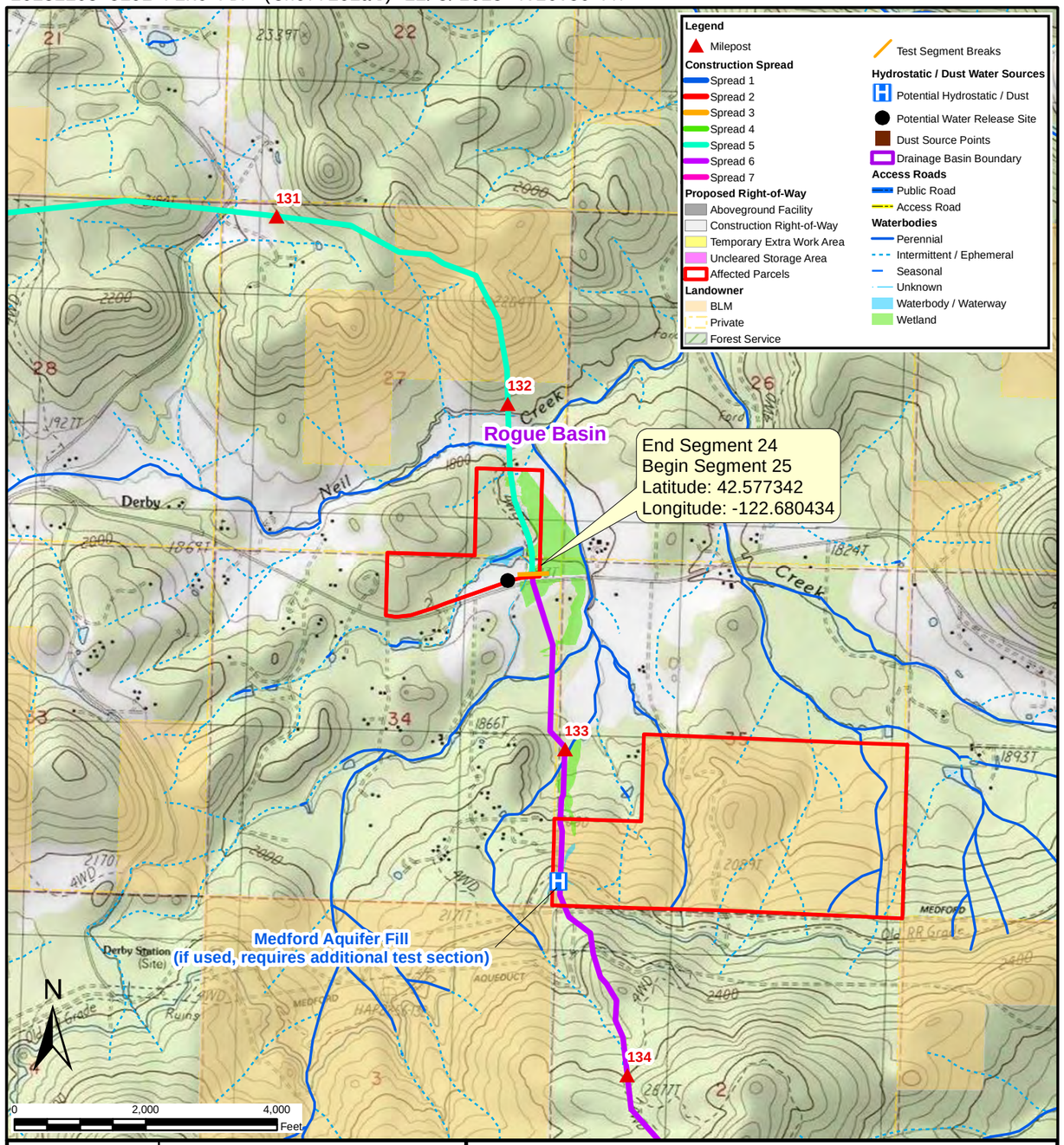
BIOLOGICAL ASSESSMENT

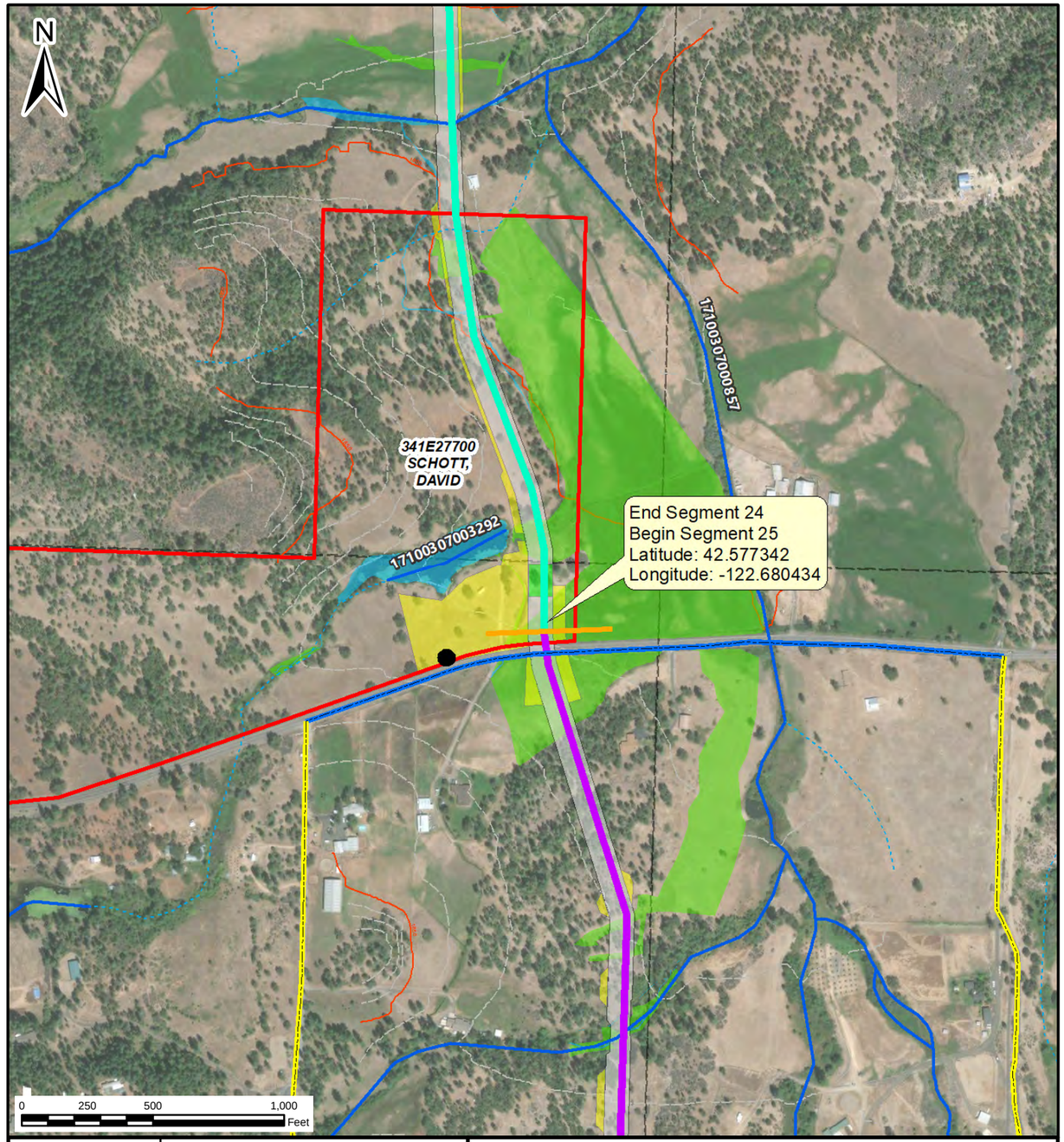
(continued)

APPENDIX U

Pacific Connector's Hydrostatic Test Plan

(CONTINUED)





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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 24 END / 25 BEGIN
MP 132.50
S-34, T-34-S, R-1-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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PACIFIC CONNECTOR GAS PIPELINE, LP
36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 24 END / 25 BEGIN
MP 132.50
S-34, T-34-S, R-1-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

