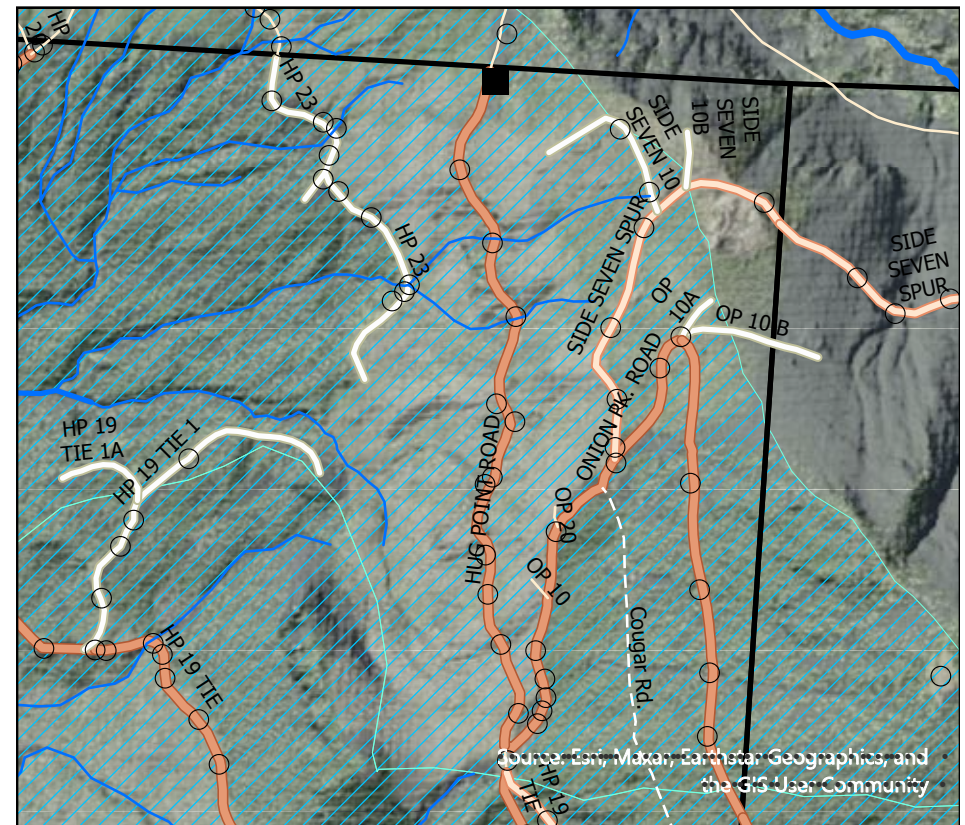
Maintenance Class - Decommission

Owner: ACF

Easements: CHECK

In DWSA: Yes

The Hug Point Mainline cuts mid-slope from Lewis and Clark Timber to the 4-way junction at Onion Peak Road. This road is currently closed, and has officially been closed for a number of years. Two landslides onto the road surface have temporarily closed it to all vehicle traffic. The road is built into an extremely steep slope with large areas of exposed basalt bedrock and large buried boulders. The rock is heavily fractured, leading to continued rock fall and erosion issues. In addition, this road cuts across the headwaters of Shark Creek. The entire area surrounding the road has been recently logged. Both the HP23 (below) and Onion Peak Rd (above) cut through this same stand and would allow access for fire, emergency, or forest stewardship activities. Based on the current ACF Multi-Resource Management Plan we do not anticipate active timber harvest occurring from Hug Point Road in this section, even if it were maintained. In addition to areas of rock fall onto

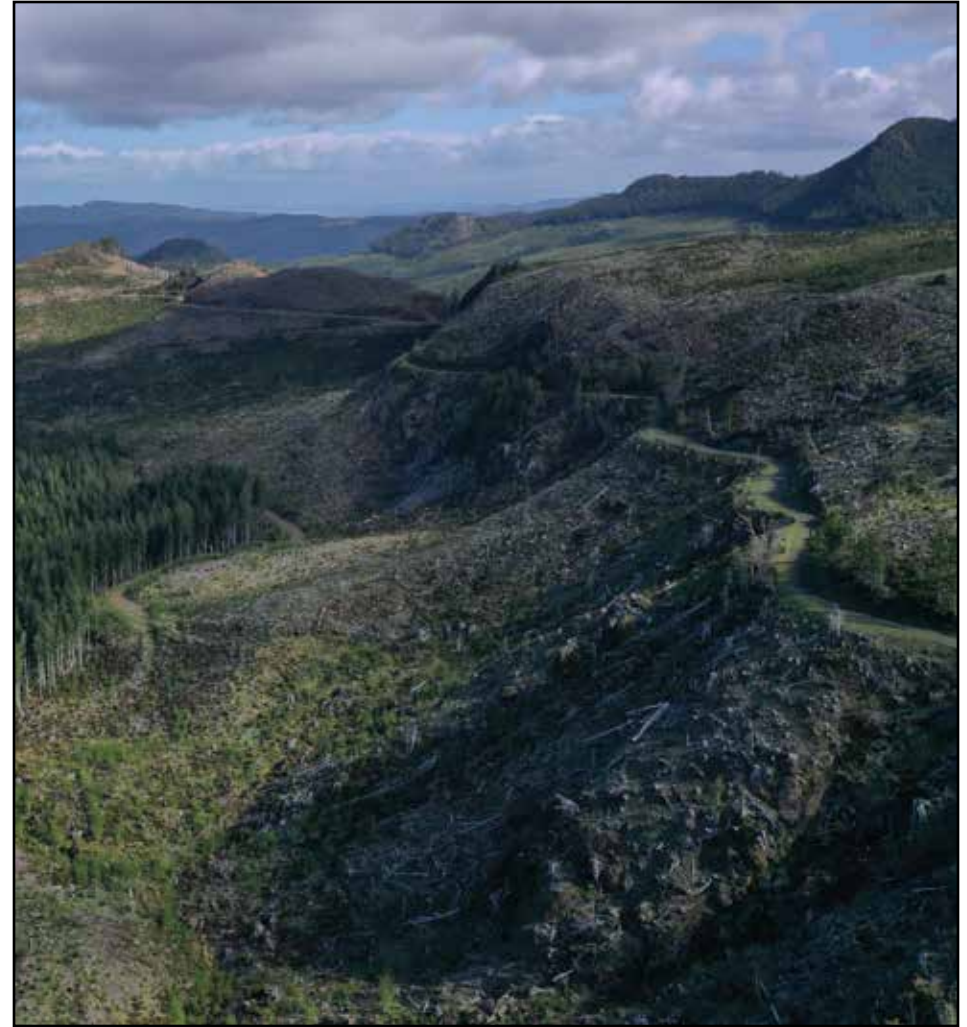


0 450 900 1,800 Feet

Source: Eric Maxon, Earthstar Geographics, and the GIS User Community

the road, two large slumps exist where the downhill road shoulder is actively eroding, there is at least one failed culvert, and additional culverts that are either partially obstructed or causing active down-slope erosion.

Management Recommendations: It is recommended to decommission and abandon the Hug Point Road from the property line with Lewis and Clark Timber to the intersection with the Onion Peak Rd. This decommission would include removal of all culverts, filling of the upslope ditch, excavation of the small areas of fill that do exist, and large water bars at 10' increments in all areas where the road bed allows for installation. In areas where the road is built on solid rock or large boulders, ditch filling and log placement in the road surface should force any ditch or road surface water downslope. Finally, the road surface should be covered with at least one "chunk" (a log at least 8' long and 12" diameter) every 50' and planted to native species. Areas with pooling water in the up-slope ditch that could provide invertebrate habitat should be marked and maintained. Large undriveable water bars should be installed at the junction with the Onion Peak Rd and either at the property line, or in agreement with Lewis and Clark, at the last turnaround on Lewis and Clark Timberlands (which are within the DWSA).



The Hug Point Road cuts across the steepest part of this convex slope, with numerous cliffs directly above the road. A more feasible primary property access would be across the road shown at left side, the HP23, which could be connected to the HP 19 TIE 1.

Segment 12

Name: HP19 - Hug Point Rd (gate) to junction with HP19A

Length: 2571'

Type: Mainline

Maintenance Class - Maintain

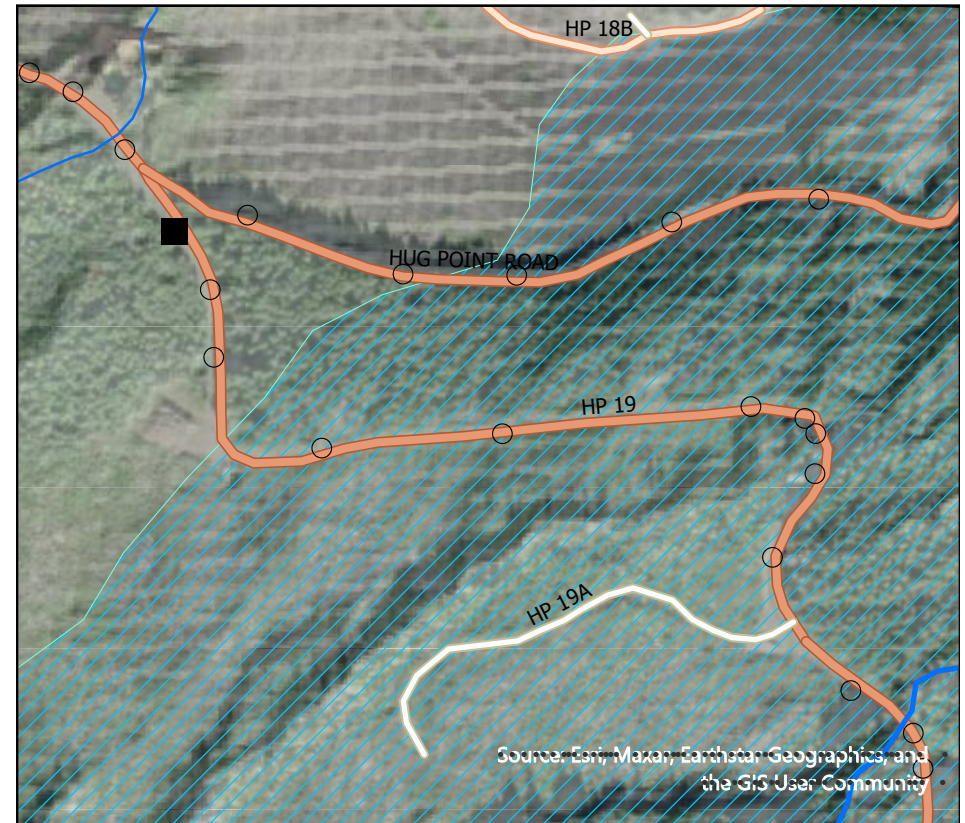
Owner: ACF

Easements: NCLC, Weyerhaeuser

In DWSA: Yes

The HP19 is the primary mainline access for the ACF and for the RR. This is a well-built mainline road with minimal issues. It is gated at the junction with the Hug Point Road. The road is surfaced with crushed rock and includes numerous ditch relief culverts and one small stream crossing.

Management Recommendations: This road should be brushed, graded, and have crushed rock added as needed. It does not have the W road shape that many other roads on the property have developed. The ditch is established and heavily vegetated.



0 212.5 425 850 Feet

Segment 13

Name: HP19A

Length: 344'

Type: Spur?

Maintenance Class - Abandon

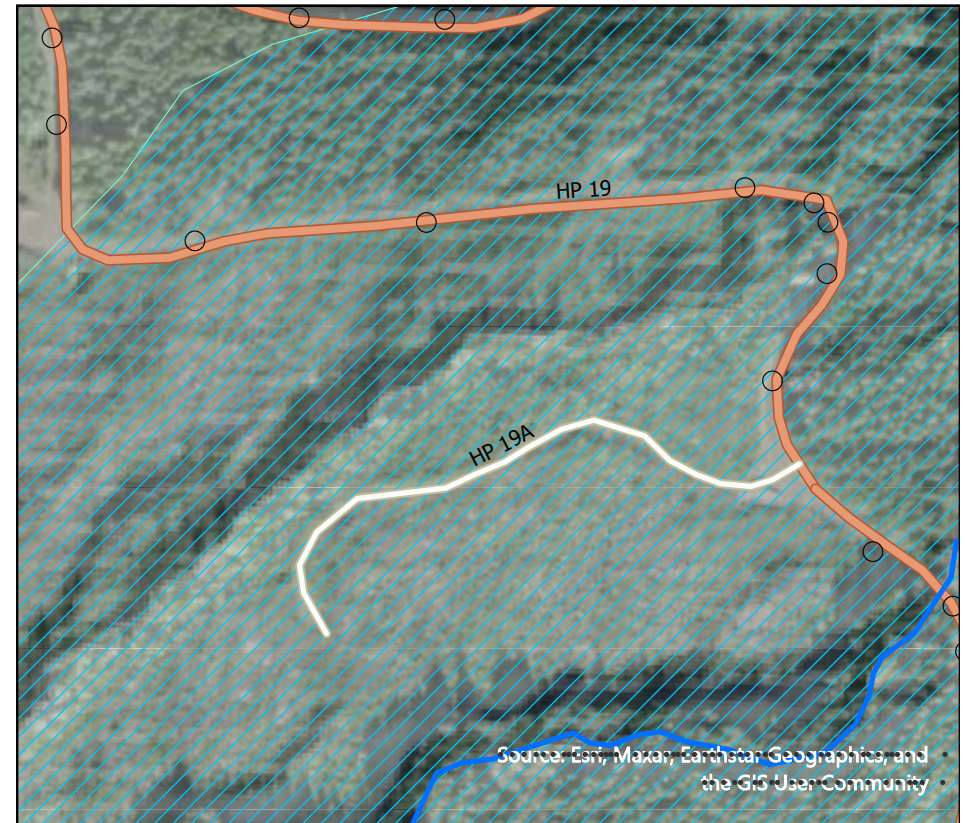
Owner: ACF

Easements: None (Check)

In DWSA: Yes

The HP19AS is an abandoned spur that leaves from behind a large spoils pile directly before the Shark Creek road re-alignment. This re-alignment unfortunately blocked two spurs- the HP19A was clearly abandoned well before this though.

Management Recommendations: Continue to abandon.



0 165 330 660 Feet

Segment 14

Name: HP19 - Junction of HP19A to HP19G

Length: 1100'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

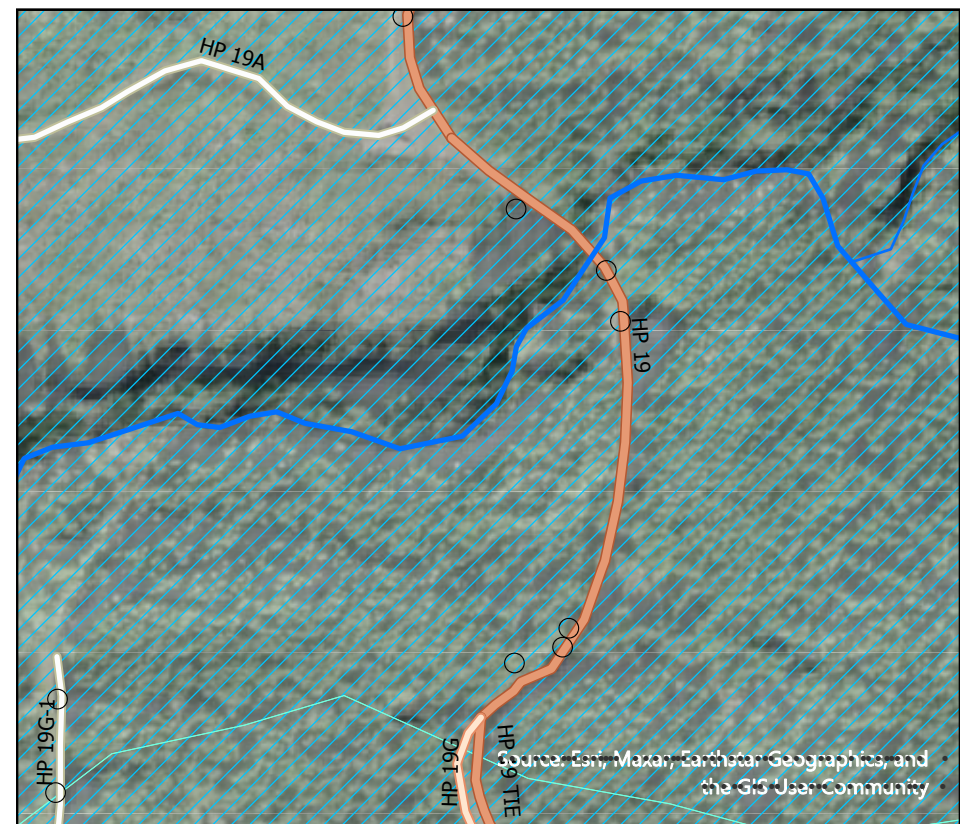
Easements: NCLC, Weyerhaeuser

In DWSA: Yes

The HP19 continues as the primary mainline access for the ACF and for the RR. This segment includes a crossing over Shark Creek. This crossing was re-built by Ecotrust Forest Management and their contractors. The old crossing was continually slumping with an under-sized pipe and other issues. The re-alignment moved the road east approximately 250' and includes ditch relief culverts in addition to the new squish culvert stream crossing. The crossing is problematic in that it creates a tight curve with a very narrow 11' road surface directly over the culvert. After review with dump truck, log truck and lowboy drivers, it appears unlikely that you could haul logs or a lowboy over the current crossing. Other than the crossing, the road is well built.

Management Recommendations: Other than at the crossing, the road should be brushed, graded, and have crushed rock added as needed. At a minimum,

the Shark Creek crossing requires significant curve widening. This could be achieved with cutting and filling at both ends to allow for a straighter segment over the culvert. The culvert is too short and the bank angle steeper than is typically used. Without fully replacing the structure, curve widening with strategic rip-rap placement is the best and most affordable course of action. It is likely that, even without some rebuilding, the structure could fail from normal use and erosion.



0 145 290 580 Feet

Segment 15

Name: HP19G - Junction with HP19 to HP19G1

Length: 1315'

Type: Secondary

Maintenance Class - Maintain

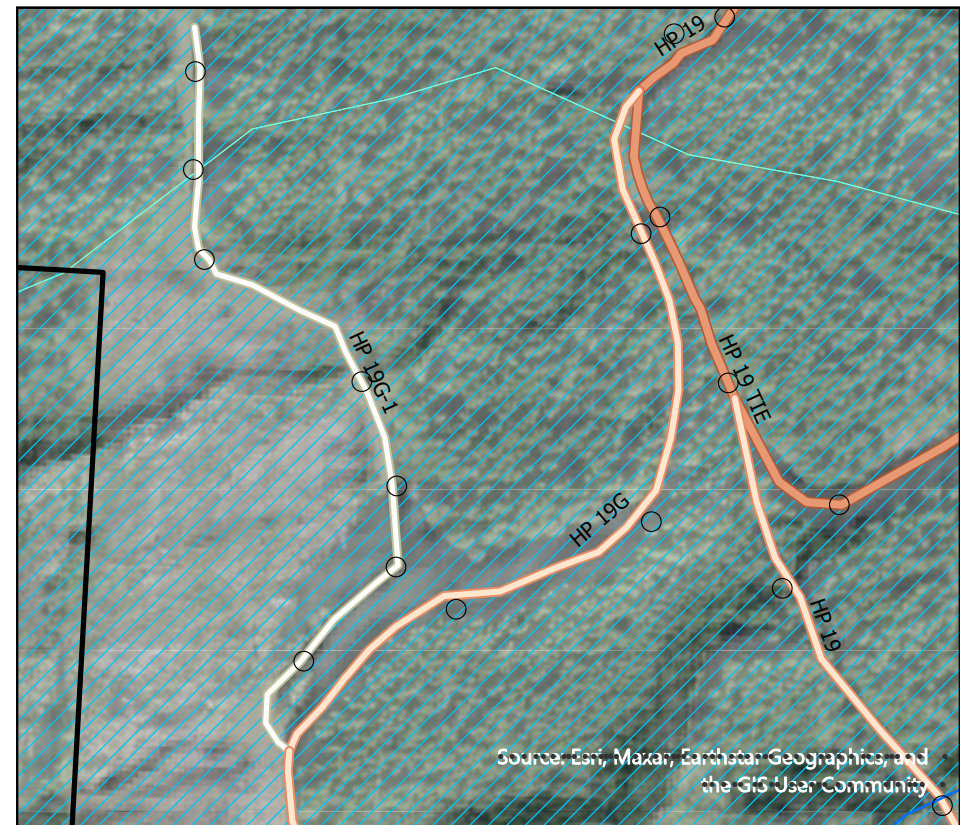
Owner: ACF

Easements: ?

In DWSA: Yes

The HP19G was historically a primary access route, but is now a secondary road due to the road closure at Asbury Creek. This road runs through an older forest with significant ditch sedimentation and needle litter on the road surface.

Management Recommendations: The road appears in good condition, but would benefit from ditch re-establishment, grading, and road brushing.



0 140 280 560 Feet

Segment 16

Name: HP19G1

Length: 1309'

Type: Spur

Maintenance Class - Decomission

Owner: ACF

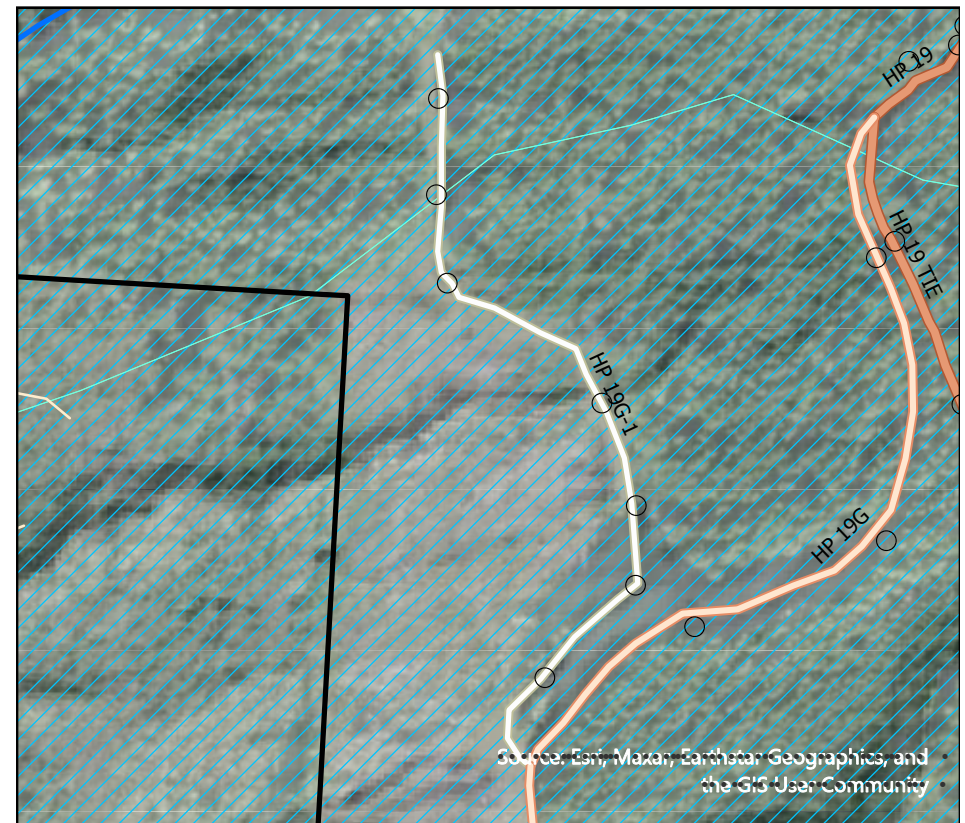
Easements: None

In DWSA: Yes

The HP19G1 is a rock road spur that has been completely blocked by a spoils pile deposited from either the Asbury road slump or Shark Creek re-alignment. This road should never have been allowed to be blocked in this way and is incredibly sloppy work on the part of the past property manager and / or contractor. The road is sod covered with 6 marked culverts. The pile of fill is approximately 25' tall and 70' across, fully blocking the road entrance for everything but an ATV. The spur provides access both to a young stand to the E and a mature stand to the W. Any operations in the older stand to the W could occur from 19G.

