PN-3604
PRJ-2.00

MEMORANDUM

To: Columbia-Cascades Area Manager
Attn: CCA-1000 (Kelso)

Through: Richard A. Link
Program Manager, Geology and River Systems Analysis Group

From: Douglas J. Bennett; Geology and River Systems Analysis Group
Roger Wright; Design Group

Subject: Site Visit to Evaluate Potential Water Storage Sites, Hood River Basin Study, Hood River County, Oregon

1. Travel period: November 7–8, 2012

2. Places or offices visited: Hood River Valley; Hood River County Planning Office; East Fork Irrigation District; Middle Fork Irrigation District (ID); and Farmer's Irrigation District.

3. Purpose of trip: To meet and discuss with County and Irrigation District personnel about potential water storage sites and to visit to those sites.

4. Attendees: Niklas Christensen, Consultant for Hood River County; Mattie Bossler, Hood River County Planning Department; John Buckley, East Fork Irrigation District; Craig DeHart, Middle Fork Irrigation District; Jer Camarata and Jerry Bryan, Farmer's Irrigation District; Dan Church (CCA-1107) and Wendy Christensen (CCA-1100), Columbia-Cascades Area Office; Roger Wright (PN-3419) and Doug Bennett (PN-3612) from the Pacific Northwest Regional Office.

5. Synopsis of trip: After flying to Portland, Oregon, and getting a rental car, Roger Wright and Doug Bennett drove to Hood River where we met up with representatives from the County (Niklas and Mattie) and the East Fork and Middle Fork irrigation districts. We then proceeded to potential sites within the East Fork ID watershed. The next day we met up with the County and Dan Church and Wendy Christensen (both from Columbia-Cascades Area Office) and proceeded to the Middle Fork ID office and then viewed sites within the Middle Fork's watershed. We

finished the day by meeting up with the Farmer's Irrigation District personnel and traveling out to their sites. Roger and Doug then returned to Portland and caught a late flight to Boise.

6. <u>Findings</u>: The geology of these sites is difficult to assess because of the thick overburden and the heavy vegetation cover. Regionally, the study area is in the Mt. Hood/High Cascade Geomorphic Province of north-central Oregon (USBR, 1982). The prominent physiographic feature to the north is the Columbia River Gorge and to the south is Mt. Hood, the dominant volcano in the area.