DWG. BY: EE	DATE: Aug - 2018	ISSUED FOR BID:	SCALE: 1 : 500
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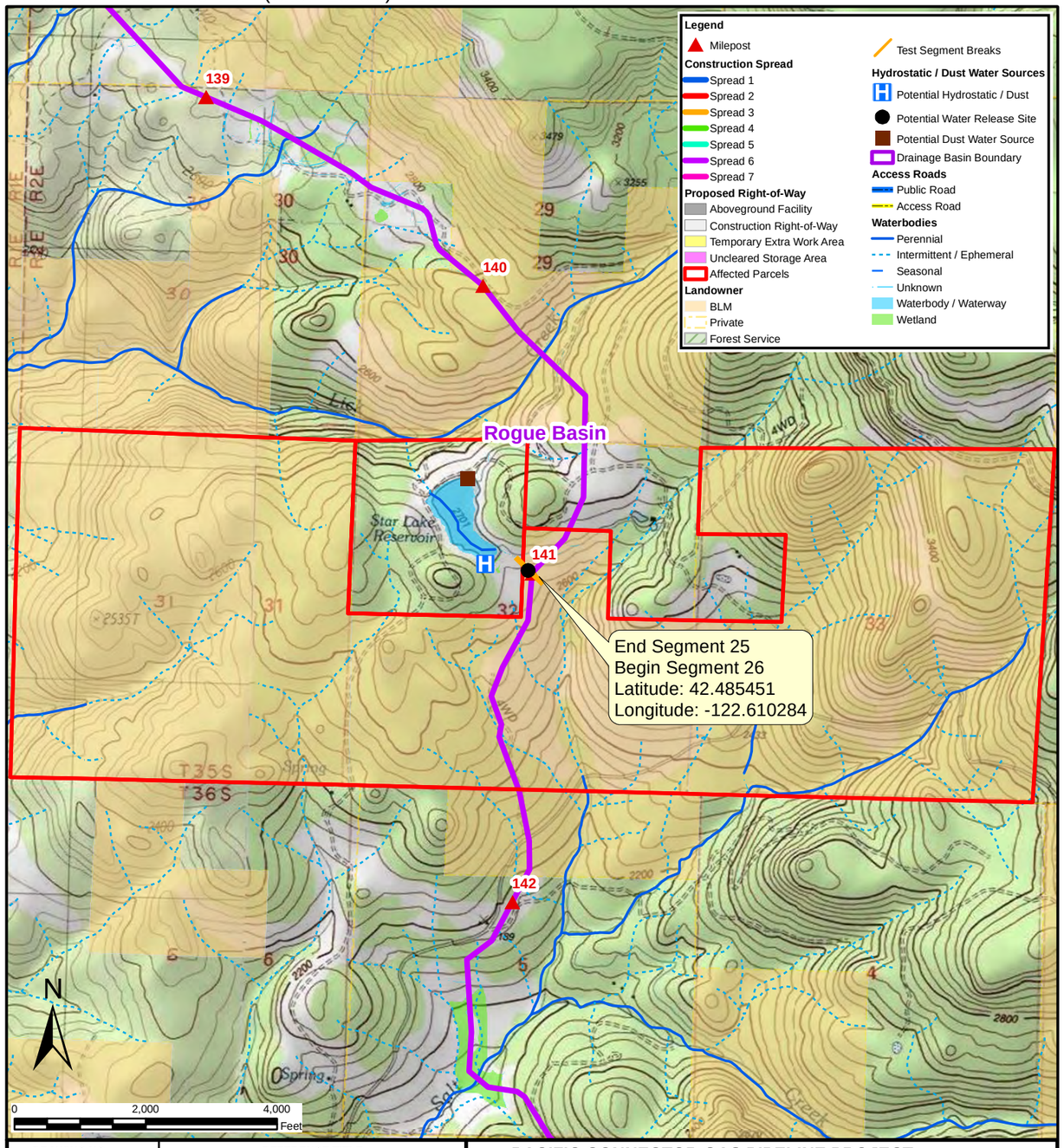