Management Recommendations: Given the large number of culverts on this spur and its location in the core area of the DWSA, it is recommended to decom-

mission this road. Decommissioning would include the removal of 6 culverts, filling of ditches, breaking apart of the road surface, and re-contouring the spoils pile to re-create a natural land form and allow temporary access.



0 140 280 560 Feet

Segment 17

Name: HP19G - HP19G1 to Shingle Mill X-over

Length: 3302''

Type: Secondary

Maintenance Class - Decommission with turn-arounds.

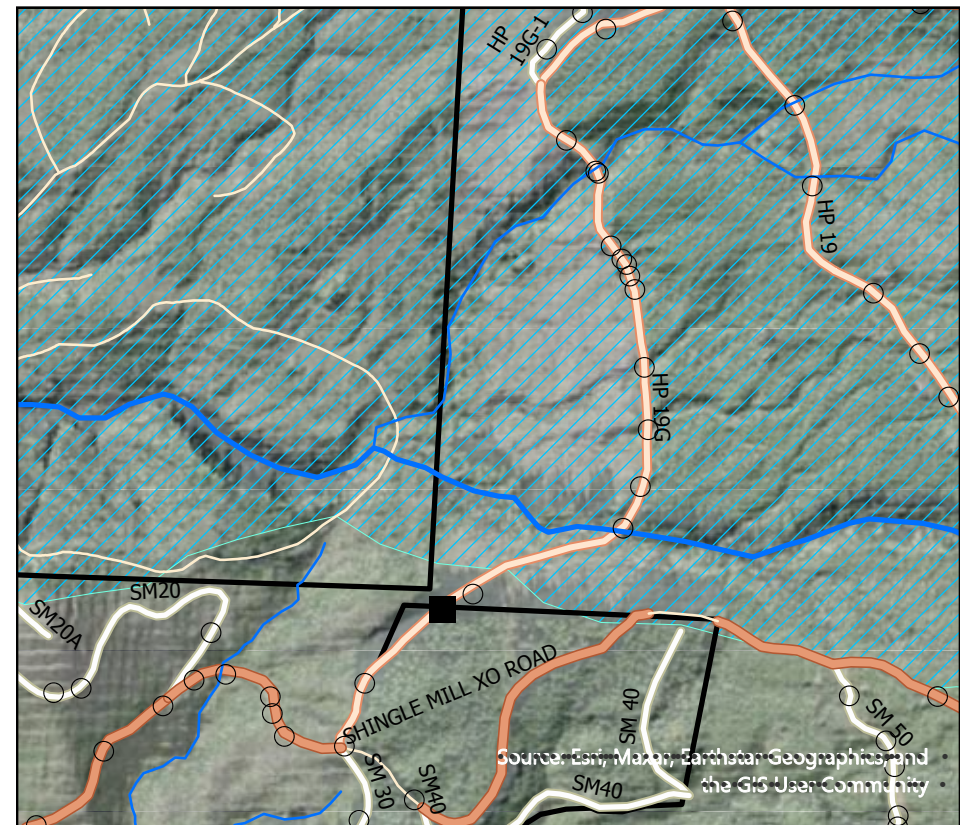
Owner: ACF

Easements: CHECK

In DWSA: Yes

HP19G historically connected the Hug Point Road system to the Shingle Mill road system. This road was a mainline road, however a large segment of road just N of Asbury Creek slumped. This slump is approx. 500' in length and continues to move down slope. An attempt was made to remove culverts and provide new stream channels below two springs, however the intermediate road surface has continued to move down slope. This is a mid-slope road that appears to be built on the toe of a large historic landslide with multiple springs just up-slope of the road. This segment also is in the core of the DWSA.

Management Recommendations: It is recommended to fully decommission this road from the last turn-around on the N side to gate on the S side. This would



include providing proper drainage around the Asbury slump, removing the culvert from Asbury Creek, and removing at least 8 culverts. At the Asbury slump, it is recommended to provide an appropriate low-angle approach on the N and S side of the small tributary to Asbury Creek with graded UTV - passable full bench trails down to the creek. This small seasonal stream would benefit from a short pedestrian bridge since this is a popular hiking route. The area S of this stream requires additional cross drainage and ditch filling - forcing the water into the water bars. The S side of the slump requires excavation of a new stream channel from the road-side seep and excavation of the fault that has create a 4' break in the road surface. To the S, the road crosses Asbury Creek through a 72" metal culvert that was installed in 1995. This is an F stream, however leaving the culvert does not provide any access and will require future removal if not removed currently. It is recommended to fully remove the fill and decommission the road back to the gate on the S end.

Segment 18

Name: HP19Tie - HP19G to HP19 Tie1

Length: 1725'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: NCLC, Weyerhaeuser

In DWSA: Yes

HP19 Tie continues as the primary access to the RR and upper portions of the ACF. At this segment the road begins to climb. The road appears to be built on a thick rock base. The ditch is vegetated with moderate siltation and appropriate cross drainage.

Management Recommendations: HP19 should be brushed, graded, and have culverts cleared. Some areas of ditch should be re-established.



0 180 360 720 Feet

Segment 19

Name: HP19

Length: 3250'

Type: Secondary

Maintenance Class - Maintain

Owner: ACF

Easements: Check

In DWSA: Yes

HP19 extends to the S from the HP19 Tie, accessing a large area of young and recently harvested forestland. The road is built with a rock base and regular cross drains. The road does extend across the same historic deep seated landscape as the HP19G and, past where it becomes undriveable, may have some slumps. The final approximately 1000' of the road have not been used recently and appear to have been abandoned. The final 200-300 feet of the abandoned segment, before a removed stream crossing, have a stream running in the middle of the road.

Management Recommendations: HP19 could either be maintained or could be temporarily decommissioned by removing culverts. HP19 crosses two small non-fish streams and has a total of 7 culverts (5 drainage, 2 stream crossing). This is a long road to maintain if no management activities are planned in the future. Following PCT work in 2023, it will be a minimum of

15 years until future thinning could take place. This is however one of the flatter portions of the property and much of the forest could be thinned with ground-based operations in the future. Depending on operating plan outcomes, a decision will need to be made of whether to maintain, temporarily decommission, or fully decommission this road. HP19 should not be abandoned without culvert removal due to the significant cost of re-opening the road to provide access if a culvert failure does occur.



Segment 20

Name: HP19 TIE 1 / 1A

Length: 2416'

Type: Spur

Maintenance Class - Maintain

Owner: ACF

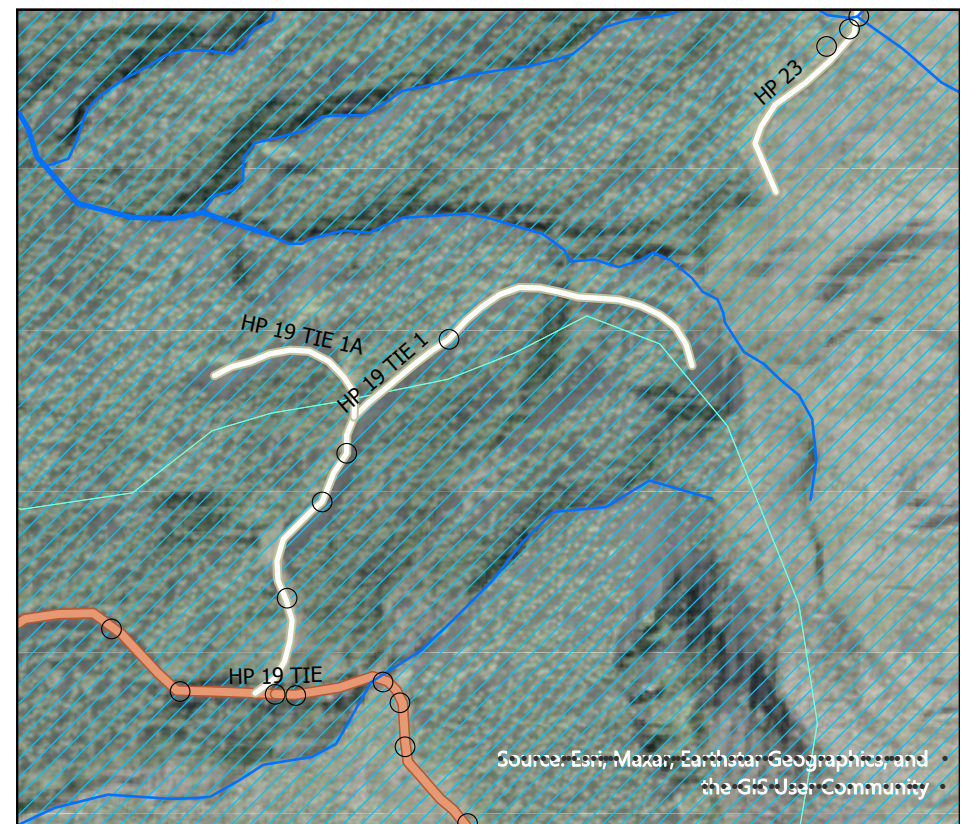
Easements: None

In DWSA: Yes

HP19 TIE 1 and 1A extend north from HP19 TIE, climbing steeply to directly below the closed portion of the Hug Point Road and 500' SSW from the end of HP23. This is a recently built rocked spur that was built to facilitate harvest to this portion of the property. The harvest was never completed and the road does not appear to have been used for harvests further up the slope, except potentially for placement of tailholds. The road is completely overgrown with alders up to 5" DBH.

Management Recommendations: HP19 TIE 1 provides a potential alternate access to the property by tying it to the end of HP23. This would require construction of approximately 700' of new road (500' straight line distance) and one crossing of a small type F stream. This would remove the need for mid-slope roads on the Hug Point Road (sketchy road) and curve widening on the Shark Creek re-alignment. In the near term, the alder in this road is too large for brushing and must be

plucked prior to any brushing taking place. Given how new the road is, many culvert inlets require clearing and the road surface will require back blading following alder plucking. In the scenario where future harvest will take place, this road should be maintained. If future harvest will not take place and the Shark Creek crossing is made passable for large vehicles, this road could be fully decommissioned. Decommissioning would be relatively low cost and entail culvert removal and significant water bar construction at 50' increments.



Segment 21

Name: HP19 TIE - HP19 TIE 1 to HP19B

Length: 2665'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

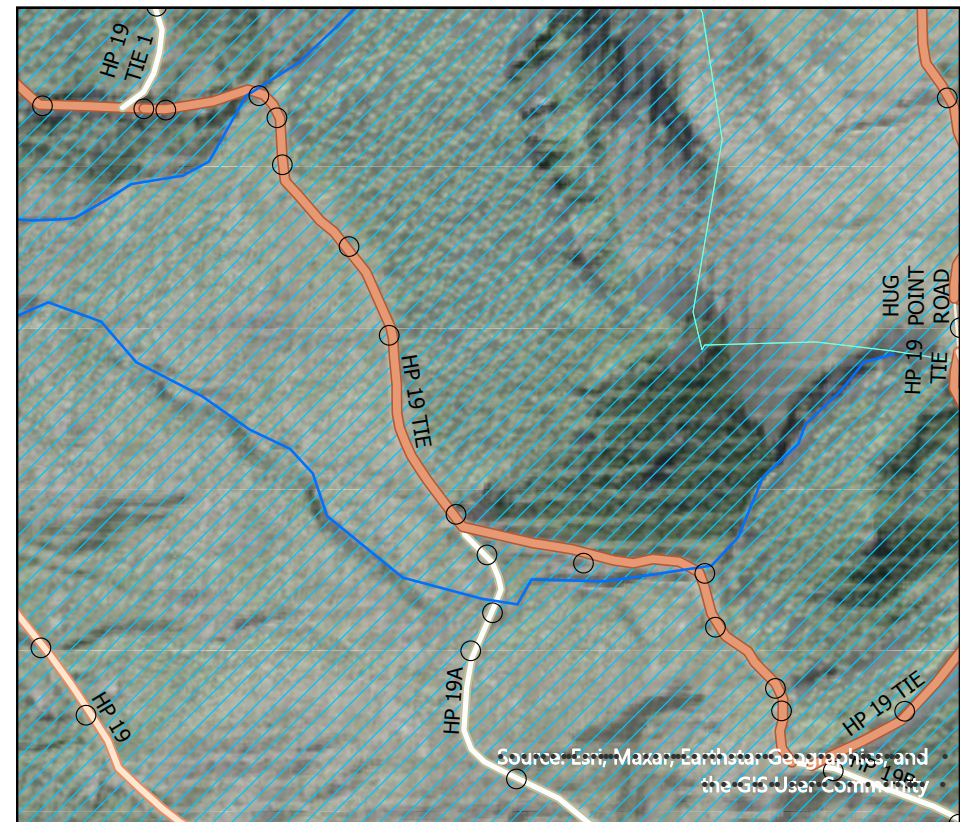
Easements: NCLC, Weyerhaeuser

In DWSA: Yes

HP19 TIE continues up slope. As this point the surrounding geology transitions from relatively deep soil to exposed bedrock and large boulders with moderate slopes. The road is relatively steep and has numerous areas with a filled ditch and significant W shape road surface. This has begun to cause rutting and erosion with water running down the road surface. The road is built in places straight on bedrock and road base rock with no cut. These small segments out sloped with no ditch.

Management Recommendations: As this segment of road has gained a W shape and begins to experience erosion, it is in need of additional out-slope, ditch cleaning (where a ditch exists) and surfacing with 1.5" minus crushed rock. Due to erosion and the relatively steep road grade, the road base is exposed intermittently and grading would be insufficient to re-shape the road. Ideally, an excavator would re-shape the road

and recover as much material as possible from the shoulders. Following this, a traction coat of rock 2-4" thick would be applied followed by a water truck and compactor roller. This segment of road will be utilized regardless of whether a tie is built between HP23 and HP19 Tie1.



0 235 470 940 Feet

Segment 22

Name: HP19A / HP19B

Length: 1302' / 630'

Type: Spur

Maintenance Class - Decommission

Owner: ACF

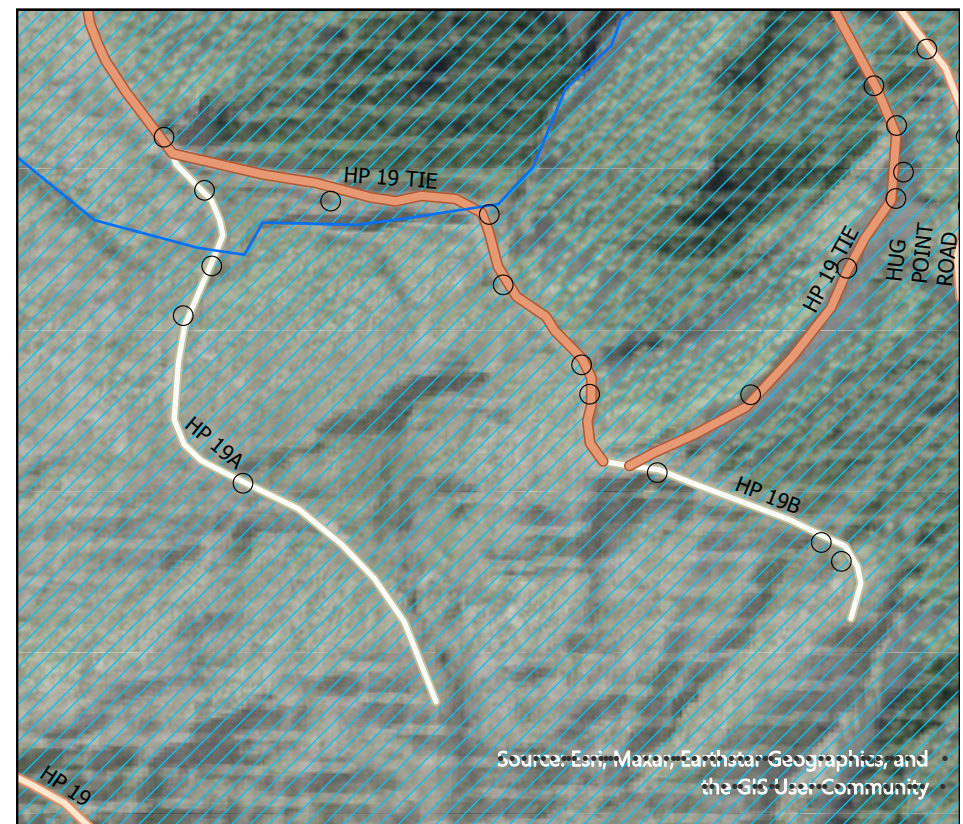
Easements: CHECK

In DWSA: Yes

HP19A and HP19B are both spurs that extend south from HP19 TIE. These roads are mid-slope spurs with tower landings along and at the end of each. These spurs are in the core of the DWSA and it is 25-35 years until they would be needed for any potential active management. They have numerous culverts and are built on relatively steep and unstable slopes. Both spurs are heavily overgrown and have potential for future failure.

Management Recommendations: It is recommended to temporarily decommission these spurs by removing culverts and putting in place frequent water bars. Any future management could still re-open these spurs, while in the meantime decommissioning would decrease road failure risk and minimize ongoing road maintenance costs. These spurs would not be required

for any near-term harvesting based on the adopted multi-resource management plan, since all timber accessed from the spurs would require cable logging.



0 180 360 720 Feet

Segment 23

Name: HP19 TIE - HP19B to Onion Peak Road

Length: 1280'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: NCLC, Weyerhaeuser

In DWSA: Yes

This section of the HP19 TIE is a steep mid-slope road cutting through a wet and boulder choked slope. The road is built almost entirely on rock base with a crushed rock surface and narrow ditch. The downslope side has a steep rocky bank and many ditch relief culverts and stream crossings. While in better condition than the next segment downhill, this segment also has a slight W profile and sediment filled ditch.

Management Recommendations: This segment requires re-shaping with an excavator followed by an application of surface rock. Due to the height of the fill, caution must be exercised with a vibrating roller and water / rock trucks. Adding too much rock could result in a loose surface - two spreads - 1.5" minus followed by .5" minus could improve the packing of the rock into the road surface. Wherever possible, the road should

be out-sloped and culverts cleaned / ditches re-established.



Segment 24

Name: Hug Point Road - Onion Peak Rd to unnamed spur

Length: 3414'

Type: Secondary

Maintenance Class - Maintain

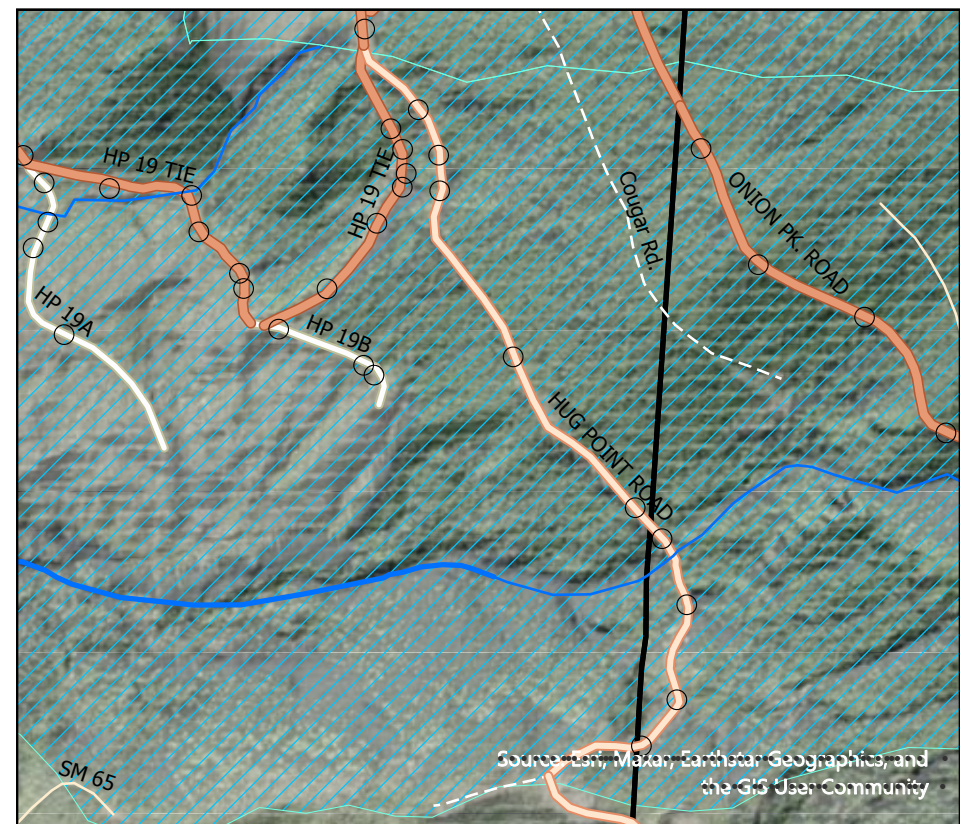
Owner: ACF

Easements: NCLC, Weyerhaeuser ?

In DWSA: Yes

The Hug Point Road extends due south, slowly climbing from the large 4-way junction at Onion Peak Rd. This continuation of Hug Point Rd provides important access for both the ACF and RR. This road eventually connects through to Shingle Mill Creek and the Shingle Mill XO Road, although the road is undrivable as a result of a large road-blocking boulder (bold drivers have made it around this blockage), a tight switchback, and a road slump and rockfall on the Shingle Mill XO. This road is well built and requires only minor re-grading and a skim coat of 1.5" - rock.

Management Recommendations: This segment, while mid-slope, is well built and requires only minor re-grading and a skim coat of 1.5" - rock.



0 335 670 1,340 Feet

Segment 25

Name: Hug Point Road - unnamed spur to property line

Length: 670'

Type: Secondary

Maintenance Class - Maintain

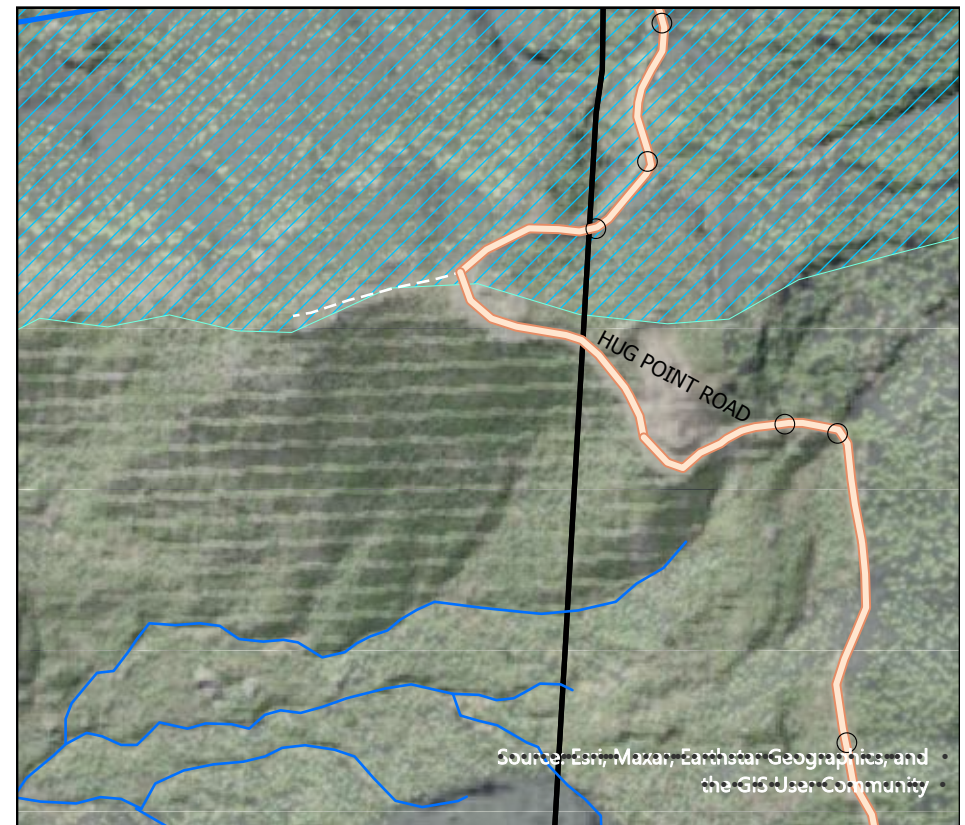
Owner: ACF

Easements: NCLC, Weyerhaeuser ?