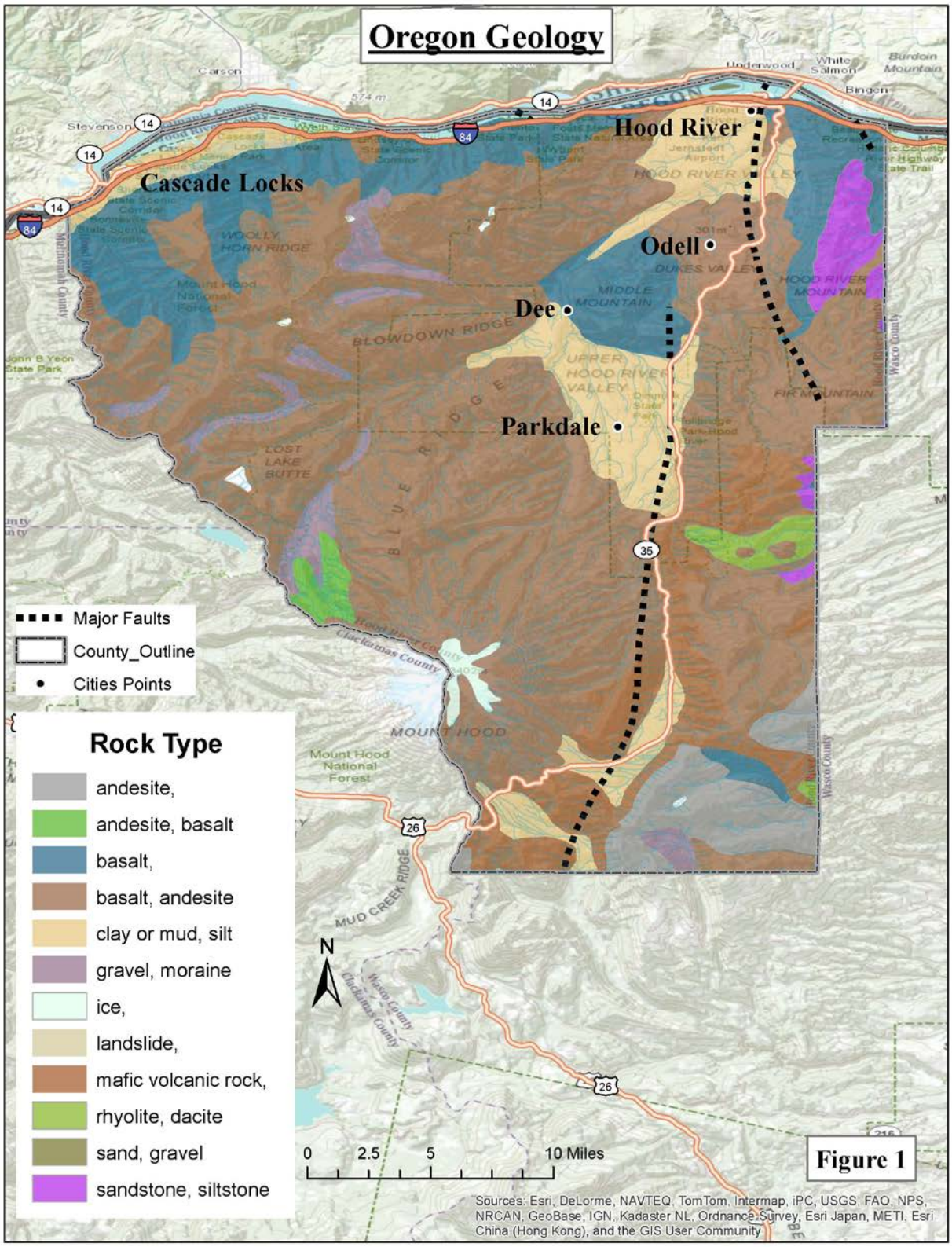
The basal bedrock unit that has been identified in the area is the Columbia River Basalt. This unit has been further identified as the Grande Ronde Basalt of the Yakima Subgroup of the Columbia River Basalt. This formation, which is several hundreds of feet thick, outcrops extensively along the nearby Columbia River and some along Hood River.

Overlying the flood basalts are the volcanic flow rocks and related extrusive materials associated with Mt. Hood and other nearby local volcanoes. These materials, which may be up to 1,000 feet thick, slope gently eastward (USBR, 1982). Where exposed in a few road cuts and along some stream channels, this volcanic formation consists of several different kinds of extrusive material such as basalt, basaltic andesite, tuff, debris flow. Glacial outwash deposits are also exposed along stream channels and overlying the volcanics. Figure 1 shows the general geology of Hood River County along with the major faults that have been identified.

In the rock exposures along the stream channels and the road cuts, the basalt flows showed columnar jointing and are moderately to highly fractured, and lightly to intensely weathered.

Earthquakes, landslides, and volcanic eruptions are the main geologic hazards that could affect potential sites. No major folding has been identified in the area and faulting appears to be restricted to a few short, local displacements (USBR, 1982). It should be noted that more recent geologic data than the 1982 USBR reference cited here may be available and should be evaluated, if the decision is made to proceed with further efforts in the Hood River study.

It is anticipated that the bedrock assemblage at individual potential damsites may be variable, both in a horizontal and vertical direction. The different rock units will have different engineering characteristics. Overburden materials may consist of alluvial deposits along the stream channels and slopewash materials on the canyon sides, and a thick soil on flatter ground.


Oregon Geology
Hood River
Cascade Locks
Odell
Dee
Parkdale
Major Faults
County_Outline
Cities Points
Rock Type
andesite,
andesite, basalt
basalt,
basalt, andesite
clay or mud, silt
gravel, moraine
ice,
landslide,
mafic volcanic rock,
rhyolite, dacite
sand, gravel
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Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Figure 1

East Fork Irrigation District (EFID) Potential Sites

Refer to the site map (Figure 5) for location of potential damsites located in Appendix A.