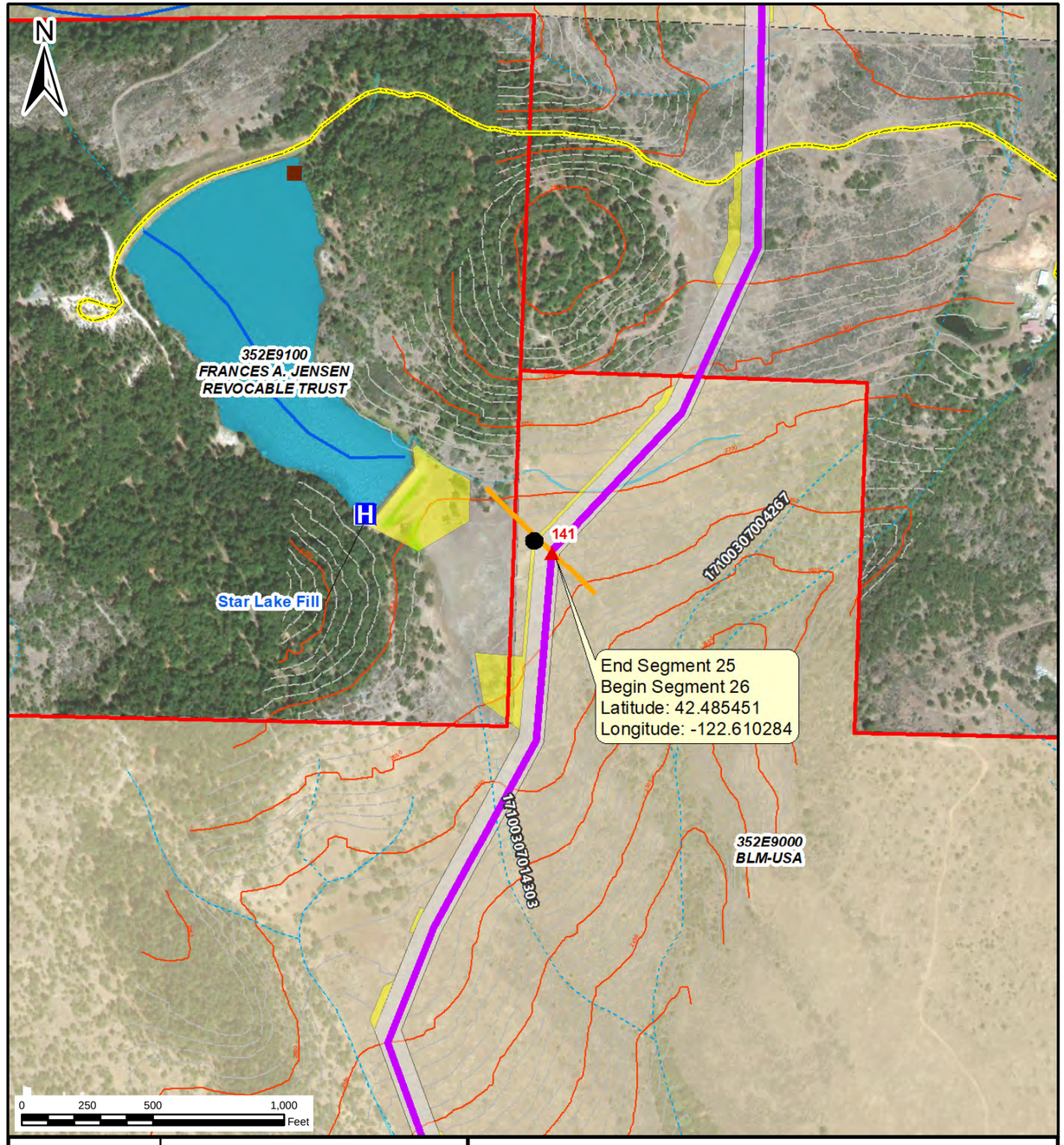

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 25 END / 26 BEGIN
MP 141.00
S-32, T-35-S, R-2-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 25 END / 26 BEGIN
MP 141.00
S-32, T-35-S, R-2-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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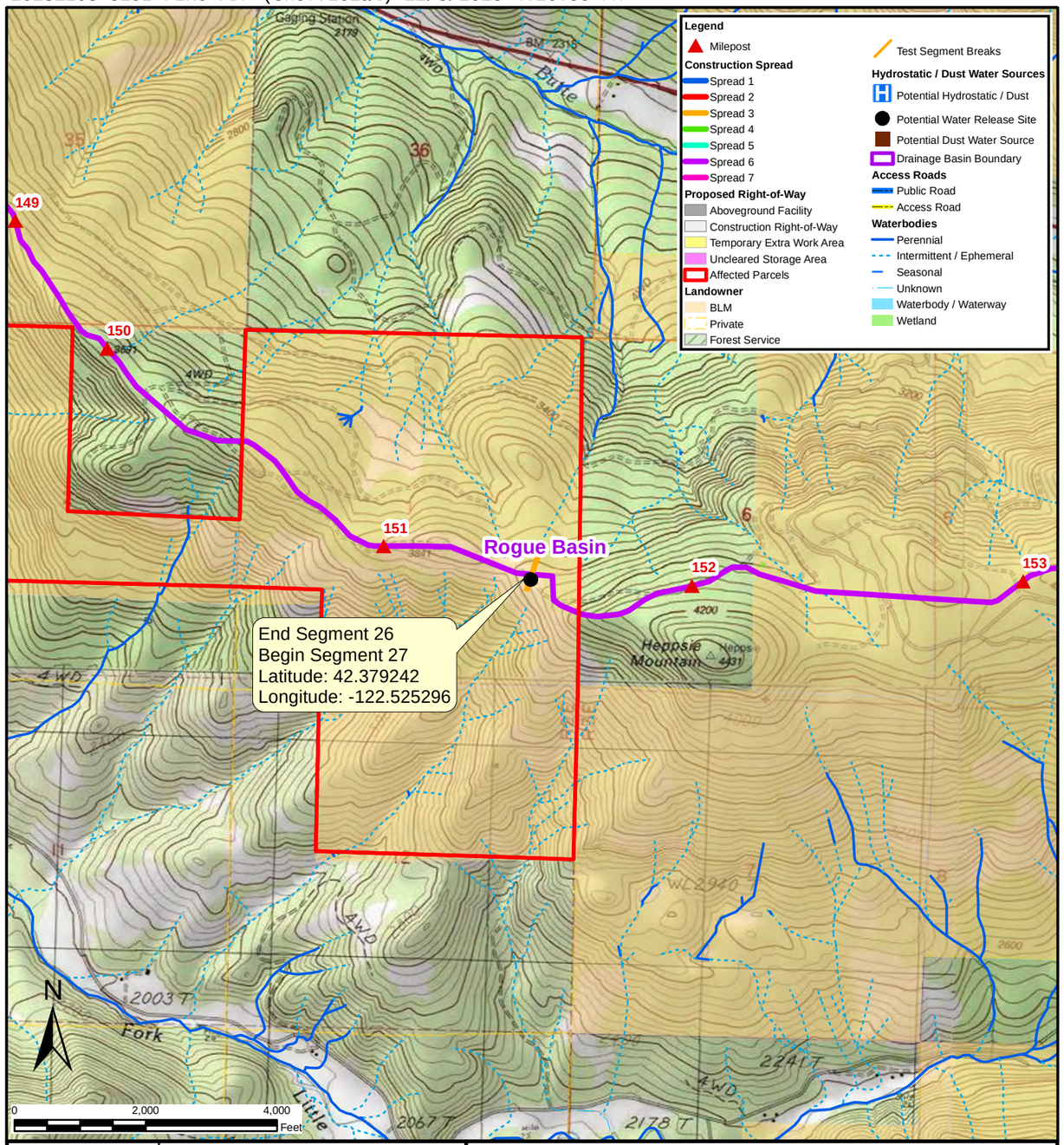

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 26 END / 27 BEGIN
MP 151.44
S-1, T-37-S, R-2-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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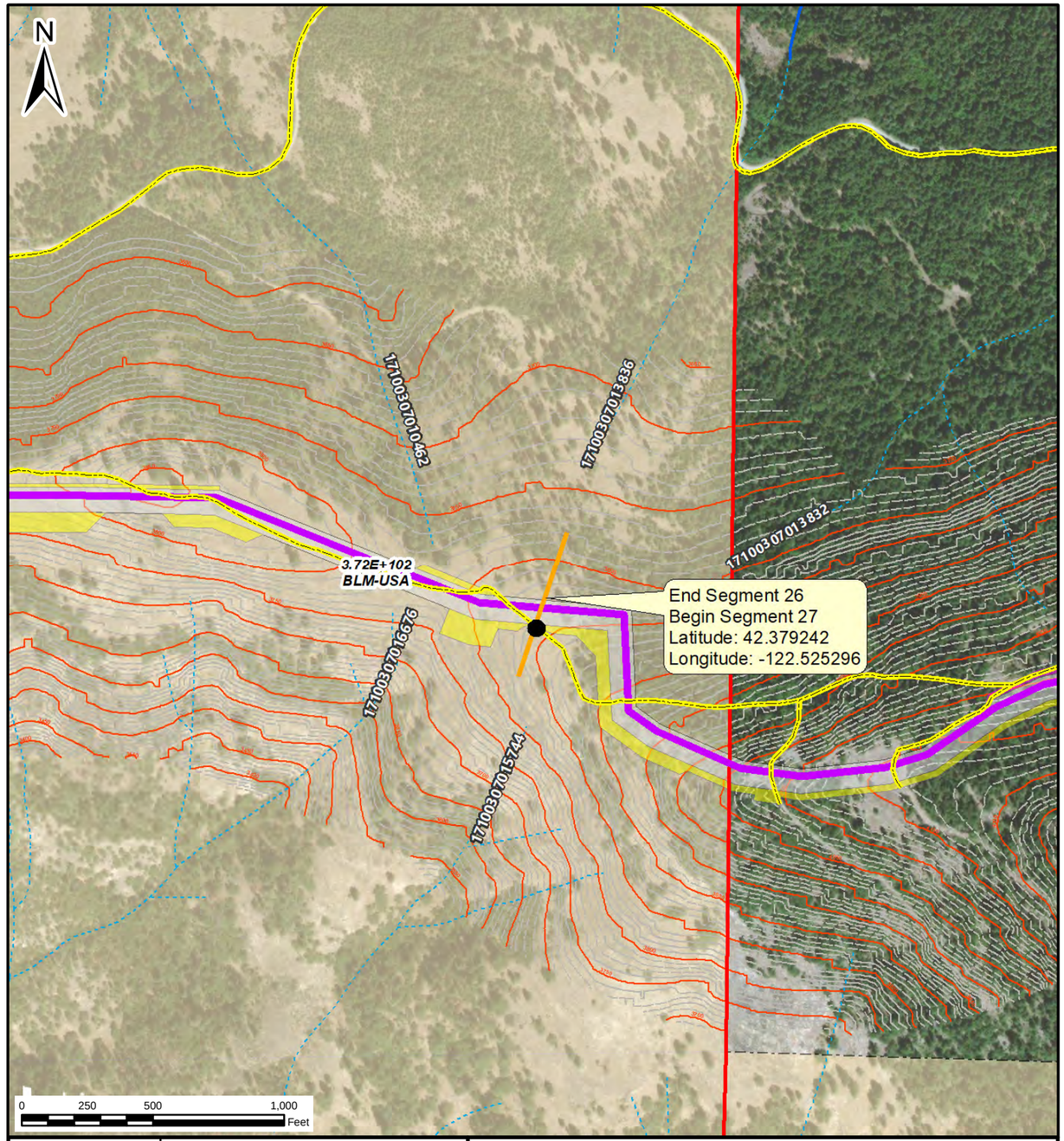