In DWSA: No

The Hug Point Road leaves the DWSA at the beginning of this segment and wraps around to a small borrow pit and the property line. This continues to be a well built road with good surface rock and established ditches.

Management Recommendations: This road is also well built and requires only minor re-grading and a skim coat of 1.5" - rock. Rock required is estimated at - 1 load (14 cubic yards) / 2 stations (2" "driveway" spread) - possibly split between 1.5" and .75" or 1.5" minus with a high fines component.



0 237.5 475 950 Feet

Segment 26

Name: Onion Peak Rd- HP19 to Side Seven Spur

Length: 1641'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

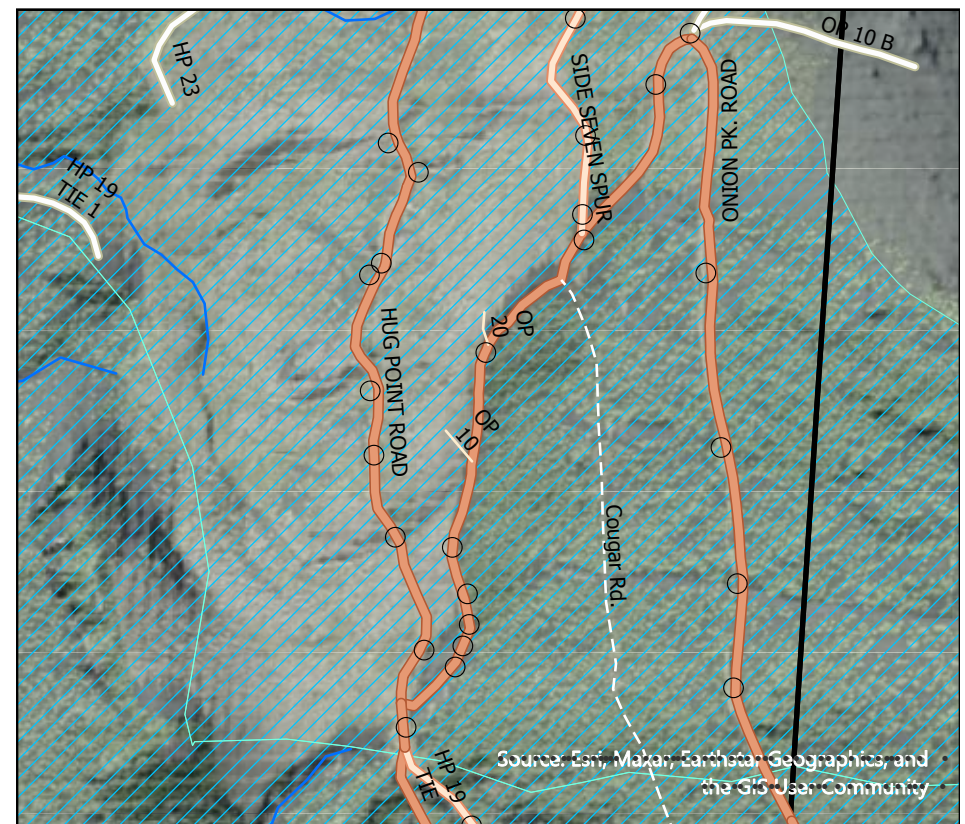
Easements: NCLC, Weyerhaeuser

In DWSA: Yes

The Onion Peak Rd climbs from the 4-way junction with the HP19 Tie and Hug Point Rd. This is again a mid-slope road, but built almost entirely on a rock road base. Significant water runs on the road surface where this road cuts across upper Shark Creek. The spring that forms Shark Creek surfaces about 100' uphill from this road before running down the roadside ditch and through a culvert. This area has become saturated and clearly shows year-around water running in the ditches. The road appears to be built on and around very large basalt boulders that extend out from the hill slope. The ditch is well established above the seeps.

Management Recommendations: At a minimum, efforts should be made to re-route the spring into the ditch. Additional culverts may be needed through this segment. The road surface is loose and would benefit

from additional traction rock sufficient to re-establish the road crown and, where possible, an out-sloped road shape. Rock is estimated at 231 cubic yards / 16.5 loads of 1.5" minus to provide a 4" lift.



0 275 550 1,100 Feet

Segment 27

Name: Cougar Rd.
Length: 2985'
Type: Abandoned
Maintenance Class - Abandon
Owner: ACF
Easements: None
In DWSA: Yes

Cougar Rd is an abandoned spur that extends to the S from the junction of Onion Peak Rd and Side Seven Spur. This road was a significant spur with a large landing at the end. It now has large conifers and alder growing in the road surface and has been un-driveable for decades. While the road inventory shows no culverts in this road, walking the road it appears that there may be some abandoned and collapsing culverts and / or log puncheons. This spur is named for a feline that followed a timber cruiser to a plot near the spur's far southern terminus.

Management Recommendations: abandon and watch out for cats.



0 380 760 1,520 Feet

Segment 28

Name: Side Seven Spur - Onion Peak Rd. to property line

Length: 2022'

Type: Mainline

Maintenance Class - Maintain

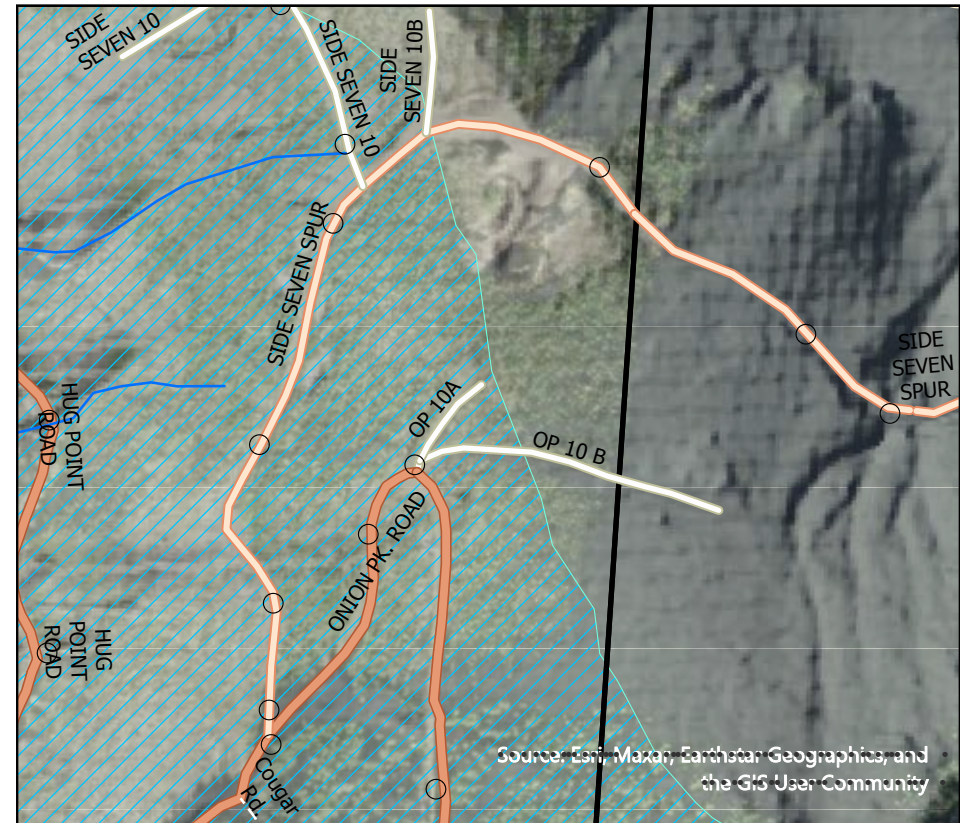
Owner: ACF

Easements: NCLC (Weyco?)

In DWSA: Yes to beginning of rock pit- rock pit is outside ACWD DWSA but in Cannon Beach DWSA.

Side Seven is a major and recently maintained secondary road that accesses the Ecola Bowl from the Onion Peak Rd. Since the decommissioning of Rock Crusher Rd, which connected to the OP400, Side Seven has provided the only access into the bowl. This is a well built road, although there is some brush encroachment.

Management Recommendations: Side Seven requires brushing and a surface coat of rock (2" driveway spread) Rock is estimated at 10 loads, 140 cubic yards, 1.5"- driveway spread.



0 210 420 840 Feet

Segment 29

Name: Side Seven 10 / 10B

Length: 867' / 268'

Type: Spur

Maintenance Class - Abandon

Owner: ACF

Easements: None

In DWSA: 10 Yes, 10B only first 20'

Side Seven 10 and Side Seven 10B are short spurs that extend north from the corner where Side Seven turns east, into the Ecola Bowl. These spurs were built for tower landings during relatively recent harvests. The roads are relatively flat and ridge-top with brush growth.

Management Recommendations: Both spurs can be abandoned with the potential for future re-opening as needed. Side Seven 10 has two culverts, however these culverts are relatively close to Side Seven, which will remain open, and neither carries significant water or presents a risk of failure. If a "no harvest" scenario is selected for ACF management, these culverts should be removed and additional water bars installed.



0 85 170 340 Feet

Segment 30

Name: Onion Peak Rd - Side Seven Spur to OP10 A / B

Length: 712'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: NCLC (Weyco?)

In DWSA: Yes

Onion Peak Rd continues to climb towards the divide separating Ecola Creek from Shark Creek. This is a well built road with adequate cross drainage. The road surface is loose rock and the road is overgrown with brush, however a solid road base exists throughout.

Management Recommendations: The Onion Peak Rd in this segment requires brushing and a surface coat of rock (2" driveway spread) Rock is estimated at 3.5 loads, 49 cubic yards , 1.5"- driveway spread



0 90 180 360 Feet

Segment 31

Name: OP10 A / B

Length: 217' / 707'

Type: Spur

Maintenance Class - Decommission

Owner: ACF, end of 10B extends 200' into NCLC

Easements: NCLC?

In DWSA: Yes, with the exception of end of 10B in Ecola Creek basin.

OP 10 A and B are short spurs built for recent logging. Neither spur has any culverts, and both are overgrown. Following the PCT scheduled for summer 2023, neither road will serve any useful purpose. Any future active management could re-open these roads.

Management Recommendations: Both spurs should be decommissioned with water bars and ditch filling. This would require an estimated 10 hrs of excavator time.



Segment 32

Name: Onion Peak Rd - OP10B to property line

Length: 2395'

Type: Mainline

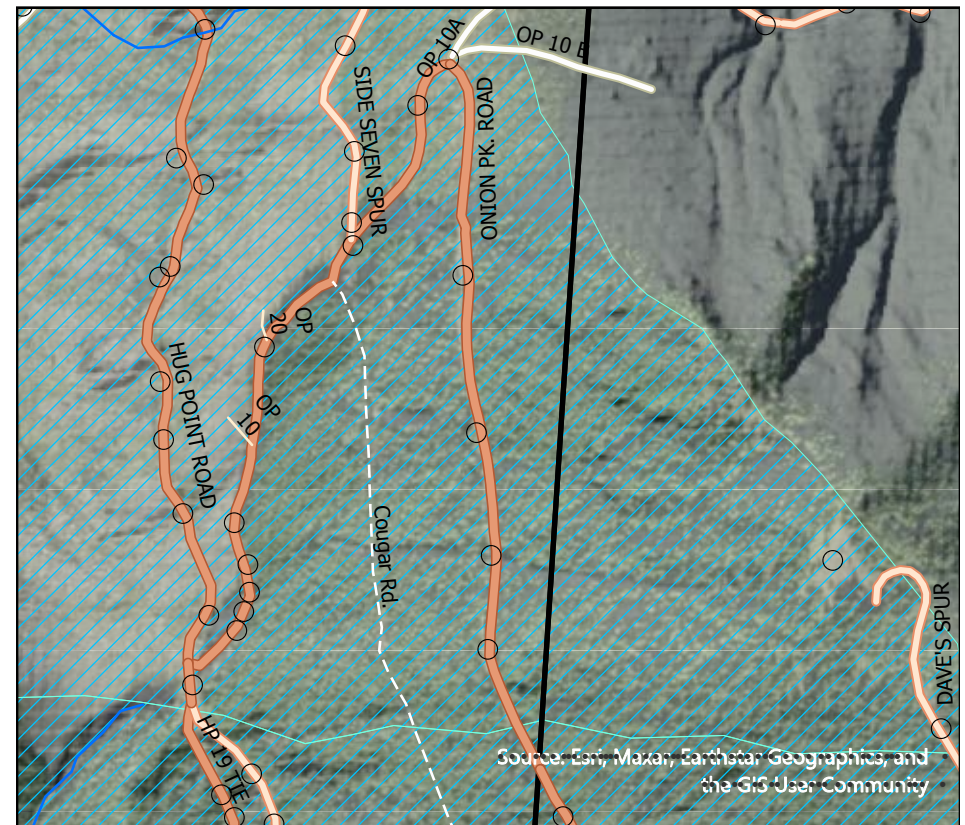
Maintenance Class - Maintain

Owner: ACF

Easements: NCLC (Weyco?)

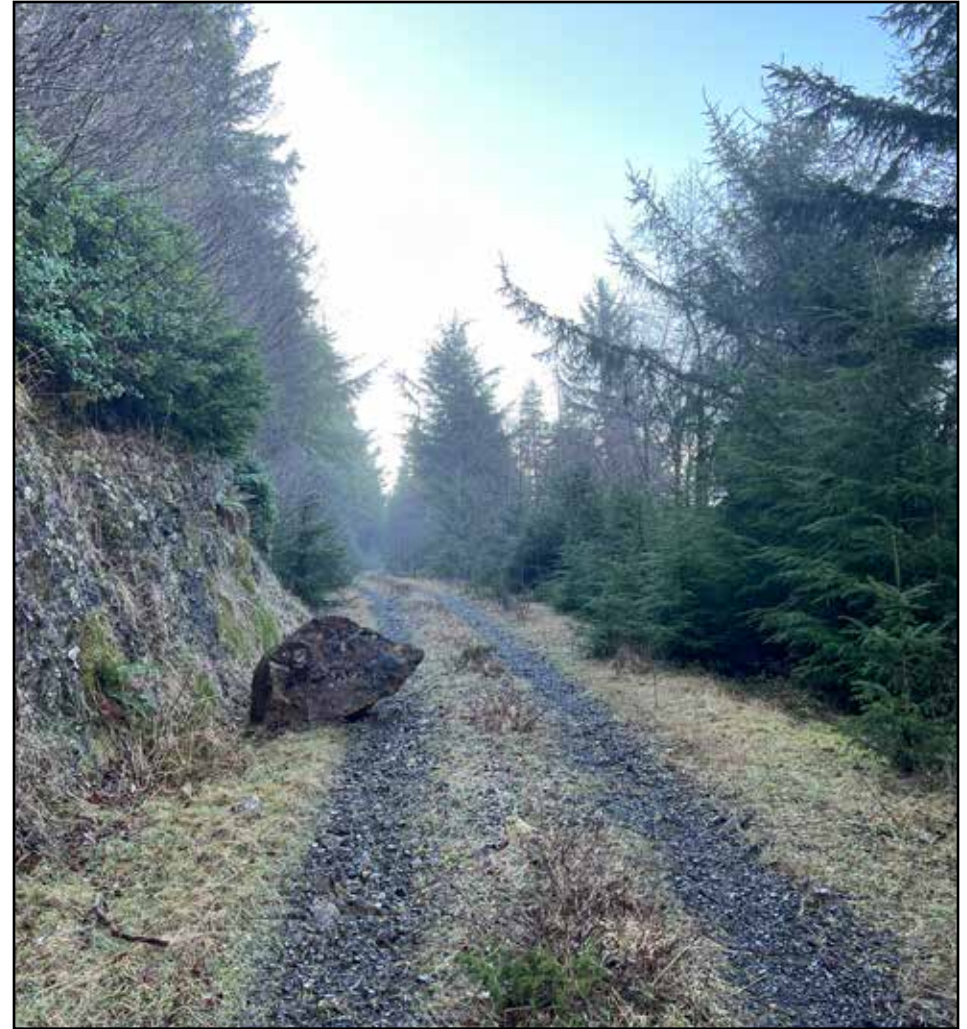
In DWSA: Yes

Onion Peak Rd changes significant at the junction with OP10B. Below that point the road has received regular maintenance and upkeep due to frequent logging by past owners. Above that point there has been very little active management in the recent past, resulting in a lower level of road maintenance. The road is still built on a rock base, with large boulders frequently poking through the road surface material. The ditch is filled with sediment and the road has a distinct W profile. The geology also shifts as the slope becomes steeper and the road winds around large basalt outcrops. Only a small portion of this road is owned by the ACF, however it provides the primary access to the Onion Peak portion of the RR. Other shifts include the existence of older forests, vernal pools along the up-slope road ditch.



0 305 610 1,220 Feet

Management Recommendations: For the short segment of the "old" Onion Peak Rd on the ACF, minimal maintenance is needed. In addition, there is a large boulder in the road that forces vehicles to drive on the outside shoulder. This boulder should be removed as soon as possible. The road has exposed road base material poking through the road surface. Following brushing, an excavator may be able to re-shape the road and pull down the outside shoulder. This road should have an out-sloped profile. This will require the addition of surfacing rock and re-grading. Rock is estimated at 23 loads, 322 cubic yards , 1.5" minus 4" lift. In addition, a grader and roller will be required for 4-6 hrs each.



Segment 33

Name: Shingle Mill XO - gate to SM20

Length: 3380'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

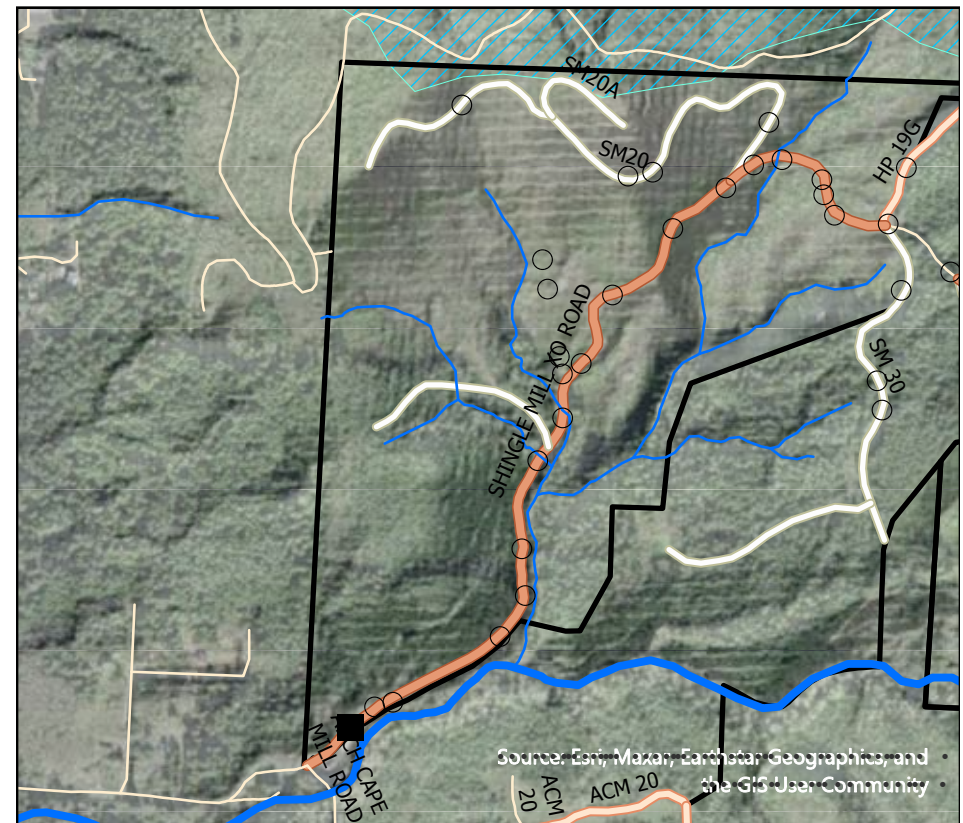
Easements: Check

In DWSA: No

The Shingle Mill XO is the second primary access to the ACF as well as to small portions of the RR along Shingle Mill Creek. This is a road that was clearly not built to serve as a mainline road, but was tied into the primary road system either following the removal of the bridge over Shingle Mill Creek or for other operability reasons. The road is built on a thin road base without the surface rock seen elsewhere on the property. The road is wet in the first 1000' before climbing steeply for another 1000' and then leveling out. The climbing section has loose surface rock and exposed road base rock.

Management Recommendations: This road needs significant work first with an excavator to remove sod and organic material from the road surface. Once a clean road base is exposed it will require a 8" lift for the first 1000' followed by a 4" lift with a high fines compo-

nent for the next 1000'. The final approximately 1000', which is relatively level, only requires minor re-grading and a skim coat. These distances are approximate and should be marked before rock is spread (estimated 40 loads of 1.5"-)



0 395 790 1,580 Feet

Segment 34

Name: SM20 / SM20A

Length: 3315'

Type: Spur

Maintenance Class - temporary decommission

Owner: ACF

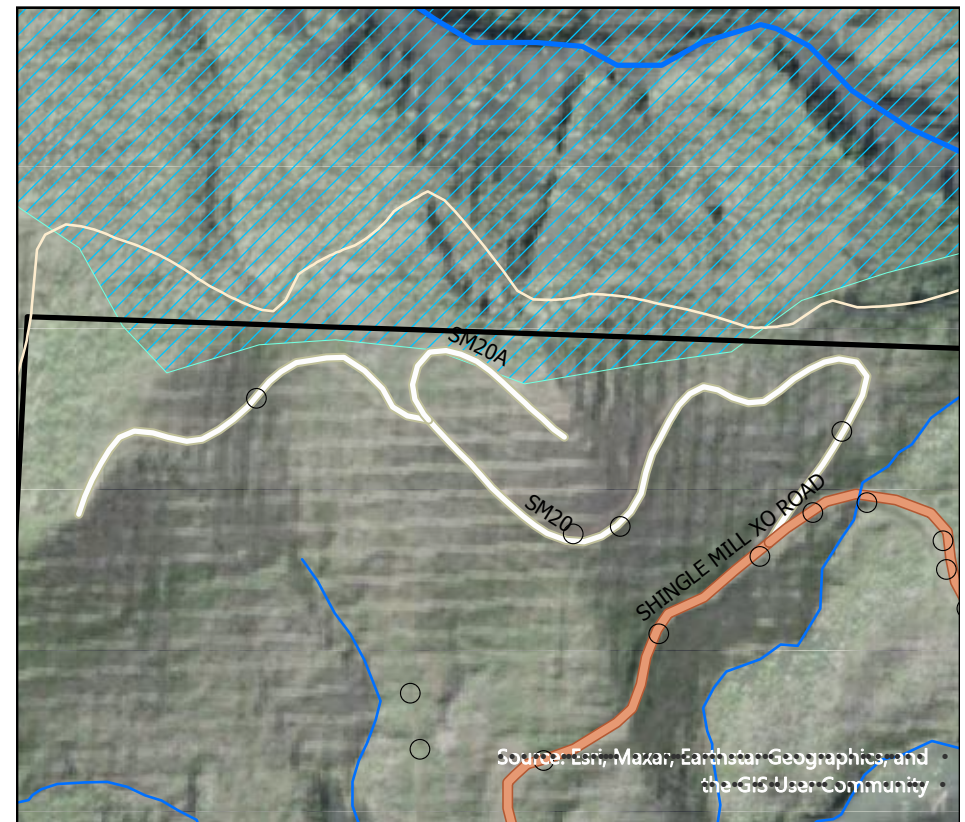
Easements: None

In DWSA: No

The SM20 is a forked spur that extends north from Shingle Mill XO. This road appears to have been built relatively recently to access the timber along this property line. The road is overgrown with alder and has been recently abandoned. The culverts are still in place. This road serves no useful purpose for the foreseeable future. In the long term, assuming some future harvest, the road could easily be re-opened.