Parcel off Neal Creek Road

This site was, at least in part, a parking lot and had little relief. The overburden consisted of material laid down for the lot and soil developed from bedrock. Vegetation covered the area outside of the parking lot boundary. No outcrops were visible at this site.

A reservoir here would require construction of dikes on basically 4 sides. A 50-foot high dike structure would impound about 922 acre-feet sitting on the 38-acre parcel. This site has an added benefit to the EFID in that it could be used to catch overflow/leakage from their canal structure located within about 700 feet of this site.

County Parcel off Smullin Road

This was a heavily vegetated area and no outcrops were visible at this site. Slopes were covered with soil and slopewash.

A dam with a crest length of 830 feet and a height of 70 feet would impound about 493 acre-feet and have a reservoir length of 1107 feet.

Rimrock Creek Drainage

This site is situated in a rather steep-sided, narrow canyon. Slopewash and heavy vegetation cover the hillsides. No outcrops were visible at this site from the vantage points that we observed it.

Two sites were looked at here:

Site 1. A dam with a crest length of 439 feet and a height of 122 feet would impound about 170 acre-feet and have a reservoir length of 957 feet.

Site 2. A dam with a crest length of 355 feet and a height of 72 feet would impound about 53 acre-feet and have a reservoir length of 583 feet.

If both dams were built, a storage capacity of about 223 acre-feet would be achieved.

Upstream of Dog River Confluence

This site is situated in steep-sided, narrow canyon. Slopewash and heavy vegetation cover the hillsides. No outcrops were visible from our distant vantage point.

A dam with a crest length of 1444 feet and a height of 286 feet would impound about 8200 acre-feet and have a reservoir length of about 3900 feet. This site appears to produce the largest

storage of any sites evaluated during our site visit. Further discussion and investigation of this site is warranted.