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MP 151.44
S-1, T-37-S, R-2-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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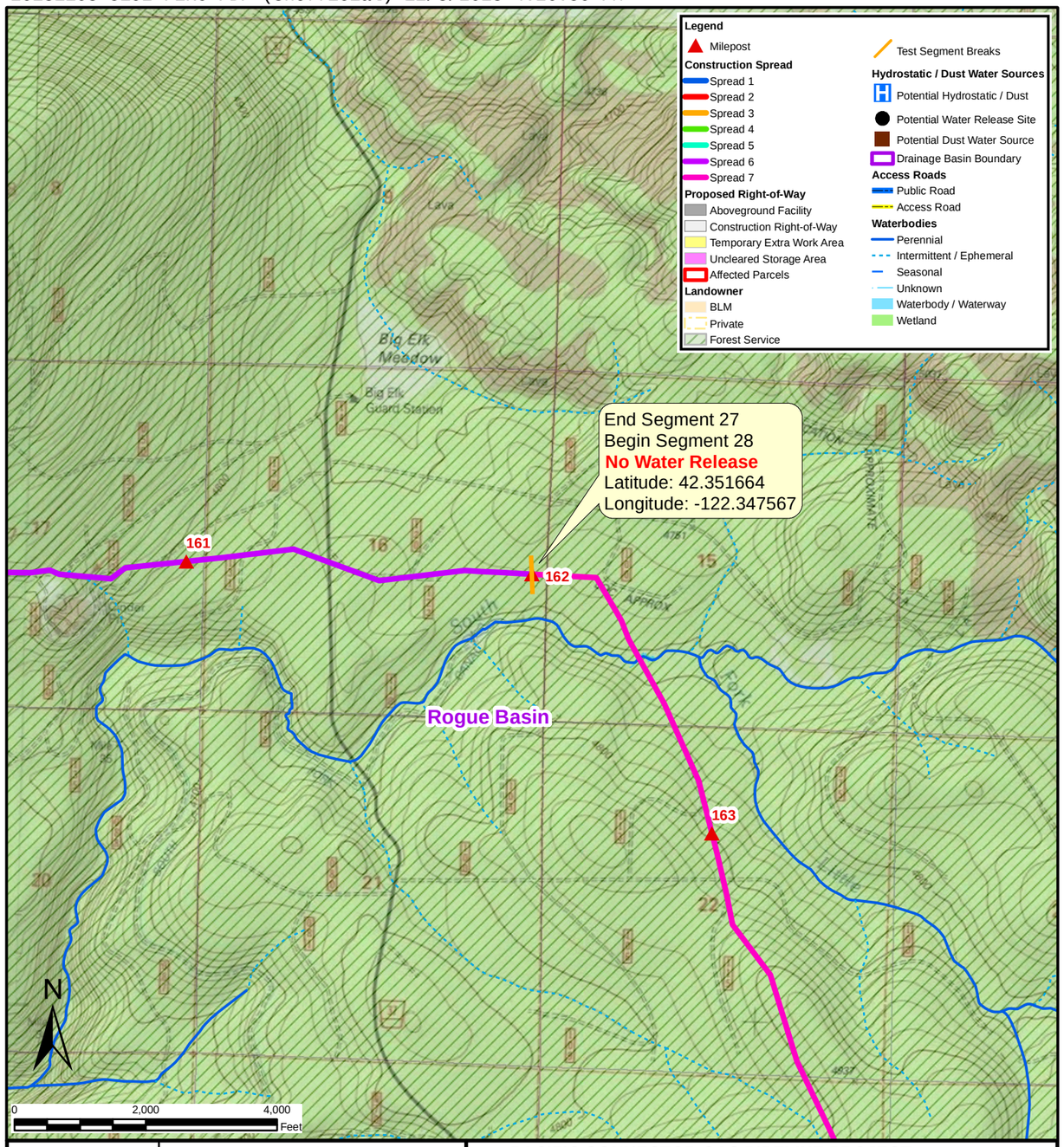

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PACIFIC CONNECTOR GAS PIPELINE PROJECT
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36" PACIFIC CONNECTOR GAS PIPELINE
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MP 162.00
S-16, T-37-S, R-4-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

DWG. BY: EE	DATE: Aug - 2018	ISSUED FOR BID:	SCALE: 1 : 2000
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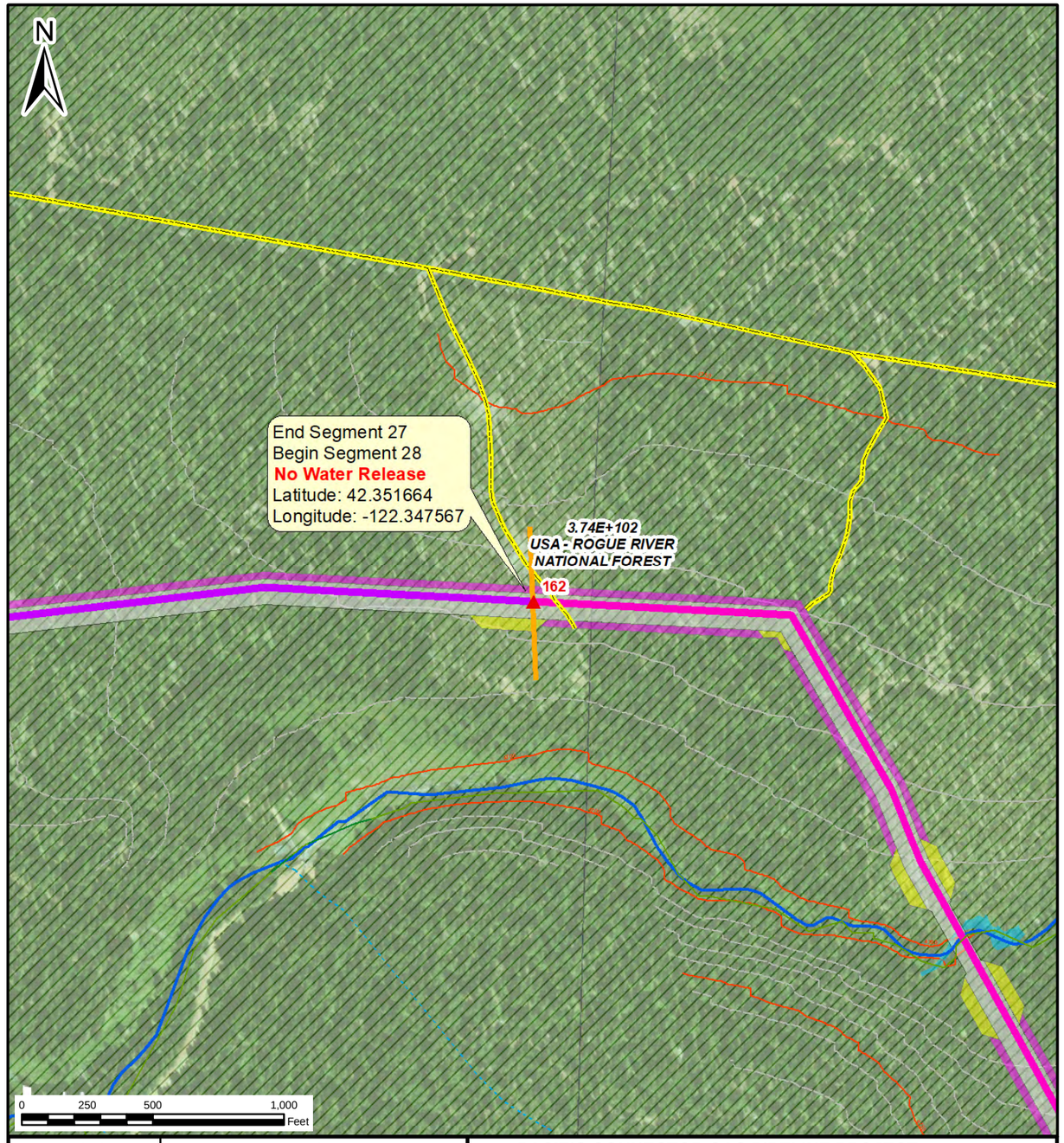