Management Recommendations: It is recommended to temporarily decommission and abandon this road by removing culverts and installing large, frequent water bars. This would require the removal of 4 culverts. While it may be possible to scrape and re-use surfacing rock from these spurs, which appears relatively clean, this should not be assumed as the road may be re-used in the future, especially given that it lies outside of the

DWSA. Decommissioning should also include ditch barriers at each removed culvert and water bar. This is estimated to take 30 hrs of excavator time.



0 212.5 425 850 Feet

Segment 35

Name: Shingle Mill XO - SM20 - HP19G

Length: 850'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Check

In DWSA: No

The Shingle Mill XO crosses over a small tributary stream before climbing very steeply through a young stand to the 4-way junction with the HP19G and SM30. This road is incised with loose surface rock, heavy vegetation growth, and non-functional ditches. It appears that this segment may have been built to tie the Shingle Mill Rd into the rest of the road system.

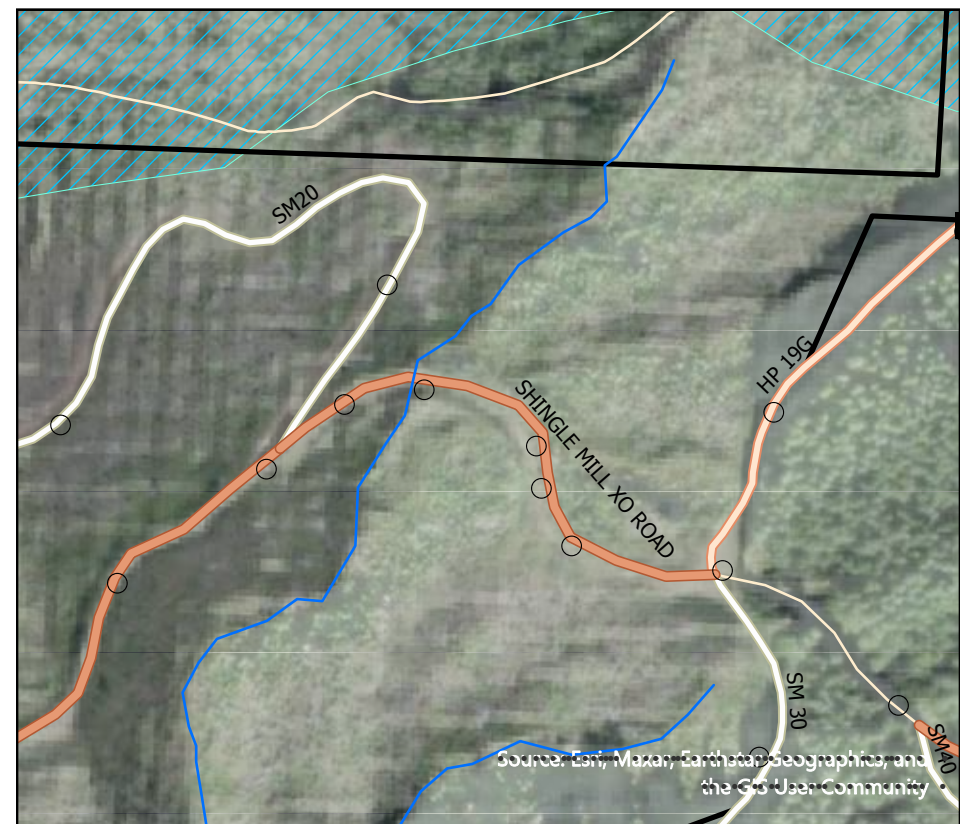
Management Recommendations: While a re-alignment of this segment could have benefits, no good alternate location exists. Instead, it is recommended to increase the fill height, provide improved ditches, and re-surface / compact the road surface. Initially, the road should be brushed extra wide and ditches established with an excavator. At that point any re-shaping of the road surface should occur. 4-6 loads of 4" road base will be required to solidify the grade over the stream crossing, followed by road surfacing with a 4" lift of 1.5" minus. The road should be either track compacted or

rolled and watered between each step. A final 2 loads of .75" minus with a high fines component should help to bind the road surface with a significant crown.

Rock is estimated at 84 cubic yards (6 loads) 4" road base

8.5 stations 4" lift = 8.5 loads or 119 cubic yards 1.5" minus

4 stations 2" lift .75" minus - 2 loads or 28 cubic yards



0 145 290 580 Feet

Segment 36

Name: Shingle Mill XO - HP19G to property line

Length: 1739'

Type: Mainline

Maintenance Class - Maintain

Owner: Arch Cape Sanitary District

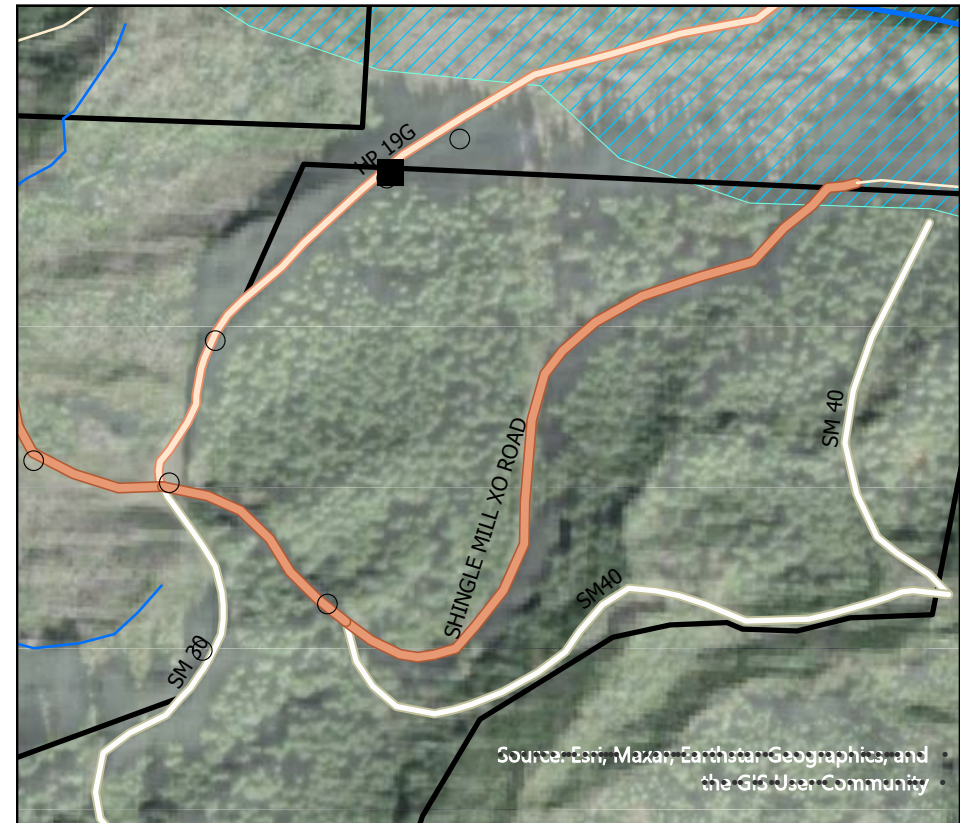
Easements: Check

In DWSA: No

The Shingle Mill XO crosses off of the ACF property onto a 122-acre property owned by the Arch Cape Sanitary District. While not officially part of the ACF, this road segment provides important access for ACF and the RR. This is a well-built gravel surfaced road with significant over-growth.

Management Recommendations: This segment requires brushing followed by re-shaping of the road surface and removal of sod using an excavator. A traction coat of 1.5" - rock with a 2" thick "driveway spread" should provide sufficient lift to stabilize the road surface.

Rock is estimated at 126 cubic yards / 9 loads 1.5" minus driveway spread. It should take an excavator approximately 8-10 hrs to clear this road.



0 160 320 640 Feet

Segment 37

Name: Shingle Mill XO - Property line (gate) to HP19

Length: 1150'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

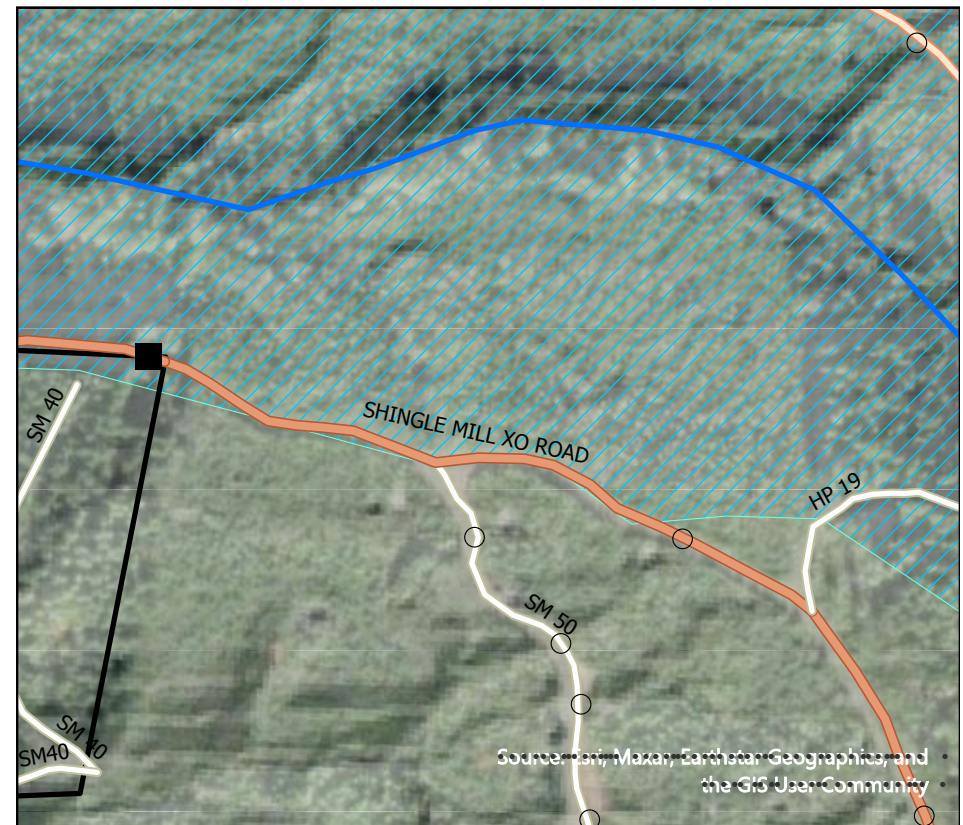
Easements: Check

In DWSA: No

The Shingle Mill XO continues to climb to a saddle where it meets the other end of what used to be the HP19, but is now a stranded spur. This segment is almost identical to the preceding section, with a slight W shape but overall good condition.

Management Recommendations: This segment requires brushing followed by re-shaping of the road surface and removal of sod using an excavator. A traction coat of 1.5" - rock with a 2" thick "driveway spread" should provide sufficient lift to stabilize the road surface.

Rock required is estimated at 84 cubic yards / 6 loads 1.5" minus driveway spread. Re-shaping and sod removal should take 8-10 hrs.



0 155 310 620 Feet

Segment 38

Name: HP19

Length: 827'

Type: Spur

Maintenance Class - ?

Owner: ACF

Easements: Check

In DWSA: No

HP19 is a short grass surfaced spur that used to provide primary access across the property. A large stream crossing on Asbury Creek was removed from the HP19 along with a 200-300yd slump in the road N of the stream crossing. In addition, a culvert approximately 100' before the end of the road appears to be failing and pooling water.

Management Recommendations: This segment requires brushing. In addition, a culvert 100' before the end of the road should be removed.



0 115 230 460 Feet

Segment 39

Name: Shingle Mill XO - HP19 to SM65

Length: 1354'

Type: Mainline

Maintenance Class - Maintain

Owner: ACF

Easements: Check

In DWSA: No

The Shingle Mill XO continues to climb to a 5-way junction with SM60, SM65, and an unnamed 4wd road.. This segment is almost identical to the preceding section, with a slight W shape and overgrowth but overall good condition.

Management Recommendations: This segment requires brushing followed by re-shaping of the road surface and removal of sod using an excavator. A traction coat of 1.5" - rock with a 2" thick "driveway spread" should provide sufficient lift to stabilize the road surface.

Rock required is estimated at 98 cubic yards / 7 loads 1.5" minus driveway spread.



0 205 410 820 Feet

Segment 40

Name: SM60 / SM 65

Length: 457' / 997'

Type: Spur

Maintenance Class - Decommission

Owner: ACF

Easements: None

In DWSA: End of SM65 extends approximately 220' into DWSA

These are two short abandoned spurs that head NE and SW from the 5-way junction with Shingle Mill XO. Both are walkable but no longer driveable - although the appraiser did drive a surprising distance up one road in a Honda Element SUV. This is more a testament to the Honda than to the road condition. SM 65 is badly eroded and incised deeply.

Management Recommendations: Continue to abandon SM 60, SM 65 requires active decommissioning with an excavator to get water off of the road surface.



Segment 41

Name: SM Geology Special

Length: 1952'

Type: Spur

Maintenance Class - Abandon

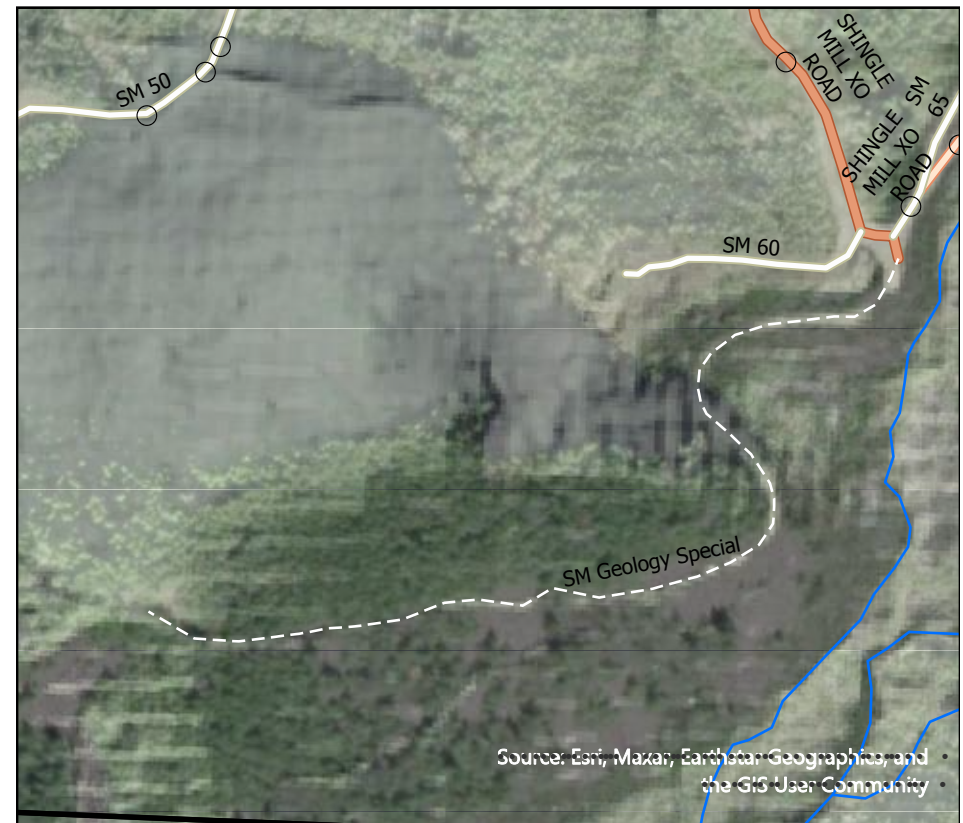
Owner: ACF

Easements: None

In DWSA: No

This is a long and impressive abandoned spur! It is not driveable but is a pleasant walk and, after a few hundred feet of thick alder, becomes more easily passable. The final segment of this road is blasted into solid basalt bedrock on the shoulder of what appears to be a historic lava dome. This is one of the more unique logging roads found on the property and poses minimal risk of failure.

Management Recommendations: Continue to abandon and go for a nice hike up the SM geology special.



Segment 42

Name: Shingle Mill XO - SM65 to property line

Length: 2071'

Type: Secondary

Maintenance Class - Maintain or Decommission (depends on scenario)

Owner: ACF

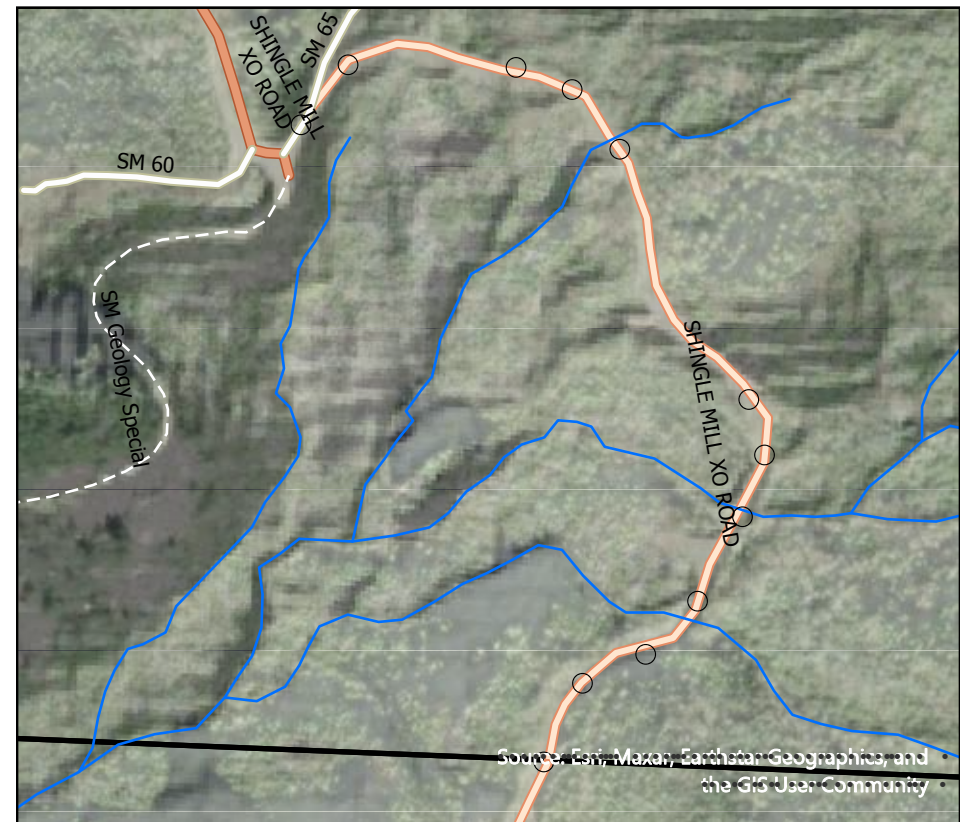
Easements: Check

In DWSA: No

The Shingle Mill XO continues past the 5-way junction, contouring back above Shingle Mill Creek. This segment alone has 12 culverts, all installed for ditch relief. The road is well built although slightly overgrown.

Management Recommendations: This segment requires brushing followed by re-shaping of the road surface and removal of sod using an excavator. A traction coat of 1.5" - rock with a 2" thick "driveway spread" should provide sufficient lift to stabilize the road surface. Depending on NCLC intended future use, this road could become a spur road with a landing at the property line. If no future management (harvest) is intended, it would be reasonable to temporarily decommission this segment at relatively low cost.

Rock is estimated at 140 cubic yards / 10 loads 1.5" minus driveway spread.



0 175 350 700 Feet

Section 2.2 -

Road Segment Assessment

RAINFOREST RESERVE ROADS

Segment 43

Name: Side Seven Spur - Property Line to End

Length: 8809'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

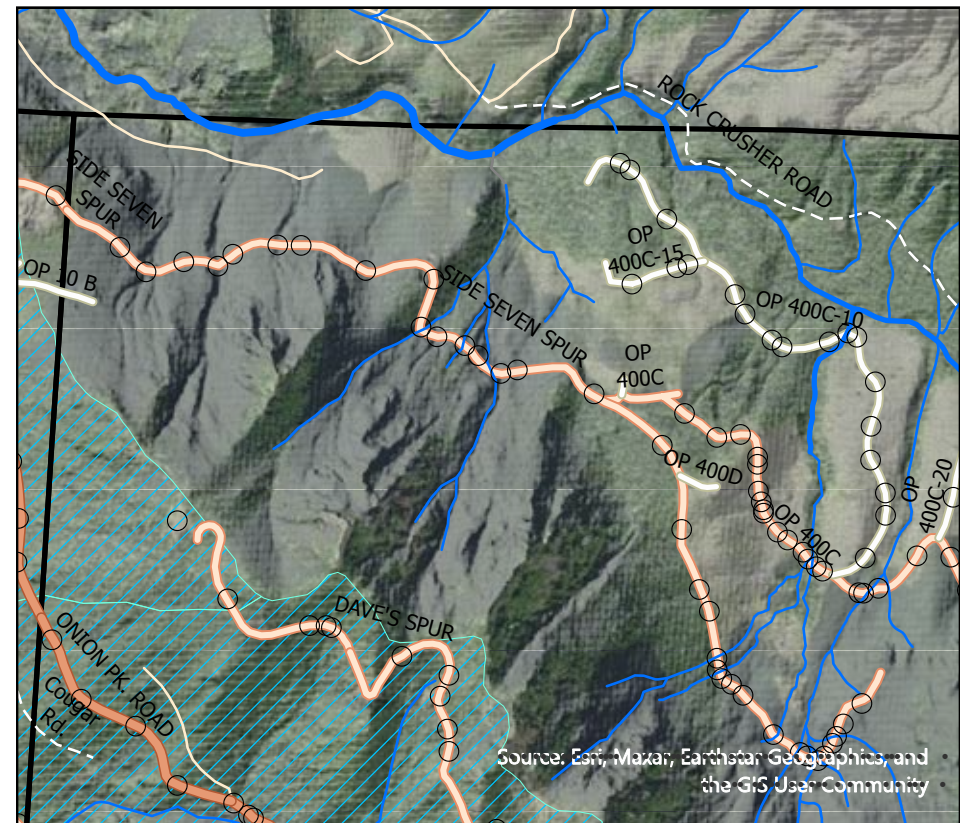
Easements: Check

In DWSA: No

The Side Seven Spur is the primary access to the Ecola Bowl. This is a mid-slope road that traverses at a relatively even elevation. The road is built on a rock base and was intended for moderate use. Most of the road is in-sloped with a significant ditch. This ditch has been cleaned relatively recently (within the past 15 years) and is fully intact. There are some areas of this road that should be watched due to erosion on the downslope side. The erosion appears primarily on the N side of the culverts - a pattern that has no clear explanation.