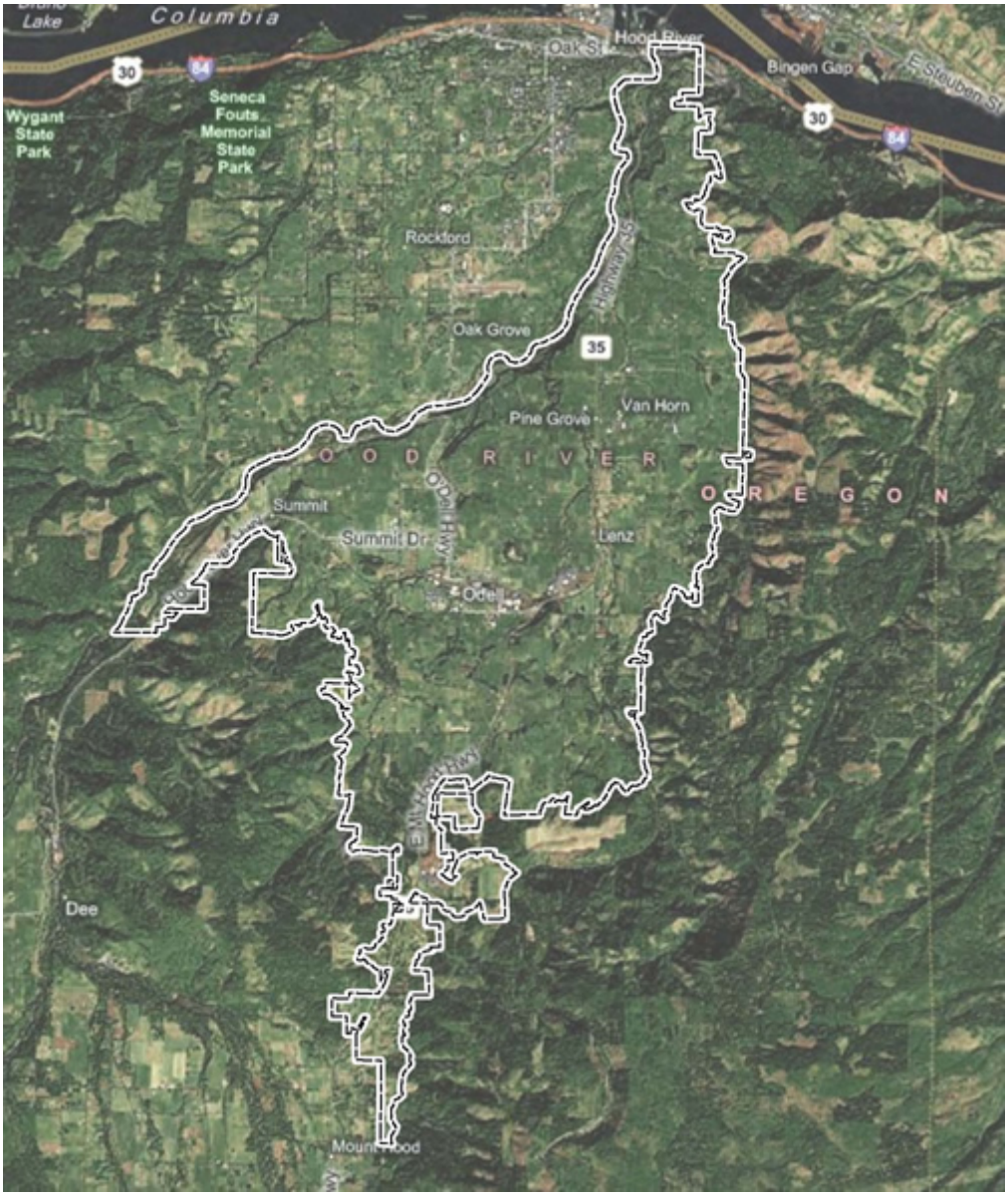

Figure 2. <u>EFID District Map</u> The District encompasses the area of land north of the diversion from East Fork Hood River near Tollbridge Park to the Columbia River, east of the Hood River and west of the East Hills of the Hood River Valley. The district boundary consists of approximately 15,150 acres on which 9611.57 acres of water rights are allocated. Source: EFID website.

Yellowjacket Creek

This site is situated in steep-sided, narrow canyon. Slopewash and heavy vegetation cover the hillsides. No outcrops were visible from our distant vantage point.

A dam with a crest length of 1123 feet and a height of 240 feet would impound about 1950 acre-feet and have a reservoir length of 1546 feet.

Horsethief Meadows

Slopewash and heavy vegetation cover the hillsides. No outcrops were visible from the distant vantage point that we observed this area. This site is on the Hood River and was briefly discussed, but was discounted for a number of issues: foremost of which is that the river carries a large sediment load of glacial debris and would fill a reservoir very rapidly at this location.

Neal Creek Drainage

This area is located in the upper reaches of the Neal Creek drainage. There are possibly two potential sites here. These sites appear from the geography of the land to have the most promise of the East Fork sites looked at. Both have fairly steep canyon walls with a somewhat broad (relatively speaking) valley floor. Slopewash and vegetation cover the hillsides. No outcrops were visible at the site, however, some bedrock (basalt and basaltic andesite) was observed in the road cuts driving to the area.

Two sites were looked at here:

Site 1. A dam with a crest length of 1038 feet and a height of 130 feet would impound about 2850 acre-feet and have a reservoir length of 3691 feet.

Site 2. A dam with a crest length of 1572 feet and a height of 130 feet would impound about 2557 acre-feet and have a reservoir length of 2362 feet.

If both dams were built, a storage capacity of about 5400 acre-feet would be achieved.

Middle Fork Irrigation (MFID) Potential Sites

Refer to the site map (Figure 5) for location of potential damsites located in Appendix A.

Tony Creek

The Tony Creek site was not looked at during this trip.