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 27 END / 28 BEGIN
MP 162.00
S-16, T-37-S, R-4-E
JACKSON COUNTY, OREGON

Pacific Connector GAS PIPELINE

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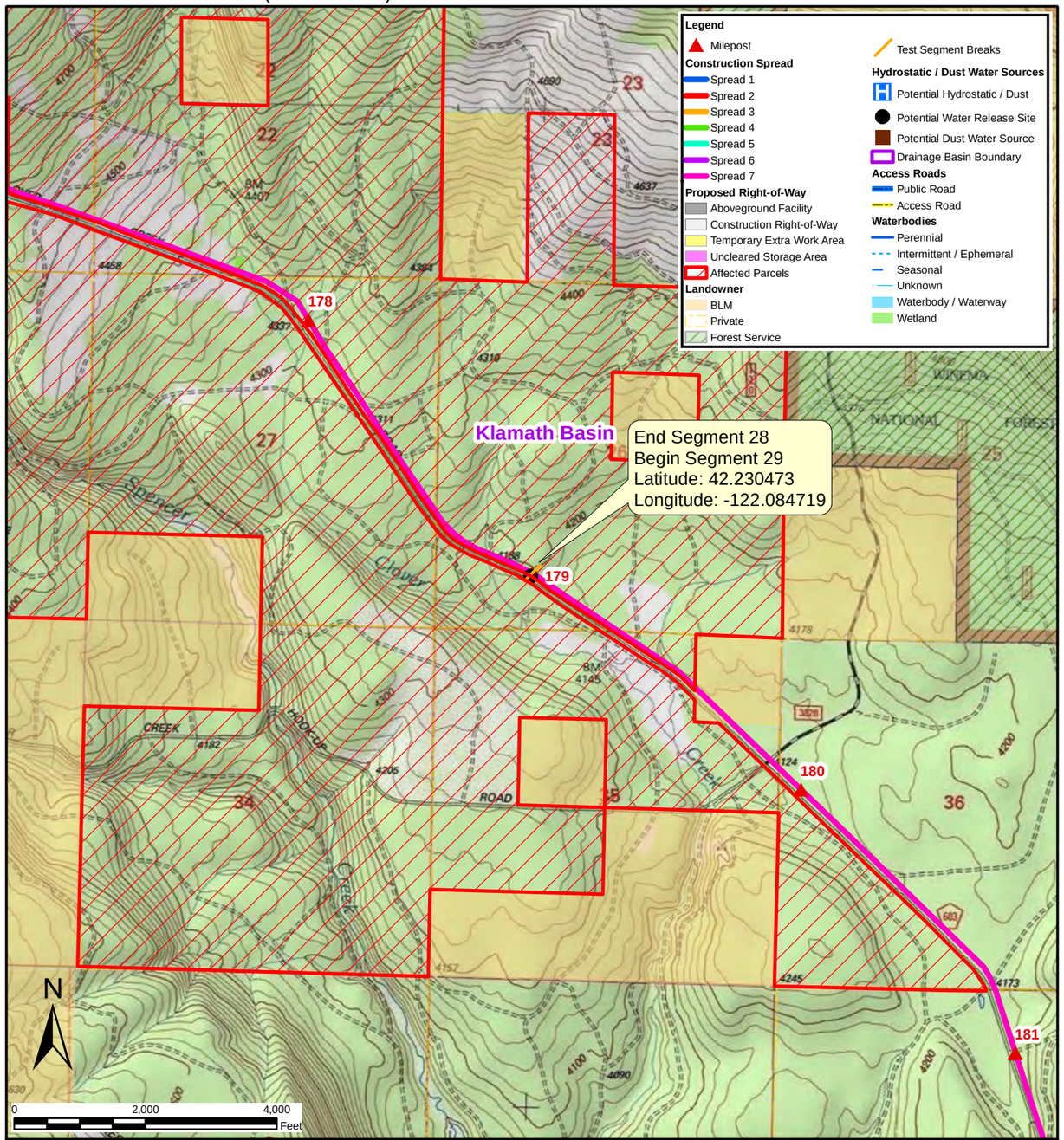

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PACIFIC CONNECTOR GAS PIPELINE PROJECT
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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 28 END / 29 BEGIN
MP 179.00
S-26, T-38-S, R-6-E
KLAMATH COUNTY, OREGON

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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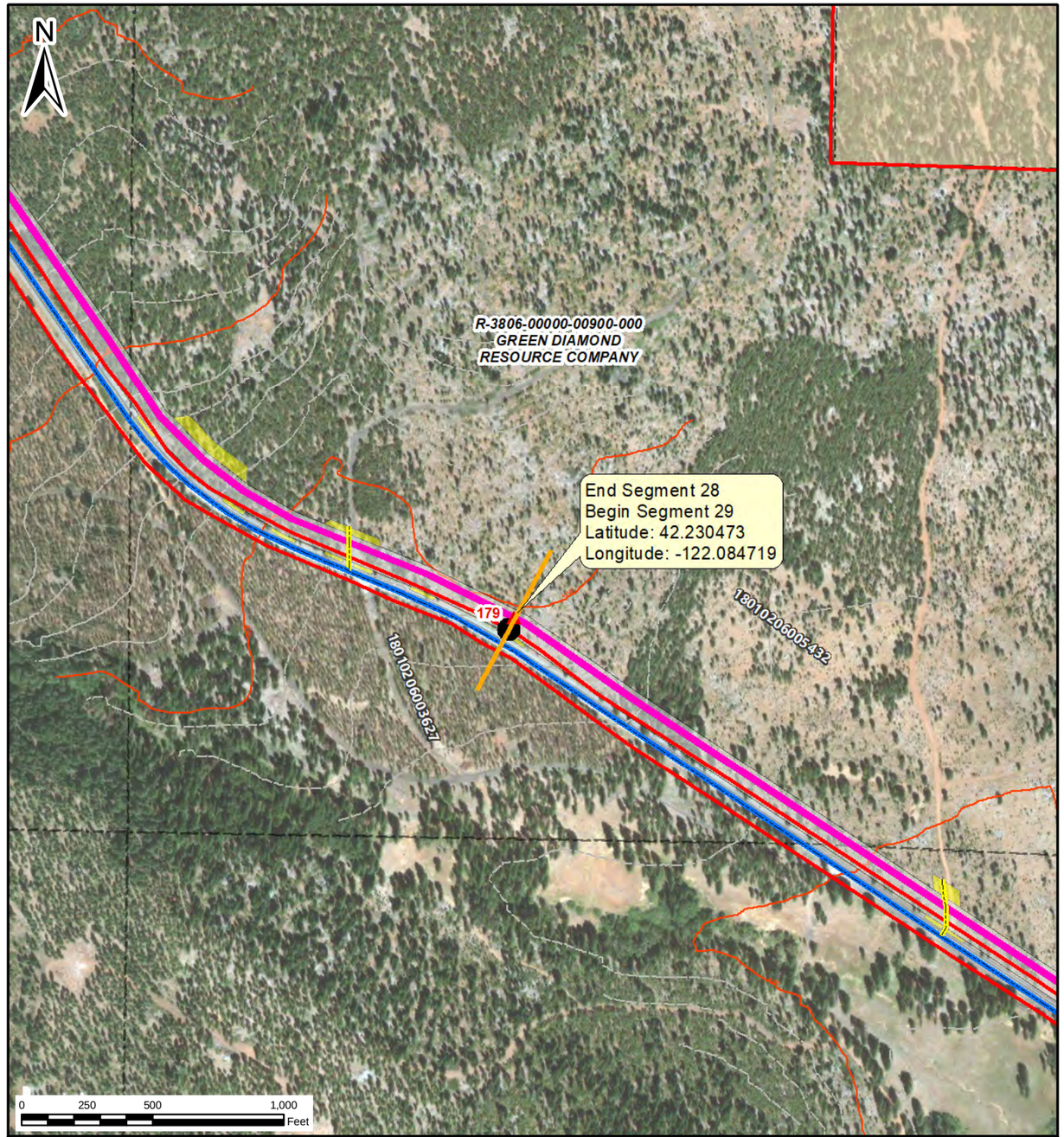