Management Recommendations: The Side Seven spur is moderately overgrown and needs brushing. Some culverts are partially obstructed and should be cleared. In addition, three main culverts show signs of moderate erosion on the downslope side. None of these have critical issues, however they should be care-

fully monitored for further erosion or shotgunning. Past the intersection with the OP400c, a large boulder obstructs the uphill ditch line with a creek running in the ditch. There is the potential for improving drainage in this area. Surface rock and road shape are fine for light vehicle use, but additional rock should be added to the surface before any truck use.



0 500 1,000 2,000 Feet

Segment 44

Name: OP400C

Length: 4636'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

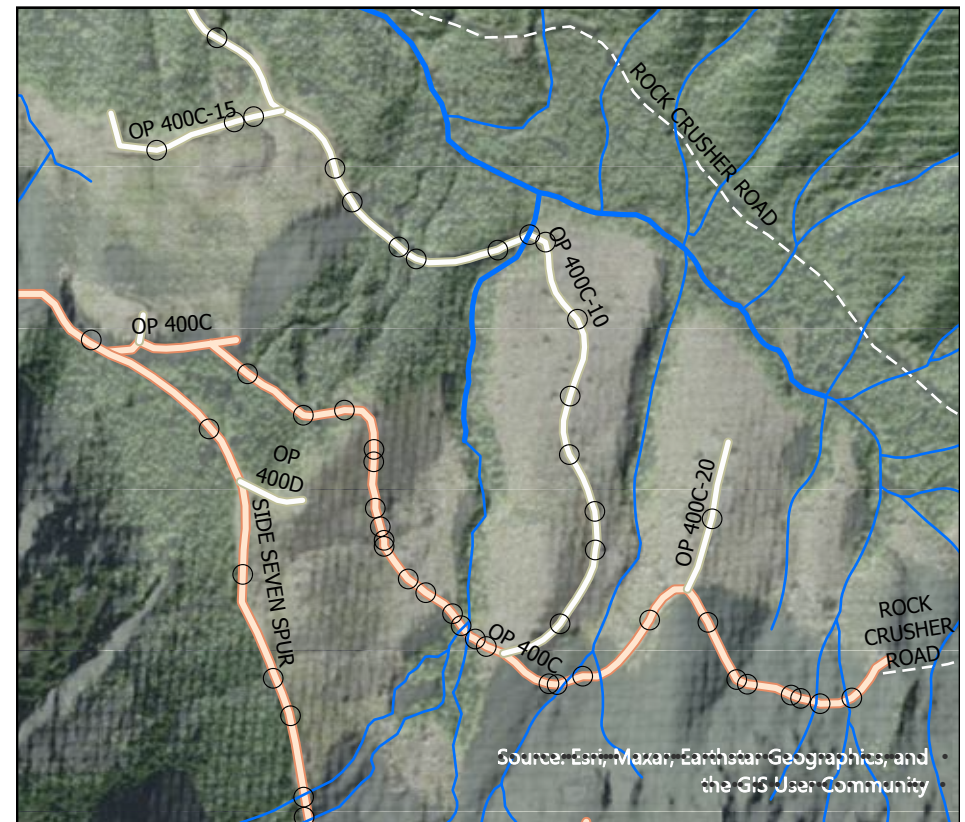
Easements: Check

In DWSA: No

The OP400C cuts downhill into the Ecola Bowl from the Side Seven Spur. The upper portion of this road was built quite recently to tie Side Seven into the existing roads, while the far end of this road appears to be a reconstruction of Rock Crusher Rd, which was decommissioned at the Ecola Creek Crossing. This road is relatively narrow and steep, with steep ditches and frequent cross drains. It is entirely in-sloped and the ditches have severe sedimentation. In some areas the culverts are 100% obstructed. There are also two large stream crossings, which were installed prior to logging and appear to good condition.

Management Recommendations: This segment needs brushing and ditch / culvert cleaning. In some areas the alders may be too large for brushing and should be plucked from the road surface. In this case,

back-blading will be needed to smooth the road surface. The two large stream crossings should be checked on a regular basis, particularly following storm events. Both have the potential of plugging due to sediment and slash in the streams. After any PCT work is completed, the end of OP400C could potentially be decommissioned.



0 380 760 1,520 Feet

Segment 45

Name: OP400C-10 / 15

Length: 4632' / 830'

Type: Spur

Maintenance Class - Maintain - decommission past the 10 / 15 junction, possibly more.

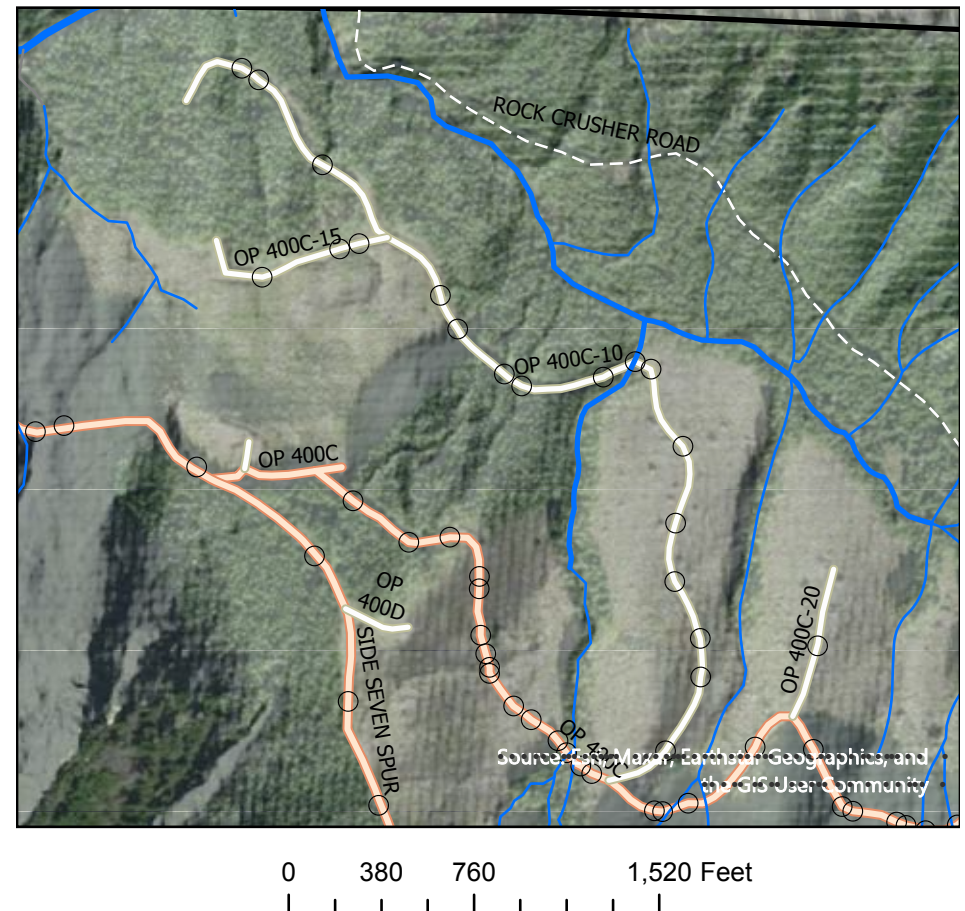
Owner: NCLC

Easements: Check

In DWSA: No

OP400C - 10 and 15 are recently built spur roads used to access the bottom of the Ecola Creek Bowl. Both are heavily overgrown with many downed trees. These roads appear to have only minimal or potentially no use, particularly from the junction of the 10 and 15 (no logging has taken place past this point in recent history). These roads have a shallow rock base and minimal traction rock. The ditches are steep and heavy sedimentation has taken place at the inlet and outlet of the culverts.

Management Recommendations: The maintenance of these roads depends on future forest management plans in the Ecola Bowl. Down to the junction of the 10 and 15, these roads provide useful access for PCT and future harvest activities. Past this point, it is unlikely



that either road would receive significant future use. It is recommended to pluck alder, brush the roads, and remove downed trees to this junction. Past this junction, both roads could be decommissioned. The rock on the surface of the roads is clean enough that it could be feasibly end-hauled and re-spread elsewhere on the property. This decommissioning would include the removal of 6 culverts, end-hauling the surface rock, water bars, and planting. If no management other than PCT is planned in the Ecola Bowl, it is recommended to decommission the OP400C-10 back to the stream crossing closest to the W Fork Ecola Creek, which would remove an additional 7 culverts, including a small stream crossing. At this point it may be advantageous to decommission the entire spur.



Segment 46

Name: OP400C-20

Length: 628'

Type: Spur

Maintenance Class - Decommission

Owner: NCLC

Easements: Check

In DWSA: No

The OP400C-20 is a short spur extending north from the OP400C. This is a steep spur that ends on a landing, with a single, fully sediment filled culvert. The road is recently built and runs down a small ridge into the unit.

Management Recommendations: Due to the high level of sediment transport in the ditches it is recommended to decommission this spur. This would entail removal of 1 culvert, filling the ditches, creation of water bars at 50' increments, sufficient excavation of the road surface to allow for replanting, and the actual replanting activities. It is estimated that an excavator would take approximately 20 hrs to complete this work, and no material would need to be end-hauled.



0 200 400 800 Feet

Segment 47

Name: Onion Pk Rd - Property Line to Dave's Spur

Length: 5545'

Type: Mainline

Maintenance Class - Maintain

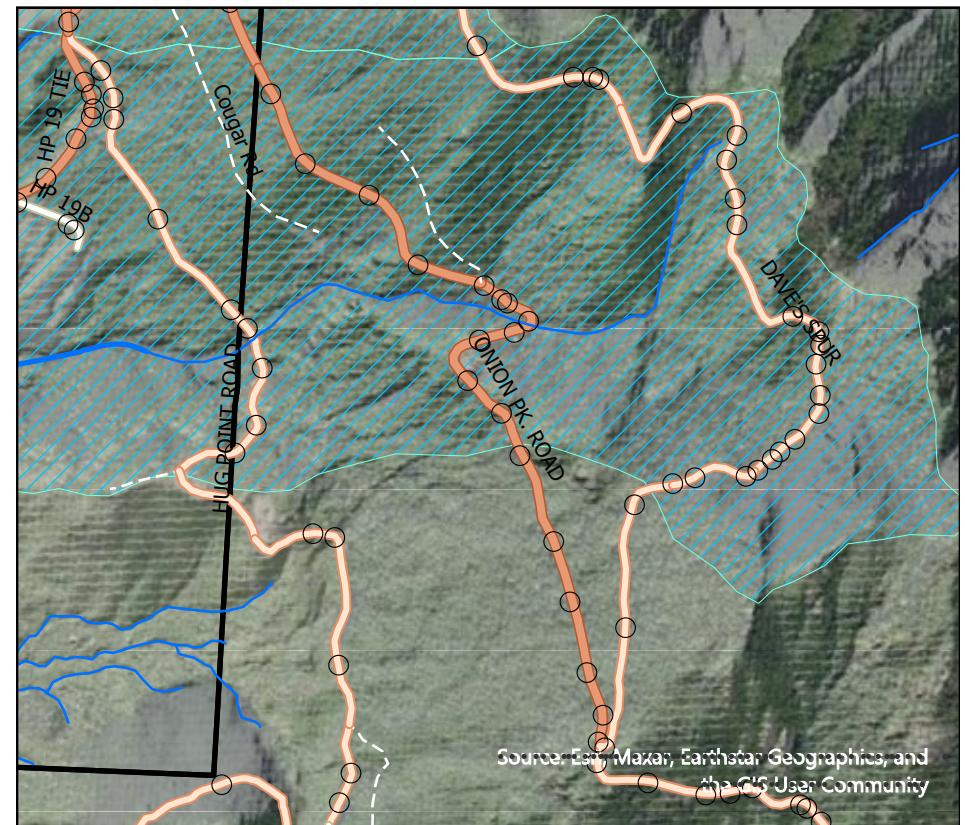
Owner: NCLC

Easements: Weyerhaeuser

In DWSA: North ½

The Onion Peak Rd continues to climb from the property line. The geology in this area is extremely rocky, with large boulders and exposed bedrock. The basalt appears to be more fragmented in this stretch of road than on Angora Peak. The result is numerous areas of rock fall and rock / sediment filled ditches. The road was initially built with an in-slope, however slumping, culvert replacements and the overall effects of gravity have led many areas to slope outwards. In addition, the road has a significant W shape for most of the climb to Dave's Spur.

Management Recommendations: Due to access needs on Onion Peak, the Weyerhaeuser easement, and the unique ecologies of the ditchlines going towards Onion Peak, this report assumes that the Onion Peak Rd. will be kept open at least to Dave's Spur. In



0 500 1,000 2,000 Feet

order to keep this road open it should be brushed with brush cleared from the uphill ditch line. This road presents a challenge since, to fully maintain it in a truck-driveable condition would be an enormous cost. The minimum option is to remove downhill shoulder berms, add water bars, and carefully manage vehicle use. Approximately 50% of the road has a raised berm on the outside shoulder, either from long term use or from past grading. A small excavator with a blade or a cat could easily push down this berm and create small water bars at 50-100' increments. The goal here would be to guarantee that water does not flow on the road surface and concentrate in areas where it flows down the hill. The challenge In addition, either crushed rock could be added sufficient to create an outslope / crown, or excavation should be completed to make sure that water drains downhill.



Segment 48

Name: Dave's Spur - first 1800 ft to DWSA

Length: 1823'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

Easements: Check

In DWSA: No

Dave's Spur heads north from the Onion Peak Rd, climbing gradually. This road is well built and the first portion is on moderate slopes. With the exception of some ditch sedimentation and the need for brushing, this first segment appears in good condition and falls outside of the DWSA. While this road provides minimal access for currently planned management, it would be expensive to decommission and presents no immediate failure risk.

Management Recommendations: Basic maintenance should occur on this segment, with brushing, ditch / culvert cleaning, and the addition of either small ditch-outs or water bars. Many areas have roadside berms, creating a W shape, that should either be removed or could be penetrated with the water bars / ditch-outs.



0 245 490 980 Feet

Segment 49

Name: Dave's Spur - DWSA Boundary to Rocky Section

Length: 3859'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

Easements: None

In DWSA: Yes

Upon entering the DWSA, Dave's Spur contours north, maintaining elevation through a highly varied forest. This segment is characterized by exposed bedrock, large boulders, and small, steep slopes above and below the road. In some areas the road is built directly onto bedrock. The road continues to be well built and has little evidence of failure. Culverts are largely intact, however some areas do have sediment blocking the ditch line. As with the Onion Peak Rd, this segment varies between in-sloped and out-sloped.

Management Recommendations: As with the prior segment of Dave's Spur, this road segment requires regular, basic maintenance, but does not show signs of imminent failure. There are some areas on rocky bluffs where a small landslide or failure could take place. In

this case, it would be very expensive to repair the road. Given the minor access that is provided by Dave's Spur, it is recommended to maintain the road until a failure does occur. In the case that a failure does occur, decommissioning or repair could be analyzed. Past this segment, all decommissioning could be completed with a small mini excavator, for which access would be relatively easy.



0 305 610 1,220 Feet

Segment 50

Name: Dave's Spur - Rocky Section - End

Length: 1852'

Type: Secondary

Maintenance Class - Maintain

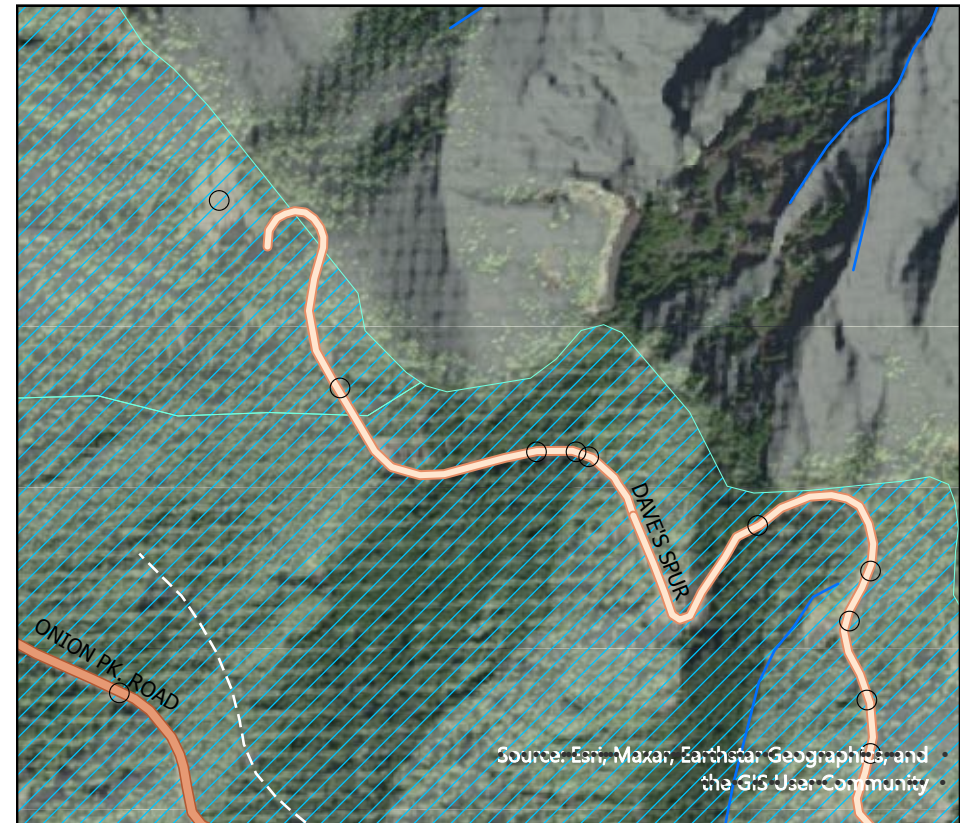
Owner: NCLC

Easements: None

In DWSA: Yes

Following the rocky segment, Dave's Spur runs along and on top of the ridge. This segment is flatter and less rocky. As with prior segments, there is a distinct W profile to the road surface and raised berms on the shoulders. Given the lower slopes and overall decrease in water, this road profile is less concerning on the final segment of Dave's Spur than elsewhere on the property.

Management Recommendations: This segment requires brushing but little other maintenance. Some ditch-out and water bar work would benefit the long-term condition of the road, but little other than monitoring is needed.



0 275 550 1,100 Feet

Segment 51

Name: Onion Peak Rd. to E-N 90 degree turn (trail junction)

Length: 6757'

Type: Secondary

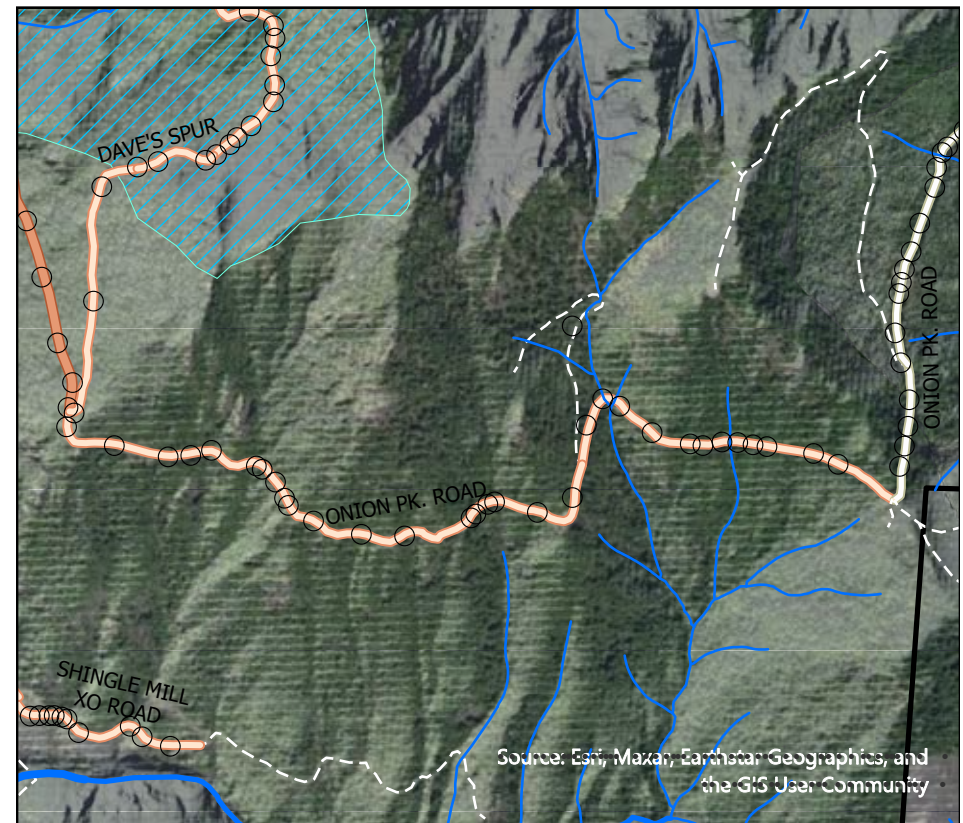
Maintenance Class - Maintain

Owner: NCLC

Easements: Weyerhaeuser

In DWSA: No

From the junction with Dave's Spur headed East, Onion Peak Rd changes notably. The road past this point is narrower, on a very steep slope, and has had minimal use or maintenance. There are multiple closures due to either slumping on the downhill side or rockfall onto the road surface. There are many generations of culverts, some of which are well placed and function, some of which are slowly failing, and many of which are mid-failure or failed. Failures range from rotten bottoms to shotgunning and erosion. Past this point there are many old log puncheons that are slowly collapsing, in some cases causing downhill erosion and / or holes in the road surface itself. One unique feature is a relatively new culvert built under the road in a location where the water appears to be flowing through boulders another 20' below the culvert.



Management Recommendations: The Onion Peak Rd past Dave's Spur is in poor shape with numerous forms of road failure, including failed culverts, erosion, rockfall, and collapsing road base. The road has significant sod and a frequently plugged uphill ditch. One result is a set of vernal pools in the uphill ditch line that provide unique habitat. At a minimum, this road should have failed culverts replaced or removed and rockfall removed from the road surface. In areas with culvert removal required, the road could be converted to outsloped. Rolling dips could substitute for culverts in some cases. It is safe to assume that this will only ever be a dry-season road from this point forward. The log puncheons will be very difficult to replace- most are built on very steep slopes with significant erosion downhill. It may be necessary to wait for failure and then replace with rip-rap and outsloped rock road base. Some of these failures could cause long, shallow landslides below the road. Alternatives include complete decommissioning or near-term removal of the puncheon logs and replacement with riprap.



A failing log puncheon creating a hole in the road surface on the Onion Peak Rd. These holes are often very deep and indicate a hollow area under the road.

Segment 52

Name: Onion Peak Rd - 90 degree junction to end.