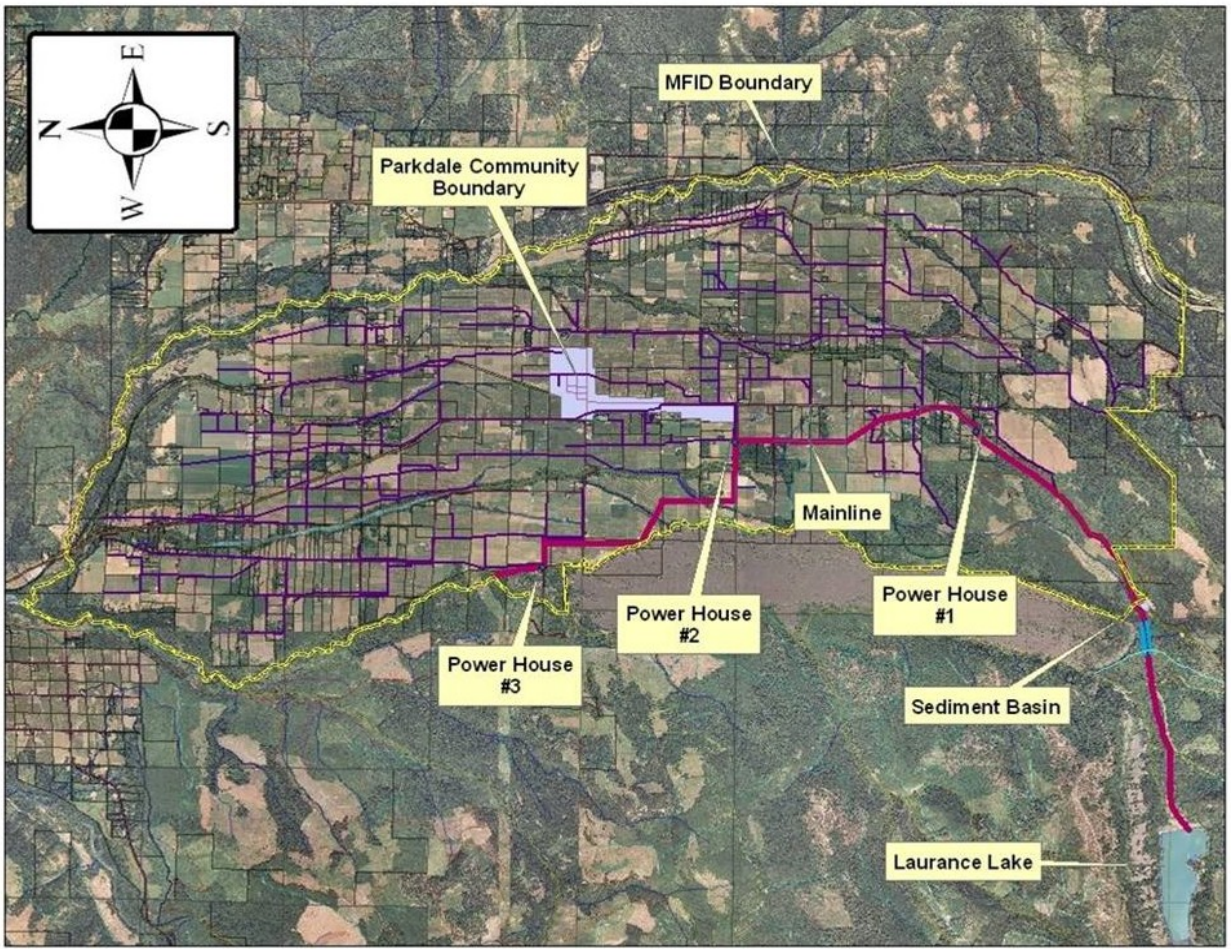

Figure 3. <u>MFID District Map</u>. Middle Fork Irrigation District boundaries are the Middle Fork of the Hood River on the west and the East Fork of the Hood River on the east and north. On the south the watershed for the District extends onto the northern slopes of Mt. Hood and includes Eliot, Langille and Coe Glaciers. The small town of Parkdale, is located near the center of MFID irrigated lands. Locally the area is described as being in the Upper Hood River Valley. Source: MFID website PDF.