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 28 END / 29 BEGIN
MP 179.00
S-26, T-38-S, R-6-E
KLAMATH COUNTY, OREGON

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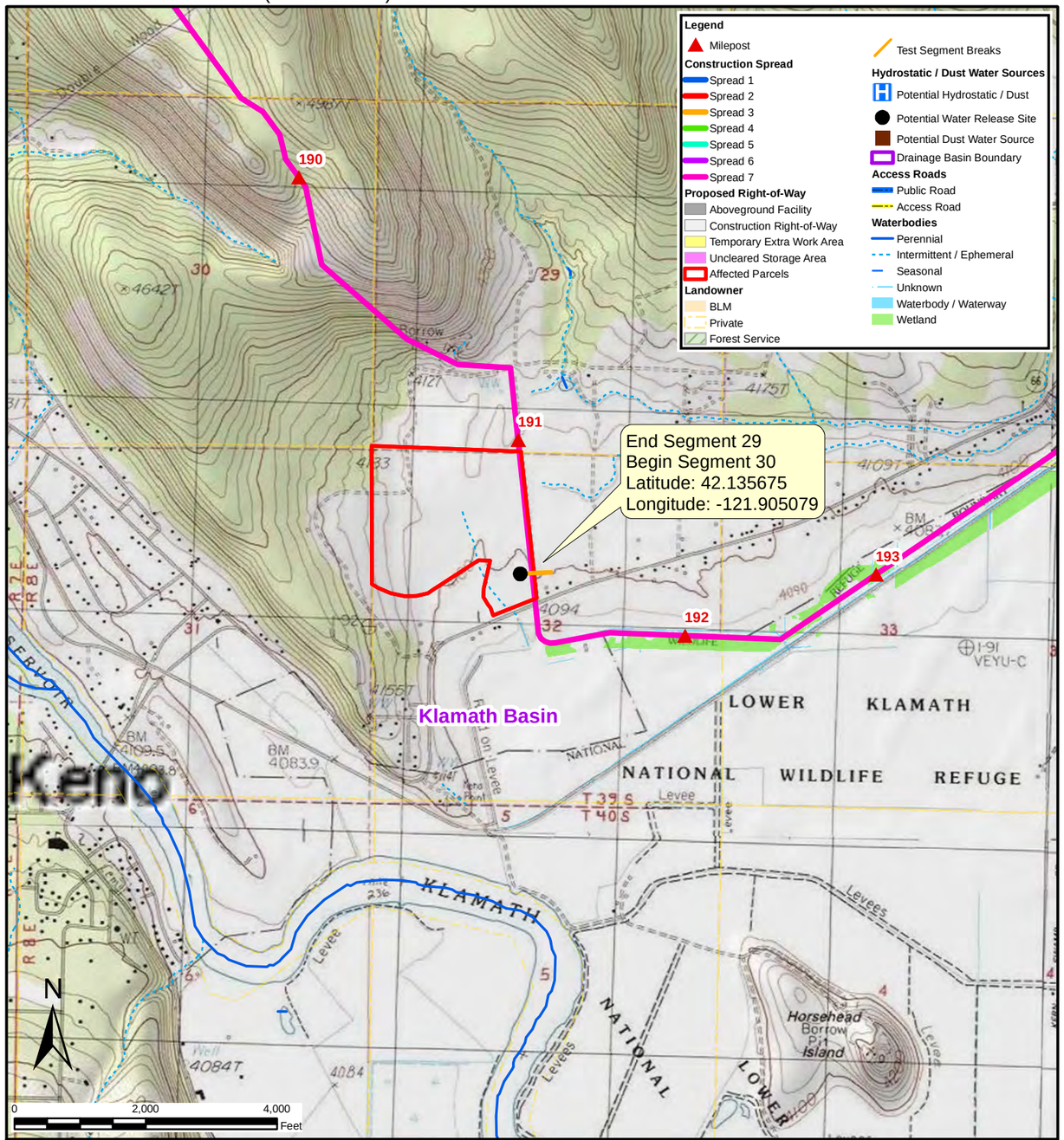

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 29 END / 30 BEGIN
MP 191.39
S-32, T-39-S, R-8-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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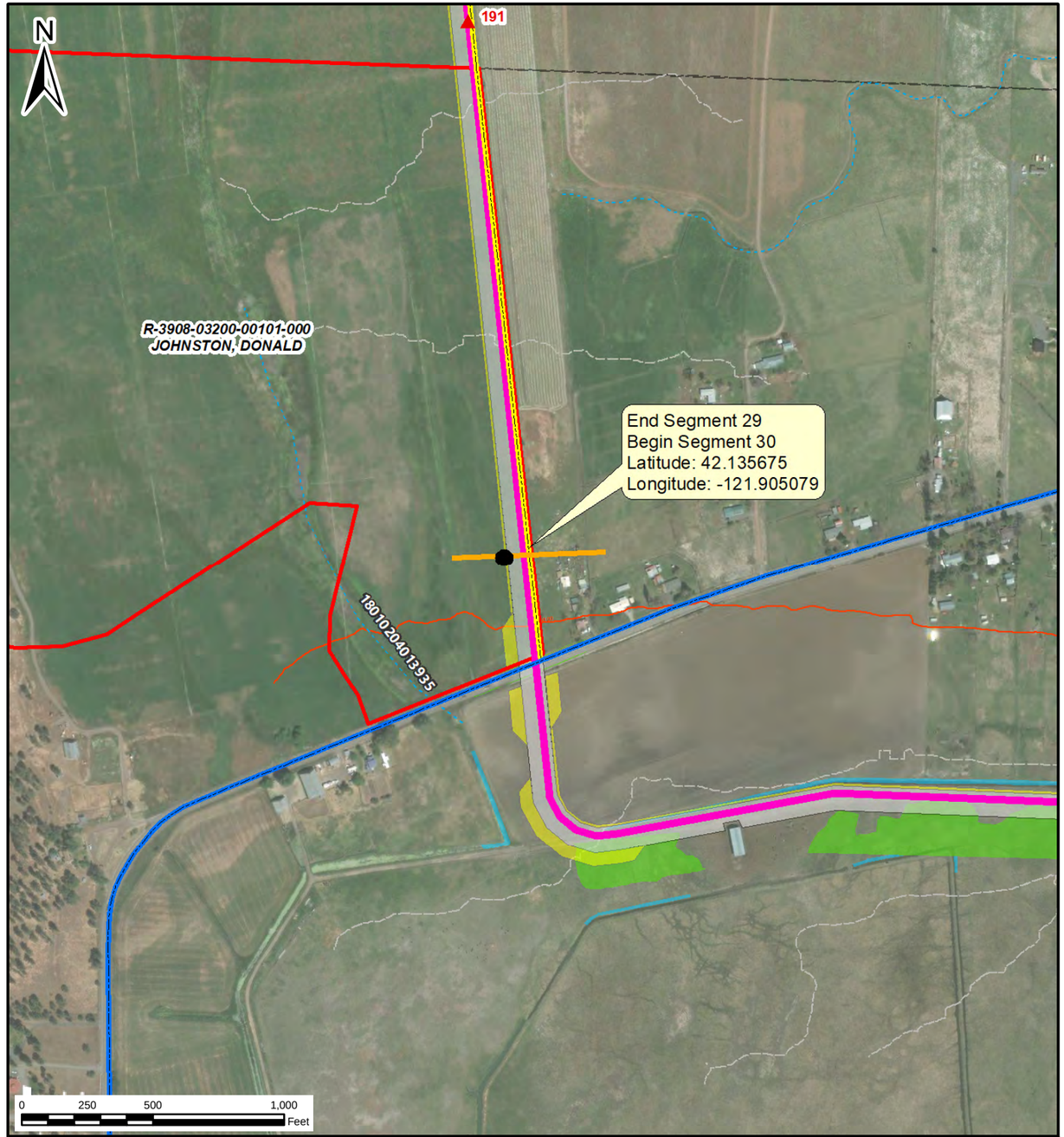