Length: 3585'

Type: Spur

Maintenance Class - Decommission

Owner: NCLC

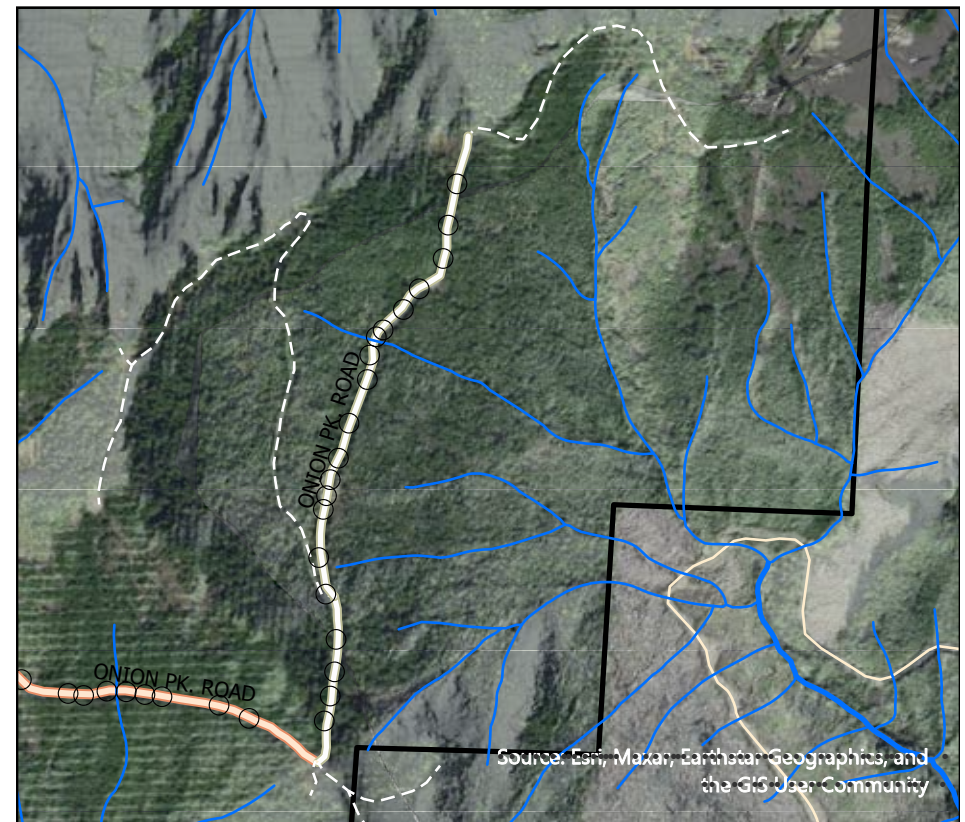
Easements: CHECK

In DWSA: No

Beyond the 90 degree turn where Onion Peak Rd. turns north and an old spur continues east, the road continues to degrade. While numerous culverts have been replaced or added, old log puncheons are frequent and the ditch is heavily clogged. Again, this has created some unique habitat in roadside vernal pools. These same pools are saturating the road fill and leading to the decomposition of log puncheons.

Management Recommendations: This final segment of the Onion Peak Rd is no longer drivable. At a minimum, removal of rock fall and cleaning ditches would improve road condition. Many segments of the road are sod covered, which has helped to stabilize the road surface. This road serves no functional purpose and would be difficult to impossible to use for commercial purposes. Removal of log puncheons and culverts

along with frequent water bars would be an appropriate form of decommissioning. This segment has lower complete failure risk than the preceding segment and would be lower cost to decommission.



0 487.5 975 1,950 Feet



Segment 53

Name: Arch Cape Mill Road

Length: 6115.4'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

Easements: Arch Cape Sanitary District

In DWSA: No

The Arch Cape Mill Road is the only access to the Sanitary District biosolids site as well as to the SW corner of the property. Many of the stands along the Arch Cape Mill Rd will likely require pre-commercial thinning in the next 5-15 years. The Arch Cape Mill Rd previously connected to Shingle Mill Ln, with the old bridge crossing the creek directly behind the water / sanitary office. In the interim, both this bridge and a culvert approximately 200' south from Shingle Mill Creek have been removed. The overall condition of the Arch Cape Mill Rd is good, although the surface is rough and the road will require some ditch re-establishment and culvert cleaning.

Management Recommendations: The Arch Cape Mill Rd has received light brushing / mowing recently and is fully driveable. The surface is rough and would benefit

from a driveway spread of 1.5" minus rock and re-shaping. In addition, ditches are moderately filled and some culverts obstructed.

Cost Estimate:

3.75 yds rock / station (228 yds total for 1.5" lift)

10 hrs excavator



0 500 1,000 2,000 Feet

Segment 54

Name: ACM 25

Length: 1409'

Type: Spur

Maintenance Class - Decomission

Owner: NCLC

Easements: Check

In DWSA: No

ACM 25 is a short spur extending east from the Arch Cape Mill Rd. It has two culverts, both of which are functional. The road is grown in with brush.

Management Recommendations: The ACM 25 serves no current purpose and could be decommissioned. If it were needed in the future, it would be relatively simple to re-open. Decommissioning would require the removal of the 2 culverts and some water bars along the initial uphill slope.



0 155 310 620 Feet

Segment 55

Name: ACM 20

Length: 845' on property line, 721' in Sanitary District

Type: Spur

Maintenance Class - Maintain

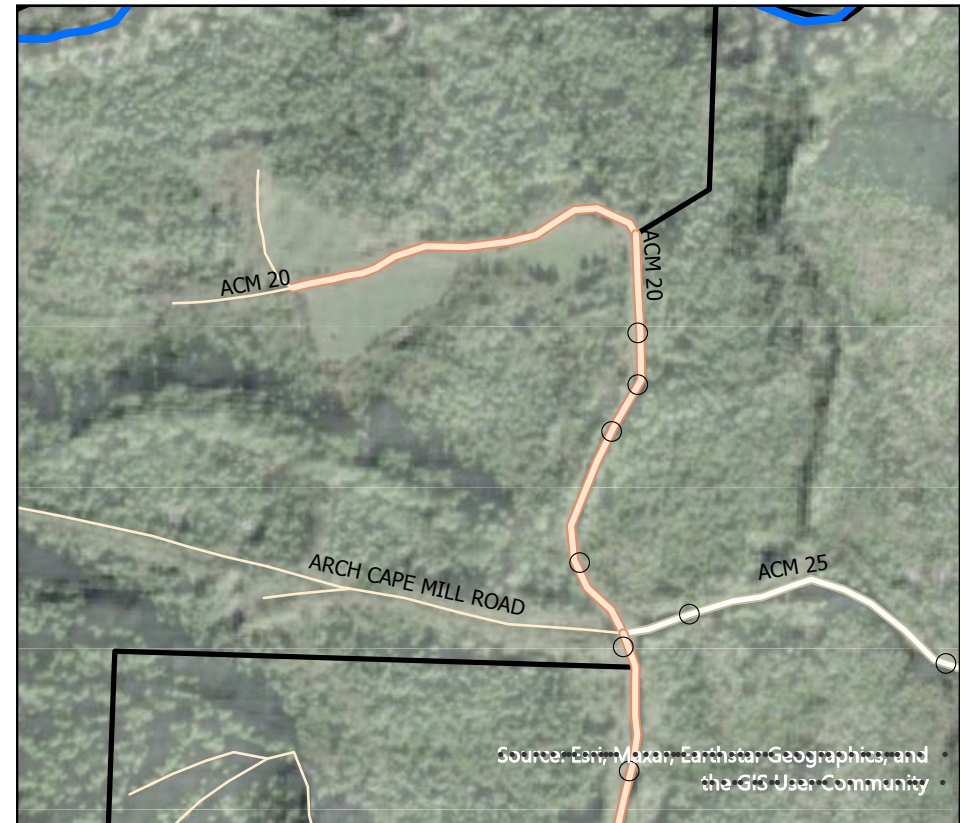
Owner: NCLC / Sanitary District

Easements: Check

In DWSA: No

ACM 20 continues North from the Arch Cape Mill Rd and accesses the biosolids application site. This road has 4 culverts on the initial downslope and is in decent condition, with some wet areas on the road surface.

Management Recommendations: The ACM 20 is necessary for access and should be maintained. It is not clear who has maintenance responsibility for this road as it runs on the property line. The road serves no purpose for NCLC and, unless some other arrangement is in place, would naturally be the responsibility of the Sanitary District. Basic brushing is all that is needed at this point (it has been brushed recently).



0 185 370 740 Feet

Segment 56

Name: ACM 35

Length: 1491'

Type: Spur

Maintenance Class - Decomission

Owner: NCLC

Easements: Check

In DWSA: No

ACM 35 is a short spur extending NE from the Arch Cape Mill Rd. It has two culverts, both of which are functional. The road is grown in with brush and cuts mid-slope.

Management Recommendations: The ACM 35 serves no current purpose and could be decommissioned. If it were needed in the future, it would be relatively simple to re-open. Decommissioning would require the removal of the 2 culverts and some water bars along the initial uphill slope.



0 185 370 740 Feet



Segment 57

Name: ACM 45 / 50

Length: 1133'

Type: Spurs

Maintenance Class - Abandon

Owner: NCLC

Easements: Check

In DWSA: No

ACM 45 and 50 are short spurs used for recent operations that extends NW from near the junction of Falcon Cover Rd and Arch Cape Mill Rd. They are rock surfaced and serves no present purpose.

Management Recommendations: The ACM 45 has no culverts. It can be abandoned and re-opened as needed. ACM 50 has two culverts that should be removed prior to abandonment



0 195 390 780 Feet

Segment 58

Name: Arch Cape Mill Road - Falcon Cove Junction to ACM 60

Length: 1151'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

Easements: Check

In DWSA: No

The Arch Cape Mill Rd segment begins at the gate just inside the property line and climbs steeply to the NE. This was historically a mainline road, however has received minor recent use or maintenance. It is rock surfaced with loose surface rock.

Management Recommendations: The Arch Cape Mill Rd still provides important access to the ACM 60 and the "scary road" segment where it is blasted into the surface. This segment is well built and should receive basic maintenance (brushing). It is also a popular hiking trail. Additional ditch-outs would help to channel water away from this ridge-top road.



0 137.5 275 550 Feet

Segment 59

Name: ACM 60

Length: 4278'

Type: Spur

Maintenance Class - Maintain

Owner: NCLC

Easements: Check

In DWSA: No

The ACM 60 is a major spur that extends north towards Shingle Mill Creek. This road historically accessed a large slope below the Arch Cape Mill Rd, however it has been abandoned with culverts removed past the small drainage that flows north into Shingle Mill Creek. The road is rock surfaced with sod and has significant alder growth in the road surface for the final 500'

Management Recommendations: While the ACM 60 does provide thinning access for a stand that could receive future PCT, it will be an expensive road to maintain past the switchback at its northern extent. The road could A) receive basic maintenance and upkeep B) receive maintenance until a failure occurs, followed by decommission or C) initial decommission. Any of these are viable options depending on future forest man-



0 310 620 1,240 Feet

agement intentions. A practical solution might be to remove culverts and abandon the road from the switchback onwards, maintaining access to the switchback. The road out to this point is ridge-top and well built. Past this point there are 5 culverts that would require removal.



ABOVE: Water pooling on the uphill side of the ACM 60 at the end of the ATV drivable section. It was unclear whether this was from a plugged culvert, or just an area with no built in drainage.

LEFT: A boulder sitting on the sod-covered ACM 60 before the switchback

Segment 60

Name: ACM 60 A

Length: 974'

Type: Spur

Maintenance Class - Decommission

Owner: NCLC

Easements: Check

In DWSA: No

ACM 60A is a short spur with another short southern extension. This road serves no current purpose, but does have rock surface and one culvert.

Management Recommendations: Since this road serves no purpose, it would be sensible to remove the one culvert and install water bars. The road could be re-opened for future management needs.



0 112.5 225 450 Feet

Segment 61

Name: Arch Cape Mill Road ACM 60 - ACM 70

Length: 985'

Type: Secondary

Maintenance Class - Maintain

Owner: NCLC

Easements: Check

In DWSA: No

The Arch Cape Mill Road continues to climb past the ACM 60 junction. Beginning in this segment, a past landowner installed large drivable water bars. These water bars have concentrated flow and have caused some downslope erosion. The road is rock surfaced and appears to be in stable condition.

Management Recommendations: It is recommended to maintain this segment as it provides access to the parking area at the bottom of the scary road. This access will be important for long-term stewardship on Angora Peak and associated roads. It is recommended to complete basic brushing, possibly by hand or with a small excavator (just enough for a pickup truck) and monitor the water bars. At some point, it may be beneficial to outslope segments or install more frequent, smaller water bars. The water bars also may become

undriveable, in which case they should be filled partially with 4" crushed rock. This would also help to decrease erosion and slow water flowing through the water bars.



0 120 240 480 Feet

Segment 62

Name: ACM 70

Length: 1878'

Type: Spur

Maintenance Class - Abandon

Owner: NCLC

Easements: Check

In DWSA: No

ACM 70 is a mid-slope spur built to harvest the large stand near the property line. This spur has no culverts, some rock surface, and large puddles of standing water on the road surface. The road is overgrown and barely drivable with an ATV.

Management Recommendations: The ACM 70 has been abandoned and you can continue to abandon without significant risk of failure.



0 195 390 780 Feet

Segment 63

Name: Arch Cape Mill Road - ACM 70 - End

Length: 3796'

Type: Abandoned

Maintenance Class - Decommission

Owner: NCLC

Easements: Check

In DWSA: No

The Arch Cape Mill Road in this segment is commonly known as the "scary road." This impressive road is blasted into a steep rock cliff with a large failing culvert and cliffs on both sides. Large water bars installed by a past owner have exacerbated drainage issues in this segment. The road is effectively abandoned, however 11 culverts are still in place, one of which has failed and is causing significant erosion. Past the end of this segment, the Arch Cape Mill Road has been properly decommissioned and is effectively a hiking trail.

Management Recommendations: The Arch Cape Mill Road, since it is blasted into bedrock for a significant portion of the segment, will be difficult to decommission. Regardless, it is necessary to remove all of the culverts from this segment before a catastrophic failure makes the road completely inaccessible. Continued abandonment in its current state is not an option.



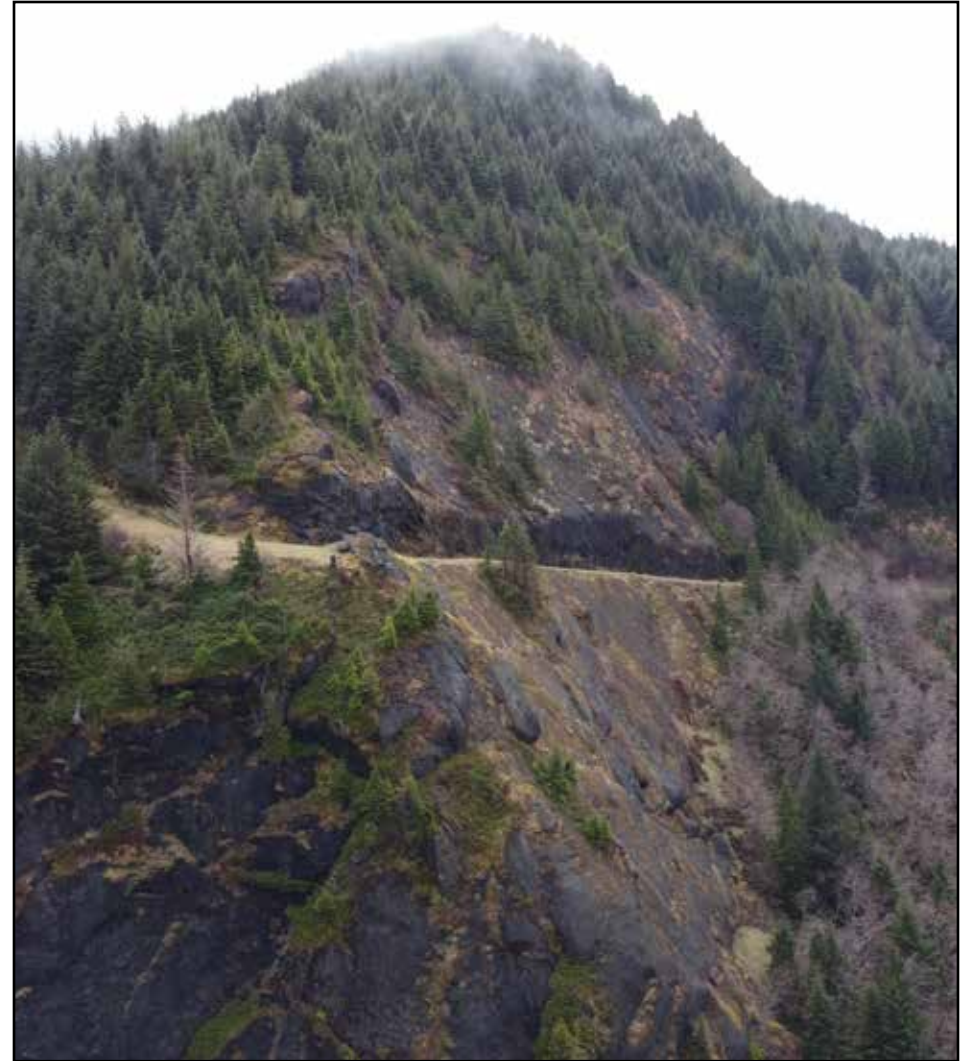
0 250 500 1,000 Feet

Recommended steps for decommissioning include 1) removing culverts 2) adding additional small water bars 3) providing proper drainage at the failed culvert.

This work will all be completed with a small excavator. A small tracked dump truck or similar may be needed for removing culverts, although it could be possible to drag culverts behind an ATV (carefully).

Beginning at the end of this segment, a small excavator should punch in small water bars and fill the ditch line for 10' downslope of each water bar. In no area should water be allowed to run down the road surface. Culverts should be removed and left as cross-drains / water bars.

There is one large culvert at the top of the bedrock section and one at the bottom. The upper culvert appears to be set on the bedrock. Removal of this should leave a natural cross drain. The lower (failed) culvert will require removal and establishment of a new drainage path through the existing water bar and downslope. There is some risk of continued undercutting of the road, which must be stabilized with rip-rap or other rock sourced on-site.



ABOVE: The Arch Cape Mill Road's impressive segment blasted into rock. The primary issue on this road is at the bottom, right side of this segment. A culvert and water bar have failed here and must be removed. In addition, all culverts above this should also be removed.



Segment 64

Name: Shingle Mill XO Road - Property Line - Slump

Length: 2860

Type: Secondary

Maintenance Class - Decommission

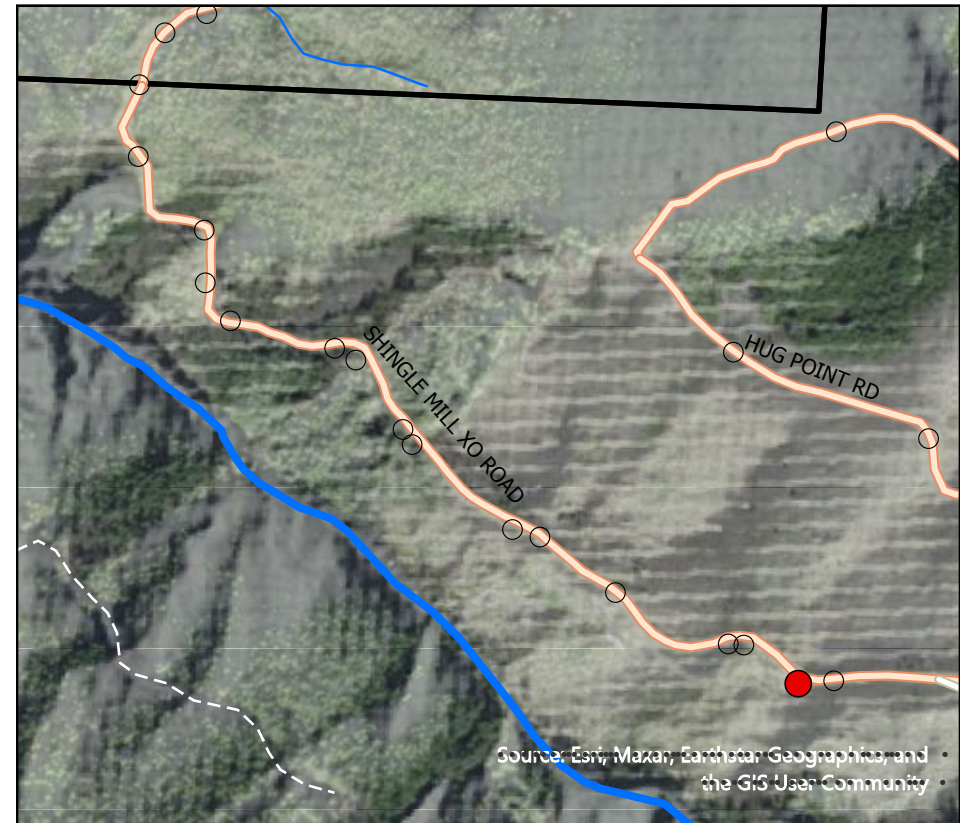
Owner: NCLC

Easements: Check

In DWSA: No

From the property line, the Shingle Mill XO re-enters the Shingle Mill Creek drainage and cuts across a steep slope. There is a large slump directly where this segment re-enters the property, and numerous additional slumps before a large landslide completely closes the road. This is a mid-slope in-sloped road with numerous segments blasted into bedrock.

Management Recommendations: The Shingle Mill XO Road serves no current practical purpose, given especially that any future management would occur from the Hug Point Rd above. A failure at any of the existing slumps would generate a very difficult scenario for further decommissioning. Hence, it would be wise to decommission this entire segment by removing culverts, filling ditches, and establishing water bars wherever the road in-slopes.



0 255 510 1,020 Feet



Segment 65

Name: Shingle Mill XO Road - Slump - End

Length: 6148'

Type: Secondary

Maintenance Class - Decommission

Owner: NCLC

Easements: Check

In DWSA: No

The Shingle Mill XO Road continues up Shingle Mill Creek after it crosses a landslide. The landslide completely closes the road and appears to have continued movement. Above this point, the road is in better condition, having been used more recently. The road however provides no thru-access at this stage and, as with the lower segment, has some potential of future, significant and costly failure. This road continues up Shingle Mill Creek with numerous culverts in varying states of function.

Management Recommendations: It is recommended, as with the lower segment, to decommission this road. It is a mid-slope road in a sensitive drainage with numerous active landslides throughout the slope, as well as seeps. Decommissioning would require removal of culverts, filling ditches, breaking apart the road surface, and outsloping or providing water bars.



0 370 740 1,480 Feet



Segment 66

Name: SM 80

Length: 958' spur, 3809' abandoned

Type: Spur

Maintenance Class - Abandon

Owner: NCLC

Easements: Check

In DWSA: No

SM 80 is a short spur that historically accessed the N face of Angora Peak. The lower segment and crossing were removed some time ago. There are however culverts still existing on the S side of Shingle Mill Creek. The damage caused by removing these would be prohibitive. The 958' spur that still exists is overgrown and serves minimal current purpose. At some point this area will likely require PCT, but that could be done from the Hug Point Rd.

Management Recommendations: It is recommended to decommission the 958' of SM 80 spur and continue to abandon the 3809' that is basically inaccessible. Decommissioning would require the removal of 2 culverts and standard excavation.