County Parcel near Laurance Lake Road

This site consisted of a small, shallow, long valley. It is confined by the county road on one side and a canal/pipeline on the other. Slopewash and heavy vegetation cover the hillsides. No outcrops were visible at the site.

This site has been looked at by the MFID in the past. It was suggested that a series of 3 small dams be situated here.

Three sites were looked at here:

Site 1. A dam with a crest length of 380 feet and a height of 38 feet would impound about 50 acre-feet and have a reservoir length of 827 feet.

Site 2. A dam with a crest length of 273 feet and a height of 32 feet would impound about 30 acre-feet and have a reservoir length of 693feet.

Site 3. A dam with a crest length of 270 feet and a height of 24 feet would impound about 15 acre-feet and have a reservoir length of 442 feet.

If all three dams were built, a storage capacity of about 95 acre-feet would be achieved.

Laurance Lake (Clear Branch Dam)

Constructed in 1969, the dam is an earth and rock zone fill dam approximately 1350 feet long with a top width of 28 feet. Height of the dam is about 106 feet and water depth at the spillway crest elevation is about 100 feet. It lies in a heavily forested valley with steep ridges on both sides. Exposed high on the left abutment was abundant talus that is probably a basaltic andesite.

From documents obtained from the MFID, it appears that the dam is founded on, at least in part, glacial moraine, alluvial and possibly lake bed materials. Drill logs for installation of piezometers indicate that glacial moraine deposits comprise the left abutment of the dam and extend below the embankment to a depth of about 78 feet but may extend to a depth of 280 feet. These materials were stratified layers of very dense silty sand, silty gravel, and gravel with silt and sand. Alluvial deposits were described to be elevationally lower than, but not necessarily underlying, the glacial moraine deposits. Alluvium was typically comprised of interbedded medium dense to very dense sand and gravel, with varying amounts of fines. Cobbles and boulders were also encountered in this unit. Lake bed sediments consisting of sand intermixed with varying amounts of silt and gravel, were encountered beneath the dam towards the central portion of the valley.

No mention of the right abutment foundation material was found. It appears that these previous reports focused on the left abutment due to the presence of seepage through some highly permeable zones in the native materials downstream of the left abutment (MFID).

Potential exists to increase storage at this dam. One option would be to raise the dam. This appears feasible from the topography of the area. However, it may not be feasible due to outside factors, including a county road and campground which would need to be re-located and a higher reservoir water surface that would infringe upon U.S. Forest Service land which has been classified as wilderness.

An 18-foot raise of the dam would increase storage by 2480 acre-feet. The dam would be modified to a crest length of 1616 feet and a height of about 124 feet.

Another more feasible alternative would be to install some sort of stoplogs on the spillway which could be a temporary storage increase when conditions are favorable. A stoplog system that had the effect of a two foot raise would store about an additional 240 acre-feet. A stoplog system that had the effect of a three foot raise would store about an additional 370 acre-feet.

County Parcel NW of Dog River Confluence

This site consisted of a small, long valley. This site sits between two low ridges on a bluff overlooking the Hood River to the south. There appears to be a topographic bowl in this drainage that could be a potential site as well. Slopewash, soil, and heavy vegetation cover the hillsides and valley floor. One possible outcrop was observed at the site, consisting of a basaltic andesite. Float observed in the surface deposits consisted of basalt and basaltic andesite.

This site was also observed from the road below it along the Hood River. A steep, near vertical cliff rose from the stream to the top of the 200-250 foot-high ridge. The proposed site is situated just beyond the ridge top. Exposed in the cliff were at least two layers of columnar jointed basalt and/or basaltic andesite. Also exposed high on the cliff was what appeared to be either a river terrace deposit or glacial flood deposits. It appeared to be plastered along the cliff and not a unit layered between the volcanic flows. However, if it was a consistent layer between the flows then seepage of any storage water above this area would need to be determined to prevent detrimental effects along this cliff face.

Two sites were looked at here:

Site 1. A dam with a crest length of 830 feet and a height of 60 feet would impound about 275 acre-feet and have a reservoir length of 1234 feet.