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36" PACIFIC CONNECTOR GAS PIPELINE
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MP 191.39
S-32, T-39-S, R-8-E
KLAMATH COUNTY, OREGON

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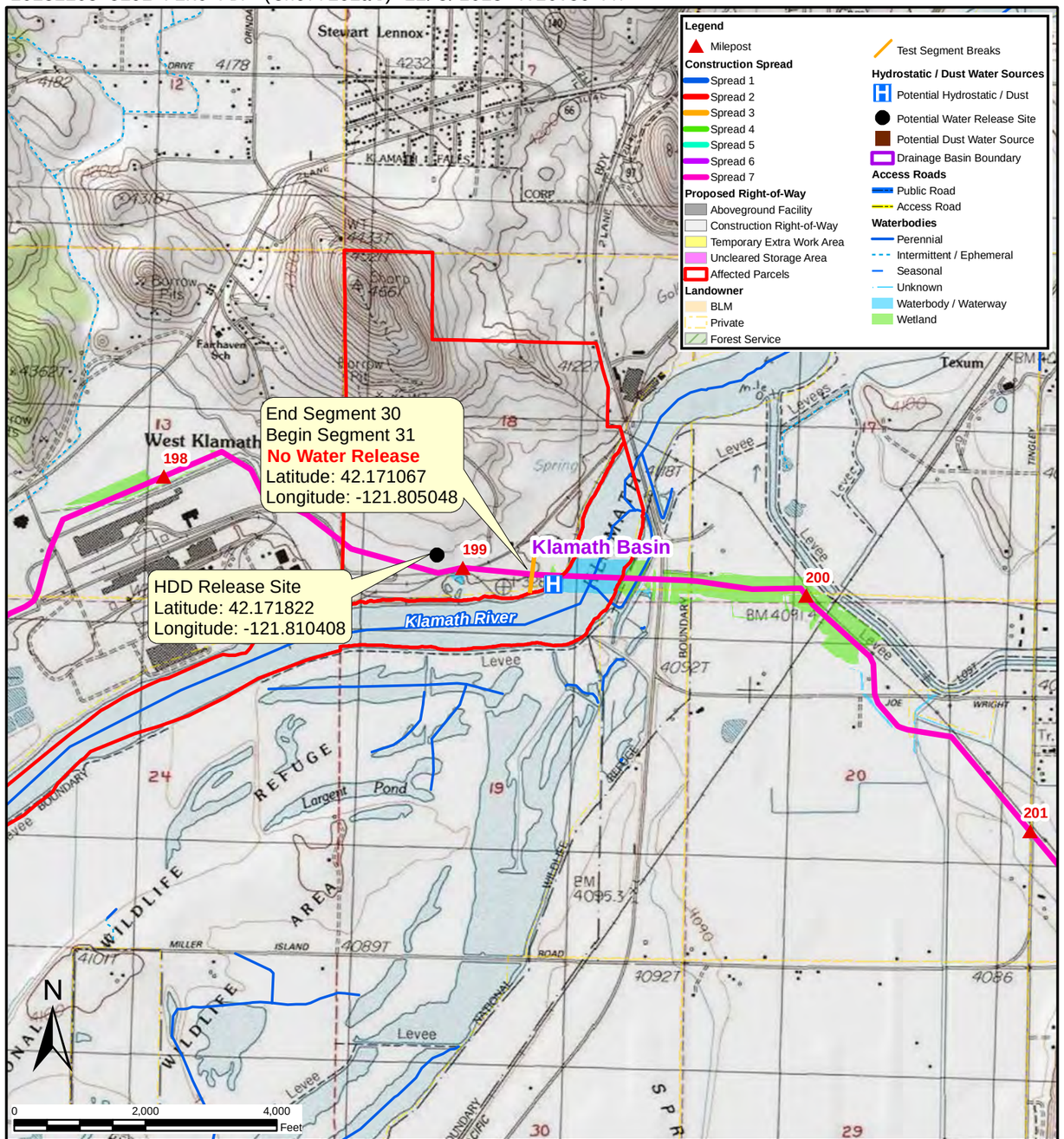

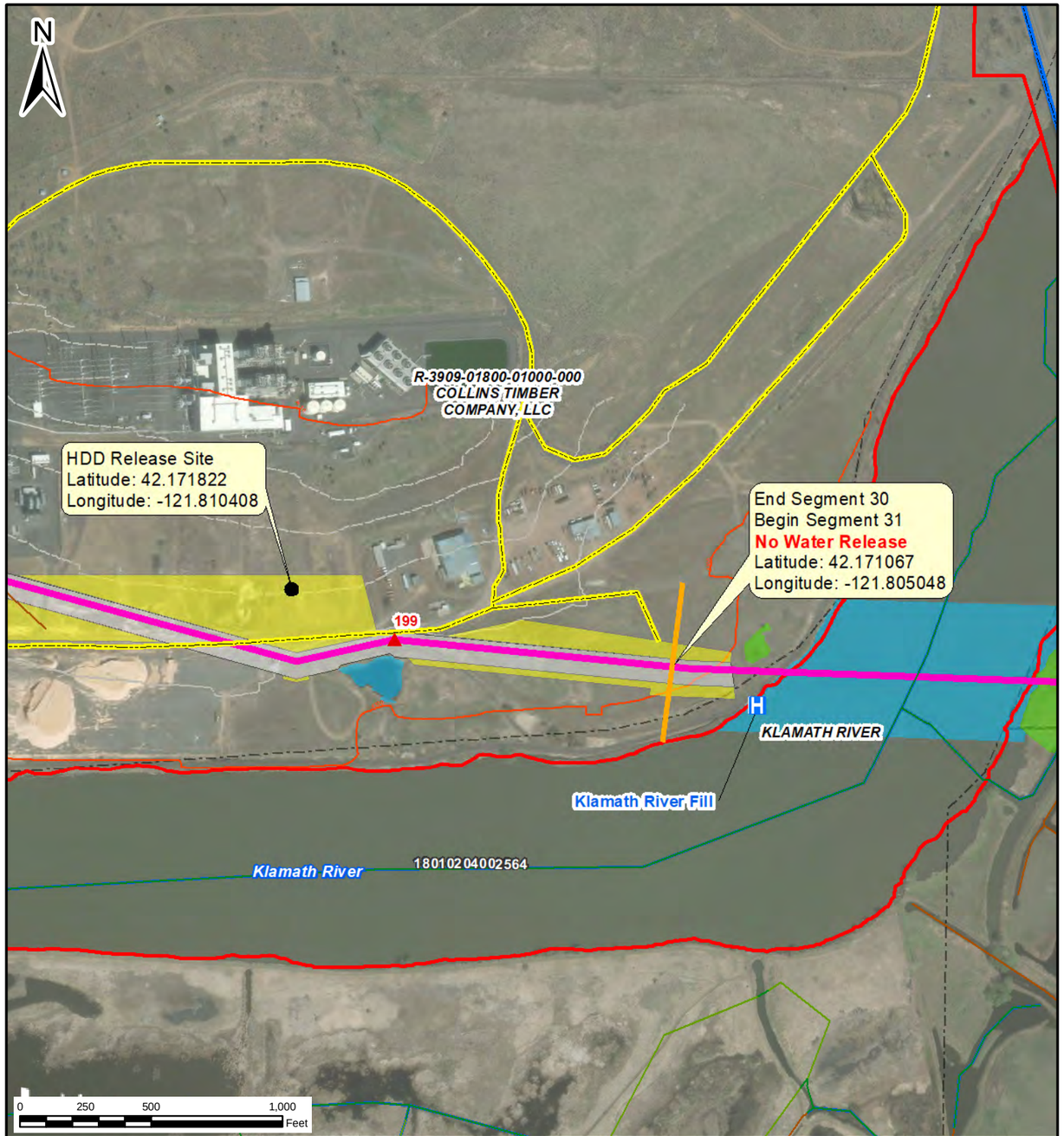

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 30 END / 31 BEGIN
MP 199.20
S-18, T-39-S, R-9-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 30 END / 31 BEGIN
MP 199.20
S-18, T-39-S, R-9-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