0 260 520 1,040 Feet



Segment 67

Name: Hug Point Rd - End to HP 27

Length: 4,843'

Type: Secondary

Maintenance Class - Maintain

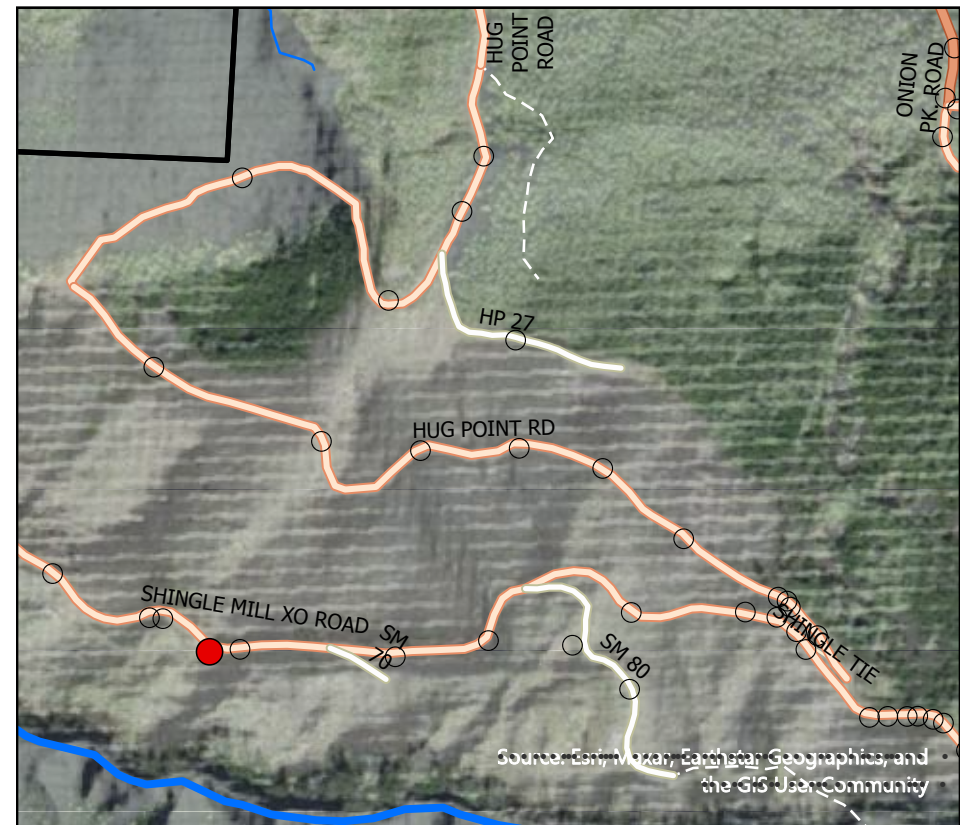
Owner: NCLC

Easements: Check

In DWSA: No

The Hug Point Road provides access to upper Shingle Mill Creek and numerous young stands that may require future management. This segment is rock surfaced with a large boulder directly south of the "knob". The road requires clearing from just past HP27 around the knob, but is currently drivable by the bold or on an ATV.

Management Recommendations: It is recommended to maintain this segment to the Shingle Mill XO. This will require standard brushing and removal of boulders and rip rap from the road surface. The road is quite rough, but does not provide any significant drainage. The end of this road, where it meets the Shingle Mill XO, includes a very strange intersection that would benefit from improved drainage (shown on the following page).



0 300 600 1,200 Feet



Segment 68

Name: HP 27

Length: 789'

Type: Spur

Maintenance Class - Abandon

Owner: NCLC

Easements: Check

In DWSA: No

The HP 27 is a short spur that provides no current access need. This is a mid-slope spur that appears to have been built to log the down-slope stand.

Management Recommendations: Given that this spur is not currently needed, and does not have significant drainage issues, it could be abandoned following removal of the 1 culvert about half way out. If the road were needed for future management it could easily be re-opened temporarily.



0 130 260 520 Feet

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Segment 69

Name: Hug Point Rd - Property Line to HP27

Length: 2392'

Type: Secondary

Maintenance Class - Maintain

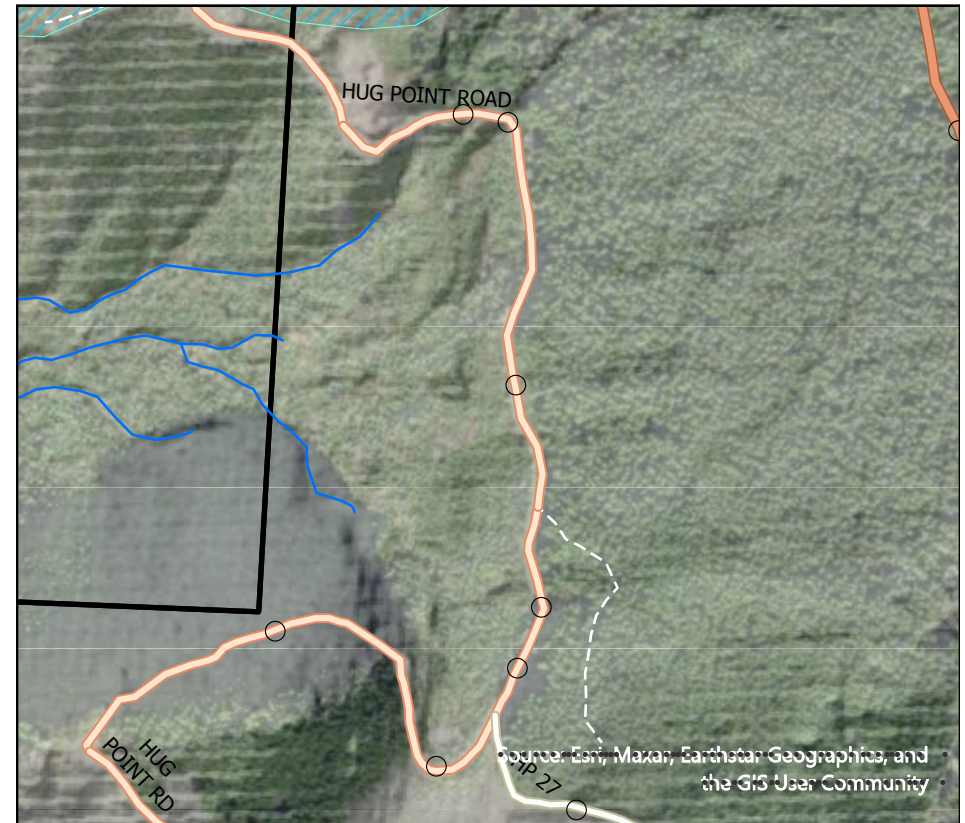
Owner: NCLC

Easements: Check

In DWSA: No

The Hug Point Road becomes very rough after entering the Rainforest Reserve. This segment is mid-slope with some alder growth and a very small ditch. The road is a mix of in-slope and out-slope and appears to have a very thick rock base, which pokes through the road surface in many areas.

Management Recommendations: This segment should remain open for the foreseeable future. This segment requires regular maintenance (brushing) and should be out-sloped as much as possible. Most of the segment is currently flat or outsloped and this would only become an issue if a slump occurred, which appears unlikely given the hydrology and geology of this slope.



0 270 540 1,080 Feet

Section 3 -

Management Recommendations

This section provides a written summary of all major projects recommended for each property. This includes road decommissioning and major maintenance or construction. This does not include routine road brushing, grading, rock, and minor culvert replacement.

Basic Maintenance

Both properties require basic maintenance. This includes:

1. Brushing

2. Ditch Cleaning

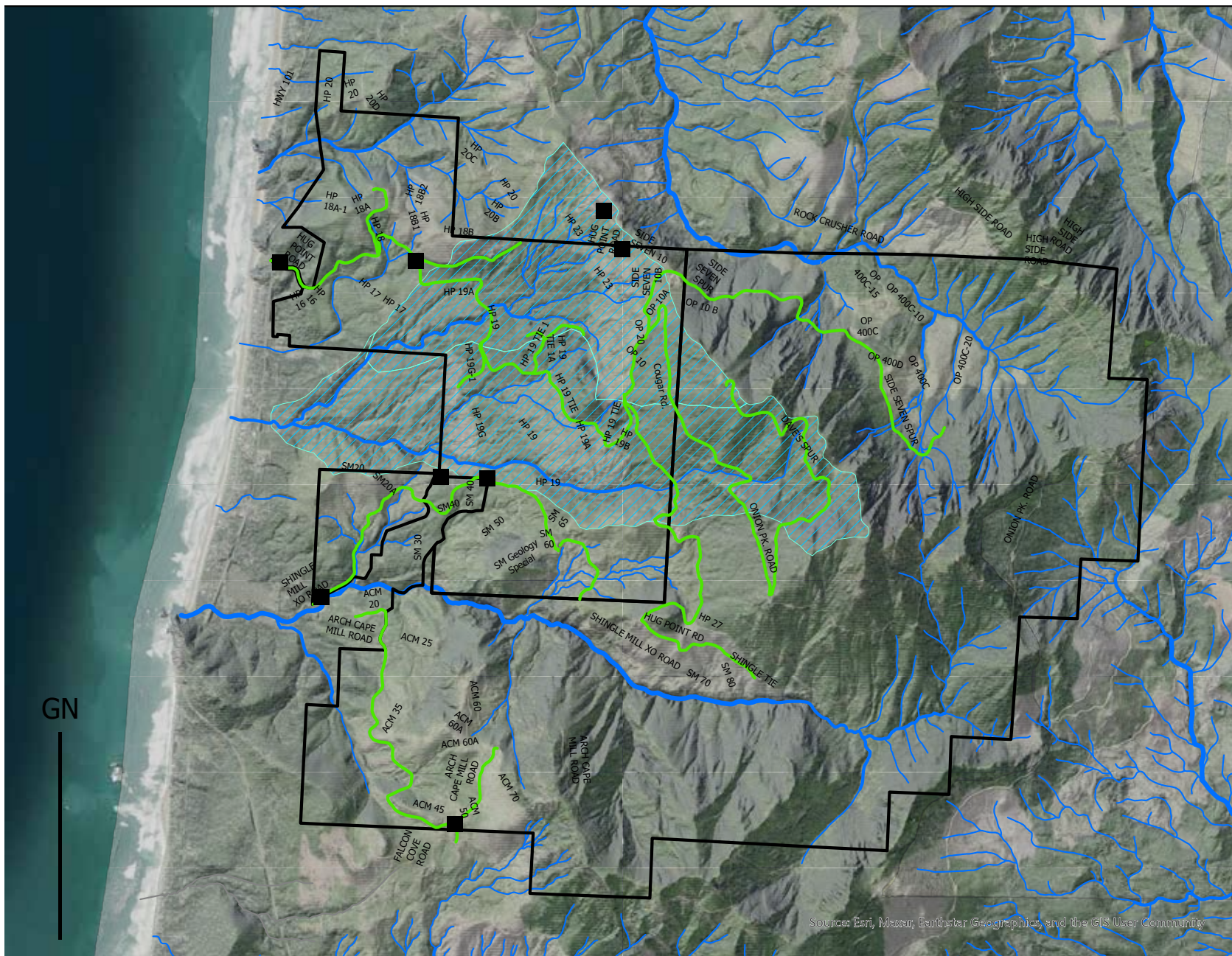
3. Culvert cleaning, repair, and replacement.

These tasks have gone uncompleted for the past 5 years and are a basic cost of land ownership. These tasks should be completed on average every 5-10 years. Brushing can be stretched if it occurs in the spring and is completed well, with a large road prism and low vegetation height. In terms of ecology, it seems as if less frequent, but more thorough brushing has a less severe impact on the ecology of the road system.

These tasks have varying costs depending on the scale of work being completed and should be quoted at the time of planned work. At a basic level, it is safe to assume that each landowner will need to spend roughly \$50,000 every 5-10 years with the current road system (no additional abandonment or decommissioning). The proposed level of abandonment and decommissioning could decrease this to \$20,000-30,000 for the same time period.

The map on the following page shows the road segments that are recommended to ongoing maintenance. There are 8.21 miles on the Arch Cape Forest recommended for continued maintenance. If Arch Cape elects a no-harvest scenario, the maintained road mileage would decrease to 6.08 miles.

Basic Maintenance Roads



Road Abandonment

Some roads may be abandoned. This can only occur on roads where there are no culverts or existing drainage issues. Abandoned roads can often be re-opened if needed.

Abandoning roads has minimal cost and will decrease the overall carrying cost of property ownership. However given the complexity of roads on this property, and significant drainage issues, there are relatively few roads that can be abandoned.

Many of the roads on the property are already abandoned.

Even if these roads have not been properly decommissioned, the damage caused by going back in to remove culverts or fix drainage issues outweighs the long-term benefit gained by the action. In most cases, the culverts are fully plugged or rusted and most of the way gone, and there are very few culverts left. For the most part, these are old, out-sloped roads that have been simply let go.

For new abandonment, the AFC has 3.07 miles of road that can be abandoned. Both currently abandoned, and roads that can be abandoned going forward, are shown on the following page map.

Road Decommissioning

Both properties have roads that serve no current purpose, and would not be needed for any scenario of near-term forest management. These roads have significant costs to the landowner, and risks to source water, if maintained. A preferred alternative is to decommission, either temporarily or permanently.

Decommissioning typically entails removal of all culverts and a level of excavation between, at a minimum frequent water bars, and at most, full re-contour of the road surface to match the surrounding topography. These options depend on topography and hydrology of the site, as well as landowner budget and intended future use.

For the most part, roads on the ACF and RR require removal of culverts, ditch filling, and some excavation of the road surface to outslope in a manner sufficient to provide full drainage.

The goal with these decommissioning projects is to provide even drainage, such that water does not concentrate on the road surface and create erosion issues. At no point should water flow down the road surface or concentrate except where it directly crosses the old road in a stream.

The Arch Cape Forest has 3.48 miles of road recommended for decommissioning. These roads are shown on the following page. If the Arch Cape Forest elects a no-harvest or watershed stewardship management scenario, an additional 2.13 miles of road could be decommissioned. These roads are shown on the following map with **initial decommission in red and **potential / future decommission in yellow**.**

Project List

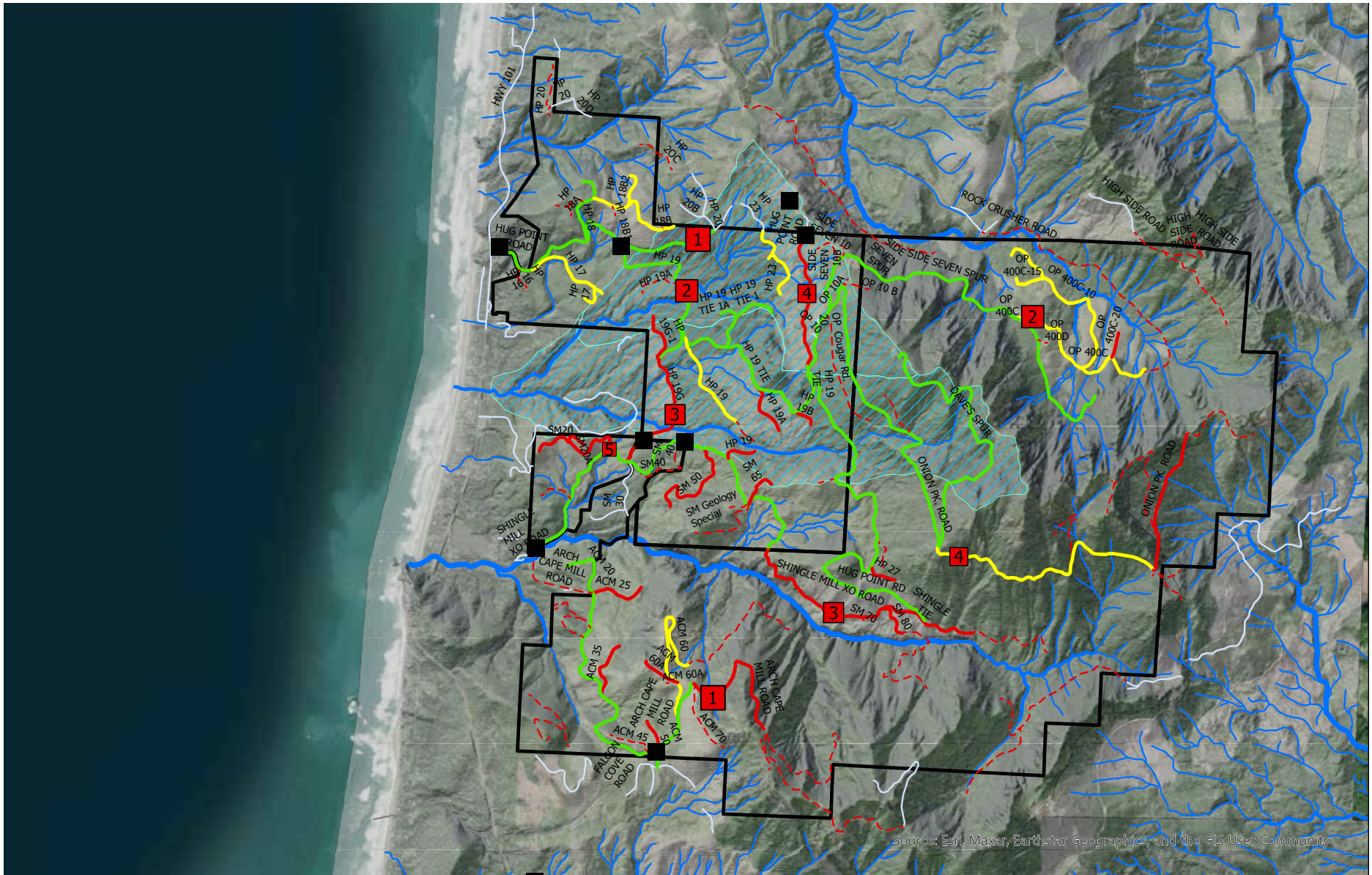
In addition to basic maintenance, road abandonment, and road decommissioning, there are large points of road failure, reconstruction, or removal. These are included in the following pages and include in a prioritized order. Budget estimates included in this report are initial estimates only and do not include equipment mobilization or contract management.

Arch Cape Forest

1. Segment 8 - Hug Point Rd Slump
2. Segment 14- HP19 / Shark Creek Road Crossing Curve Widening
3. Segment 17 - Asbury Creek Crossing removal / slump decommission
4. Segment 11 - Hug Point Road Removal from property line junction - Onion Peak Rd
5. Segment 33/35 - Single Mill XO Repairs
6. HP 19 / 23 TIE new road construction (possible)

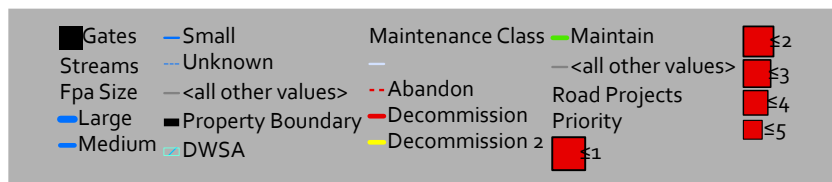
Rainforest Reserve

1. Segment 61/63 - Arch Cape Mill / Angora Road Decommission
2. Segment 45/46 - OP400C 10, 15, 20 removal
3. Segment 51/52 - Onion Peak Road Maintenance / Decommission (past Dave's Spur)
4. Segment 64/65/66 - Shingle Mill XO Road Decommission



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

GN



Section 3.1 -
ACF PROJECTS

1. HUG POINT SLUMP

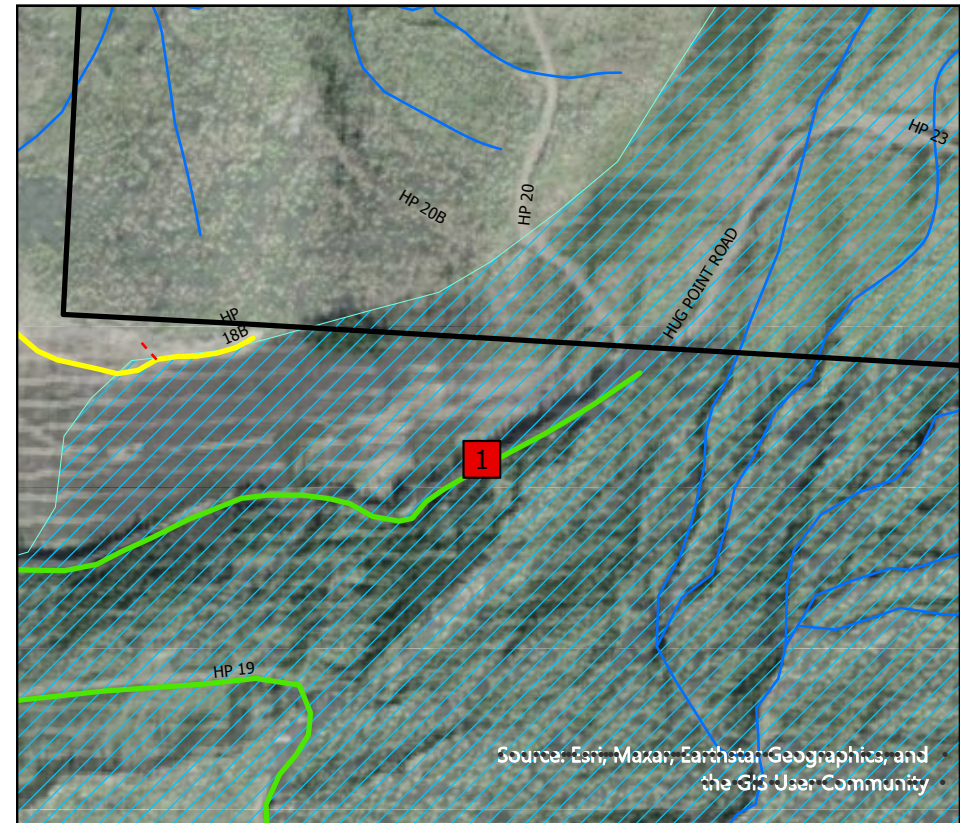
ROAD: HUG POINT ROAD

TYPE: SLUMP / CROSSDRAIN

DESCRIPTION: The Hug Point Road has 165' segment that has slumped 3-4' due to saturated fill. The fill is on top of a perched culvert and exists just down-slope from a seep. This seep goes completely dry in the summer but holds water in the uphill ditch-line during the winter. It appears that past managers attempted to decrease the fill saturation by adding cross drains just up-slope from the road failure. The road is currently drivable but has required 2-3 patch loads and was bladed flat during the brushing. This road segment is in the DWSA and is required for future management. It is proposed to remove the fill, re-shape the intake and outfall of the culvert, and re-install a 36" x 36' HDPE culvert. The budget includes sufficient rock to cover from the HP gate to the property line with a 4" lift.