Site 2. A dam with a crest length of 592 feet and a height of 60 feet would impound about 260 acre-feet and have a reservoir length of 1093 feet.

If both dams were built, a storage capacity of about 535 acre-feet would be achieved.

Farmer's Irrigation District (FID) Potential Sites

Refer to the site map (Figure 5) for location of potential damsites located in Appendix A.

Upper Green Point Dam and reservoir

The dam is a homogeneous earth fill dam with a crest length of approximately 900 feet. Height of the dam is about 30 feet with a crest width of 12 to 15 feet (USBR, 1982b). It was built in 1937 and impounds about 715 acre-feet. The dam is founded on weathered volcanic bedrock (HWA GeoSciences Inc., 2002). The spillway is an unlined chute on the left abutment near the groin of the dam. The reservoir was very low at the time of the site visit with lots of reservoir rim exposed. Some basaltic float was visible along with abundant red soil/slopewash.

Potential exists to at this dam to increase storage. One option would be to excavate material at the upper end of the reservoir to increase storage capacity to approximately 1000 acre-feet. This would have no effect on the existing dam. Material excavated would be overburden and probably basaltic andesite bedrock and could probably be done by common excavation. Another option could be to raise the existing dam. This would increase storage and appears feasible from the surrounding topography. However, existing deficiencies within the dam would need to be

addressed and fixed before a raise would be accepted. Deficiencies were noted in a USBR memo (USBR, 1982b) back in the 1980's and still exist today, including seepage in the right abutment and the unlined spillway and chute.

An 8-foot raise of the dam would increase storage by 561 acre-feet. The dam would be modified to a crest length of 1156 feet and a height of about 38 feet. This raise may create the need for a small dike at the tail end of the reservoir in a saddle area.

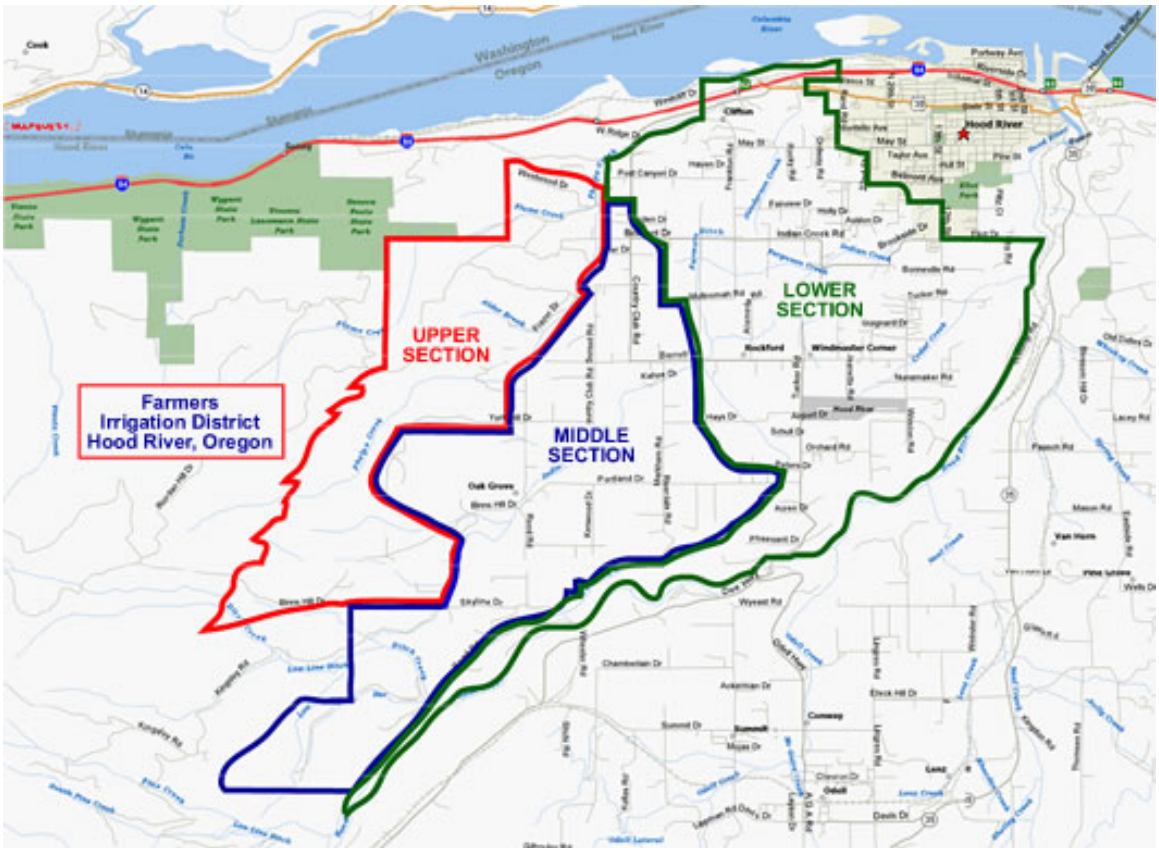

Figure 4. **FID District Map**. The district provides water to 5,800 acres of land and 1,722 users, both residential and agricultural. The present-day Green Point Reservoirs have 288 acre-feet of storage capacity in the lower reservoir (which was built in 1936) and 715 acre-feet of storage in the upper reservoir (constructed in 1937). Source: FID website.

Lower Green Point Dam

The dam is a homogeneous earth fill dam with a crest length of approximately 400 feet. Height of the dam is about 30 feet with a crest width of 10 to 12 feet (USBR, 1982b). Built in 1936, the lower dam has about 288 acre-feet of storage. The spillway is an unlined chute on the left abutment near the groin of the dam. The Irrigation District is not filling this reservoir, but there was flow from the upper dam coursing through the reservoir basin. Some basaltic float was visible along with abundant red soil/slopewash. The FID wants to decommission this dam which

would be prudent if additional storage is gained in the upper dam, as deficiencies have been identified at this dam also (USBR, 1982b).

7. Conclusions/Action Items:

Slopewash and vegetation covered most of the sites that we looked at. At the time of this site visit, specific dam sites had not been identified, just county land that may have some potential. Development of these sites using LiDAR topography will help immensely in narrowing down actual potential dam sites. Then a more detail site specific geologic assessment can be made.

Drilling will be needed in any future studies of these sites to further outline the geology and feasibility of a potential damsite. Drilling and sampling would be used to determine depth of the overburden and the engineering characteristics of the bedrock at each site.

It should be noted that this report and the potential dams are a "First Look" scenario to increase water storage in the basin. There may be issues with some of the sites that would necessitate modification of the dam concept or site itself. The figures generated from the work are approximations of the potential of the site and should be used for planning and not design.

Attached as Appendix A is a site map of the potential dam locations mentioned above.

Attached in Appendix B are data sheets on the potential storage sites that were visited and/or addressed.

8. References:

USBR, 1982, *Geologic Appraisal Study, Mt. Defiance Tunnel Site, Farmers Irrigation District, Hood River Project, Oregon*; PN Region, Division of Design and Construction, Geology Branch, August 1982

USBR, 1982b, Memorandum, *Green Point Upper and Lower Reservoirs, Farmers Irrigation District, Hood River, Oregon*; PN Region, Division of Design and Construction, Geology Branch, dated July 6, 1982

HWA GeoSciences Inc, 2002, Technical Memorandum, *Stability Evaluation of the Existing Dam Structure Upper Green Point Reservoir Project, Hood River, Oregon*; dated October 18, 2002

MFID, *Section 5, Clear Branch Dam Supporting Technical Information Document;* Middle Fork Irrigation District files, no other info provided.

cc: CCA-1002 (Wiedmeier), CCA-1100 (Christensen), CCA-1107 (Church)
PN-3800 (Hessman), PN-3440 (Montague), PN-3400 (Parkinson), PN-6221 (Turner)
PN-3419 (Wright), PN-3612 (Bennett)

APPENDIX A

Location Map – Figure 5
Site Locations by Latitude and Longitude

APPENDIX B
Summary Sheet for all the potential dams
Individual Data Sheets for each dam location