BUDGET ESTIMATE:

Project 1	Quantity	Cost	
Excavator (small)	10	\$	1,450.00
Excavator (large)	30	\$	5,100.00
Dump Truck	40	\$	4,200.00
Roller	5	\$	575.00
Grader	0	\$	-
Other Materials (eg culverts)	36	\$	1,753.20
Rock / yd (including trucking)	1009.544	\$	36,343.58
TOTAL		\$	49,421.78



0 250 500 1,000 Feet



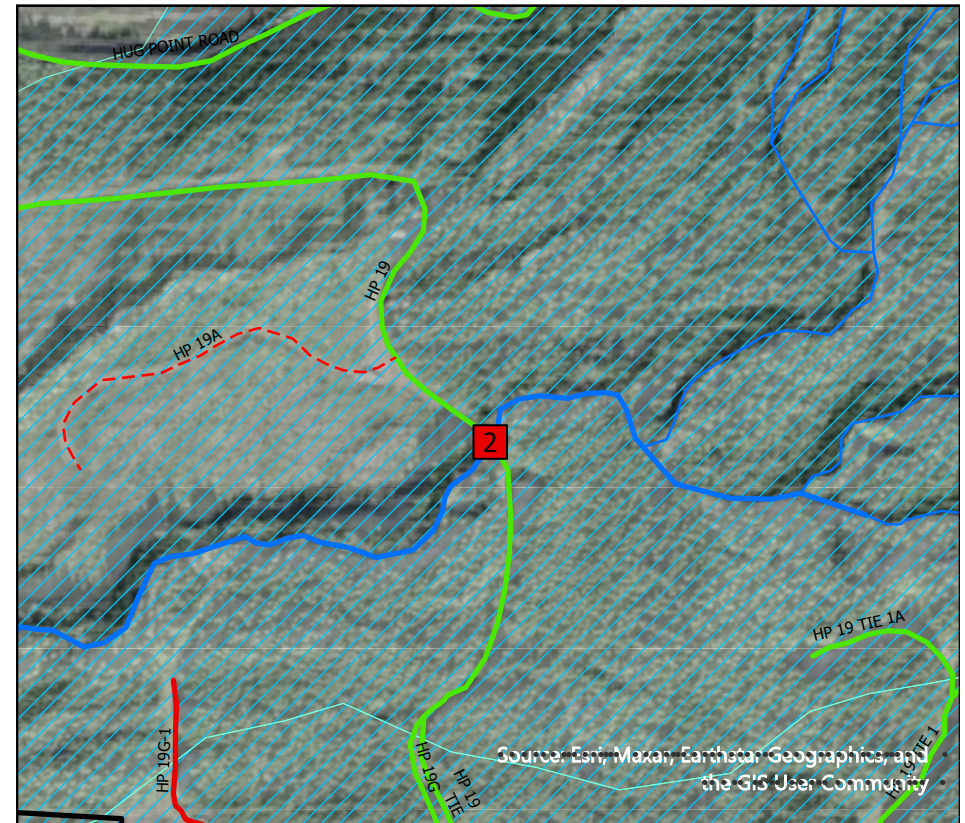
2. SHARK CREEK CURVE WIDENING

ROAD: HP 19

TYPE: Curve Widening

DESCRIPTION:

The HP 19 was re-aligned by EFM following a mass soil movement on the original HP19. The re-alignment required a new large stream crossing (Shark Creek, inside the DWSA) and installation with a significant fill. During the construction of this crossing, the contractor hit solid rock and was unable to lower the road surface in order to meet standard specifications for curve widening, fill slope, and road width. The result is a crossing that is borderline passable with a log truck and presents significant erosion risk from overly steep banks. The solution is to either A) widen the curves and reinforce the banks B) remove and re-build the crossing 75' downstream or C) shift access to another road. Option A is recommended, especially if a no-harvest scenario is selected, with plan details on the following pages.

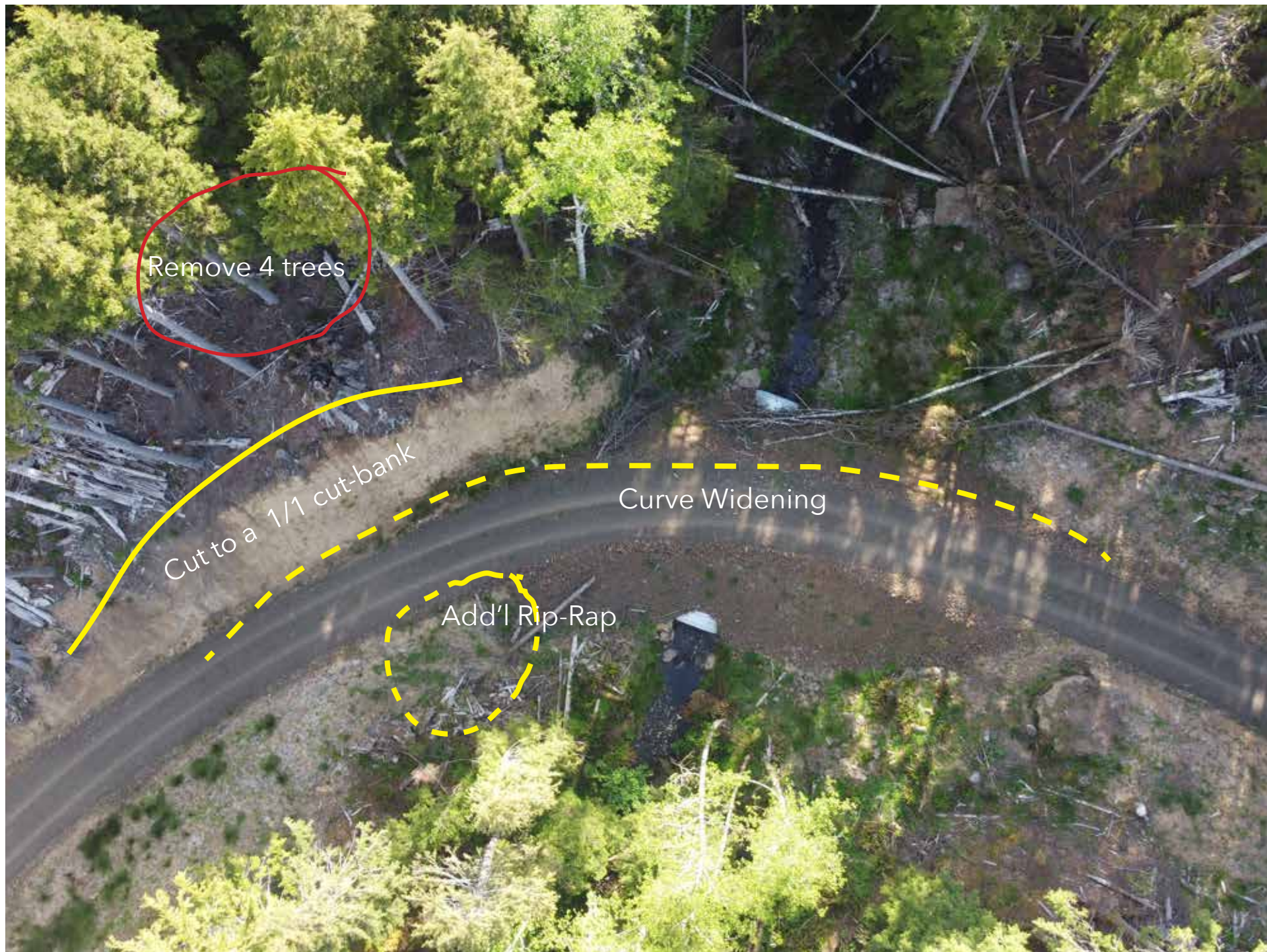


0 250 500 1,000 Feet

BUDGET ESTIMATE:

Project 2	Quantity	Cost	
Excavator (small)	20	\$	2,900.00
Excavator (large)	80	\$	13,600.00
Dump Truck	80	\$	8,400.00
Roller	3	\$	345.00
Grader	0	\$	-
Other Materials (eg culverts)	1	\$	500.00
Other Labor	40	\$	3,000.00
Rock / yd (including trucking)	103.6	\$	3,729.60
TOTAL		\$	32,474.60





Remove 4 trees

Cut to a 1/1 cut-bank

Curve Widening

Add'l Rip-Rap

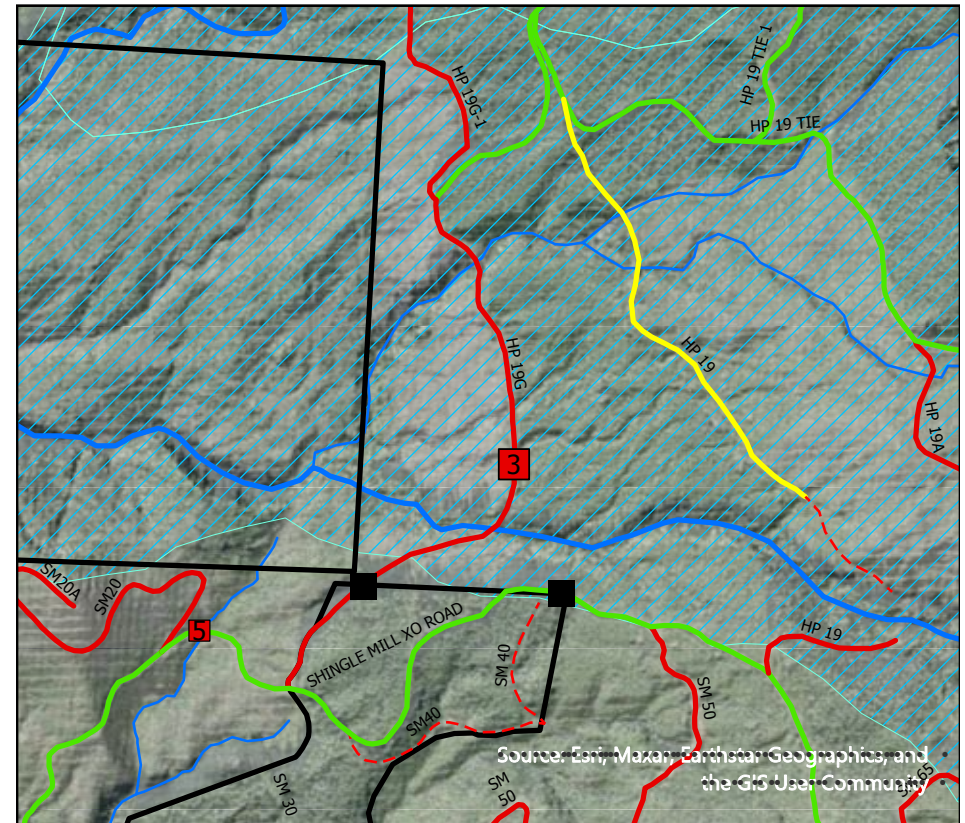
3. ASBURY SLUMP

ROAD: HP19G

TYPE: Road Removal

DESCRIPTION:

The HP 19G historically provided important access between the Shingle Mill area and the Hug Point gate. Unfortunately a mass soil movement closed this road beginning in 2015, with complete closure in 2019 when the fills were removed. At that time, a geotech from the Oregon Department of Forestry evaluated the site and determined that road reconstruction was not advisable. The road exists on the toe of a deep-seated landslide that also impacted the HP19, leading to closure. Unfortunately the past decommission did not fully allow for water passage and the fill is still saturated and sliding down the hill. In addition, this is a popular hiking route, which has led to sedimentation in the stream. A full removal of the road is recommended combined with removal of the large culvert on Asbury Creek, 150' south from the slump. All locations would be stabilized with small pedestrian-passable walkways. This project is inside the DWSA



BUDGET ESTIMATE:

Project 3		
	Quantity	Cost
Excavator (small)	20	\$ 2,900.00
Excavator (large)	80	\$ 13,600.00
Dump Truck	80	\$ 8,400.00
Roller	0	\$ -
Grader	0	\$ -
Culvert Disposal	2	\$ 200.00
Other Materials (plants + bridg	600	\$ 5,510.00
Other Labor	80	\$ 6,000.00
Rock / yd (including trucking)	24	\$ 864.00
TOTAL		\$ 37,474.00



4. HUG POINT ROAD REMOVAL

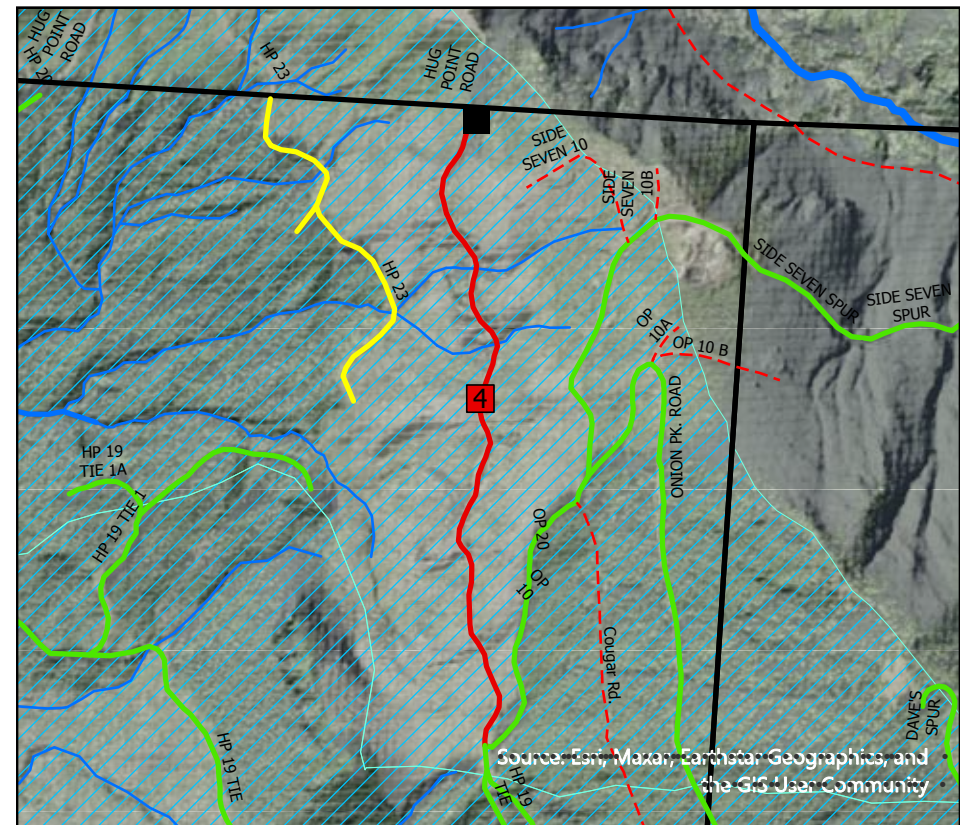
ROAD: Hug Point Road

TYPE: Road Removal

DESCRIPTION:

The Hug Point Road cuts from Lewis and Clark Timberland's boundary due south across the top of the DWSA. This road has been closed since approximately 2016 due to both rock-fall onto the road surface and slumps on headwall road fills. The road no longer serves any access purpose, and presents both risk of catastrophic failure and for vehicular access (it has continued to receive some use despite very clear signage and a gate). ODF fire personnel indicated that they would have sufficient access without this road, and that it presents something of an access risk for vehicles without local familiarity.

It is recommended to fully remove the entirety of the road from the junction on Lewis and Clark Timberland and the OP junction. This requires the removal of 12 culverts, crunching the road surface, and placing downslope road-fill into the cut-bank / ditch. This exceeds the decommissioning called for elsewhere in the plan. The site would be re-vegetated following the project.



0 475 950 1,900 Feet

BUDGET ESTIMATE:

Project 4		
	Quantity	Cost
Excavator (small)	200	\$ 29,000.00
Excavator (large)	200	\$ 34,000.00
Dump Truck	200	\$ 21,000.00
Roller	5	\$ 575.00
Grader	0	\$ -
Culvert Disposal	12	\$ 1,200.00
Other Materials (plants)	600	\$ 510.00
Other Labor (re-planting)	80	\$ 6,000.00
Rock / yd (including trucking)	0	\$ -
TOTAL		\$ 92,285.00



5. SHINGLE MILL XO REPAIR

ROAD: Shingle Mill XO

TYPE: Road Maintenance

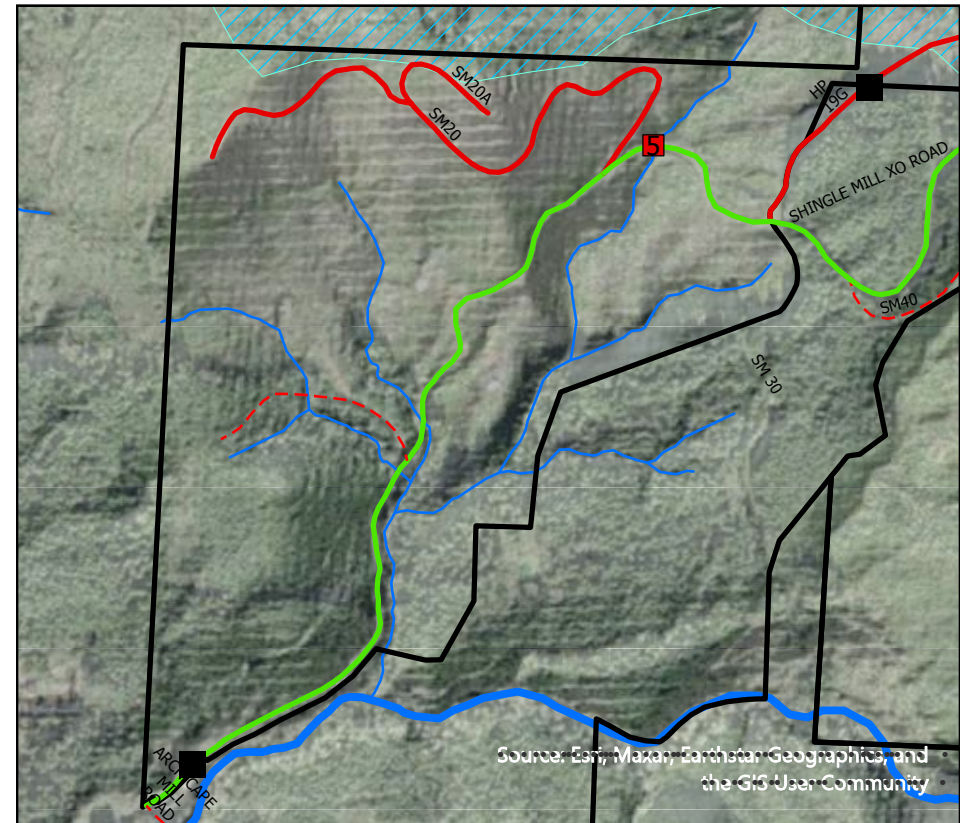
DESCRIPTION:

The Shingle Mill XO Road enters the property at the wastewater treatment plant. This road is unusual in that it runs up the creek bottom before traversing mid-slope to a very steep creek crossing. The road has a lower construction quality than other roads on the property, but still provides very important access. This segment is 3637' long.

The road is potholed with standing water in the road surface. In addition, the two steep grades are eroding rapidly and require a significant lift as well as ditch-outs and other drainage improvements. The entire road is recommended to receive a 6" lift with sufficient rock for curve widening on a 12' running surface.

BUDGET ESTIMATE:

Project 5			
	Quantity	Cost	
Excavator (small)	20	\$	2,900.00
Excavator (large)	60	\$	10,200.00
Dump Truck	20	\$	2,100.00
Roller	10	\$	1,150.00
Grader	20	\$	2,800.00
Rock / yd (including trucking)	799.2	\$	28,771.20
TOTAL		\$	47,921.20



0 362.5 725 1,450 Feet



6. HP 23 / 19 TIE (possible)

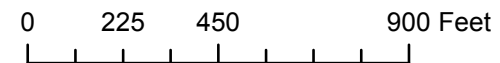
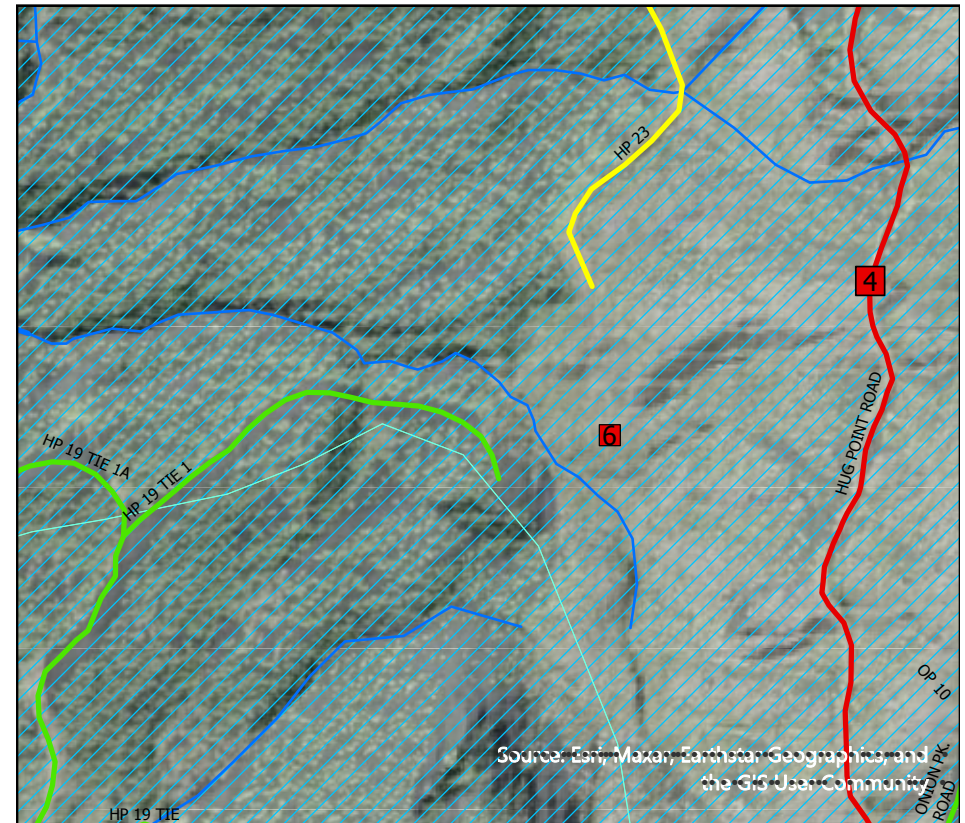
ROAD: HP 23 / 19 TIE

TYPE: Road Construction

DESCRIPTION:

While primary property access is currently provided by the HP19, the Shark Creek Crossing will likely create continued issues both for vehicle access and for sediment runoff from the steep banks and exposed mineral soil. An alternative is to construct a tie road between the HP19 TIE and the HP23 roads. The straight line distance between the roads is 505', while the new road construction would be approximately 1,500'. The primary advantage would be that the new stream crossing would be on a small non-fish stream rather than the current crossing of a medium fish stream in the core of the DWSA. This option would also require that the ACF, NCLC, and possibly Weyerhaeuser agree to abandon the current access, which has a legal easement, and negotiate a new access easement with Nuveen, the manager of Lewis and Clark Timberlands. This access would be essential to the feasibility of the project.

Access could be gained by negotiation or purchase of new easements. Easements typically transact for \$12,000-20,000 / mile, but are highly variable. The easement distance would be approximate 1865'. In addition, a trade might be possible, where ACF granted some access to L&C Timberlands, or provided another service such as decommissioning part of the Hug Point Rd within the DWSA. (continued on next page).



Costs must be considered for whether to construct the TIE or to continue to use access from the HP19 across the existing crossing.

One other variable is that the curve from the HP19 and initial curve could be difficult to construct for truck traffic. This curve would provide an adverse haul for loaded log trucks. Since large boulders are known to exist in this area, it will not be known until excavation begins how easy / feasible it would be to re-route the intersection to allow for a gradual increase in grade onto the HP19TIE.

Due to these variable costs and complications, it is recommended to only consider the HP23 / 19 TIE if considerable commercial harvest is planned for the property. If this were to take place in the future, this project could be re-considered.

BUDGET ESTIMATE:

Project 6		
	Quantity	Cost
Excavator (small)	0	\$ -
Excavator (large)	40	\$ 6,800.00
Dump Truck	30	\$ 3,150.00
Roller	10	\$ 1,150.00
Grader	30	\$ 4,200.00
Other Labor	40	\$ 3,000.00
Rock / yd (including trucking)	1174.13333	\$ 42,268.80
Culvert Cost (feet)	76	\$ 3,701.20
TOTAL		\$ 60,568.80