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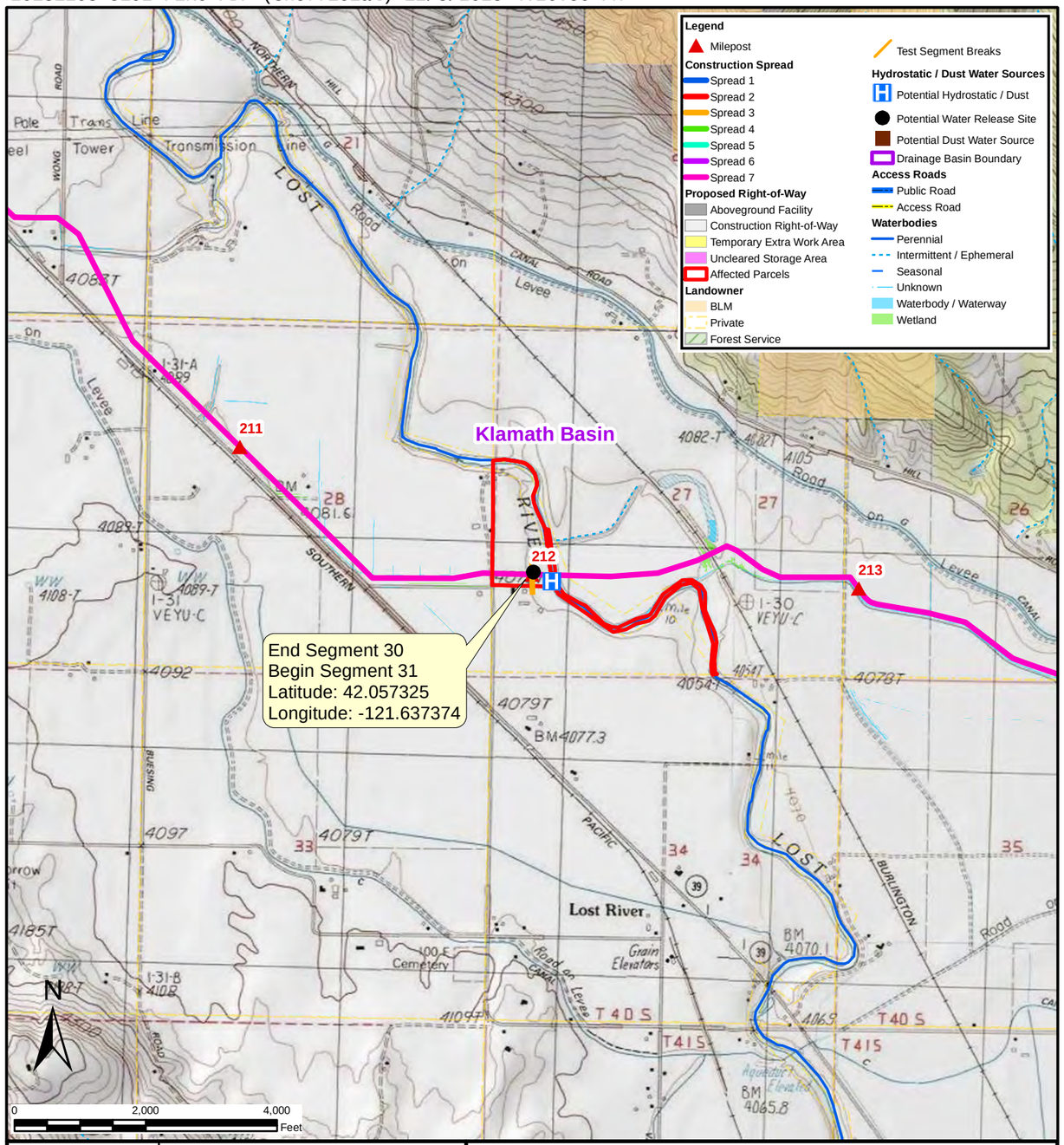

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MP 212.00
S-27, T-40-S, R-10-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

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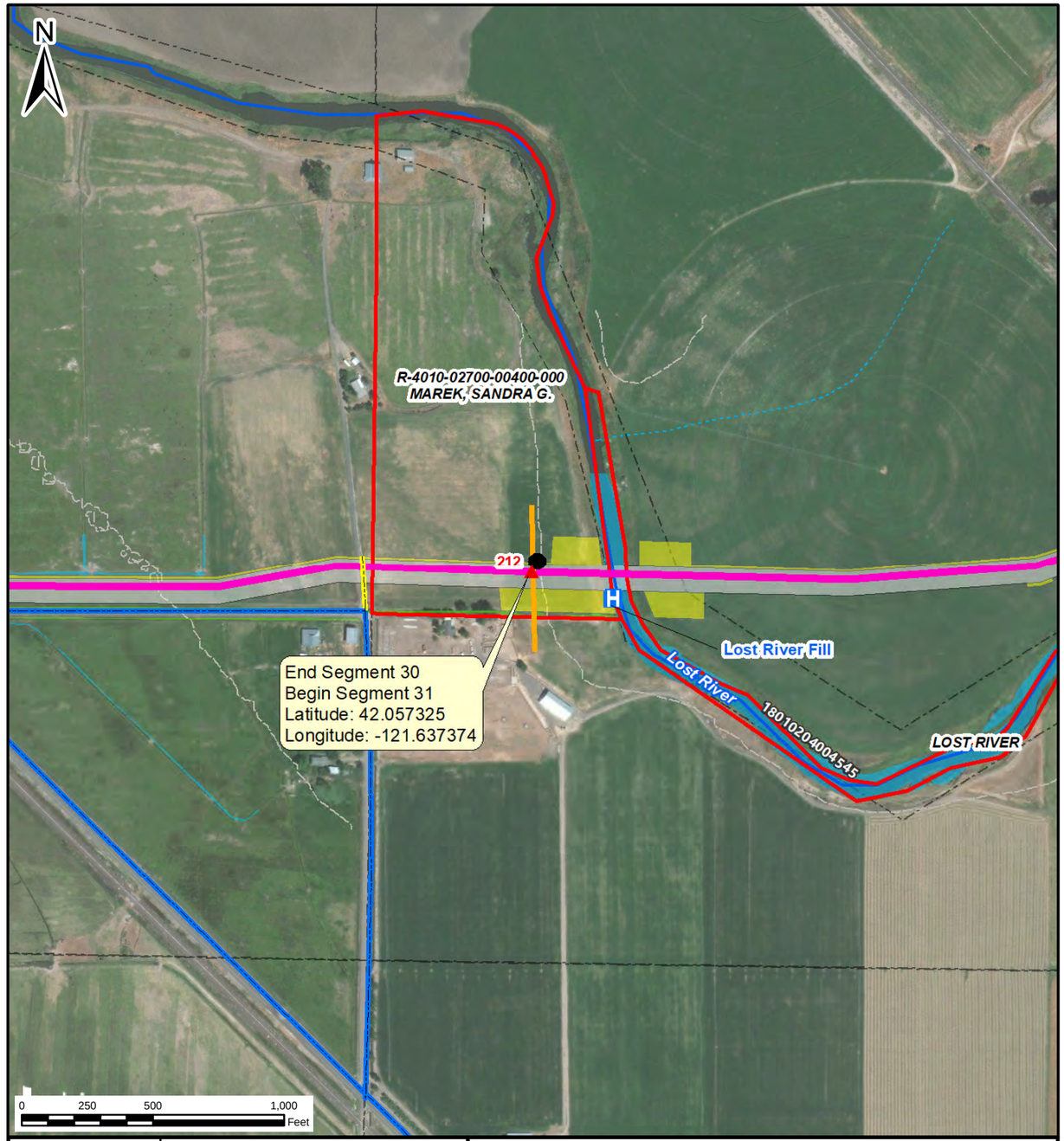

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36" PACIFIC CONNECTOR GAS PIPELINE
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MP 212.00
S-27, T-40-S, R-10-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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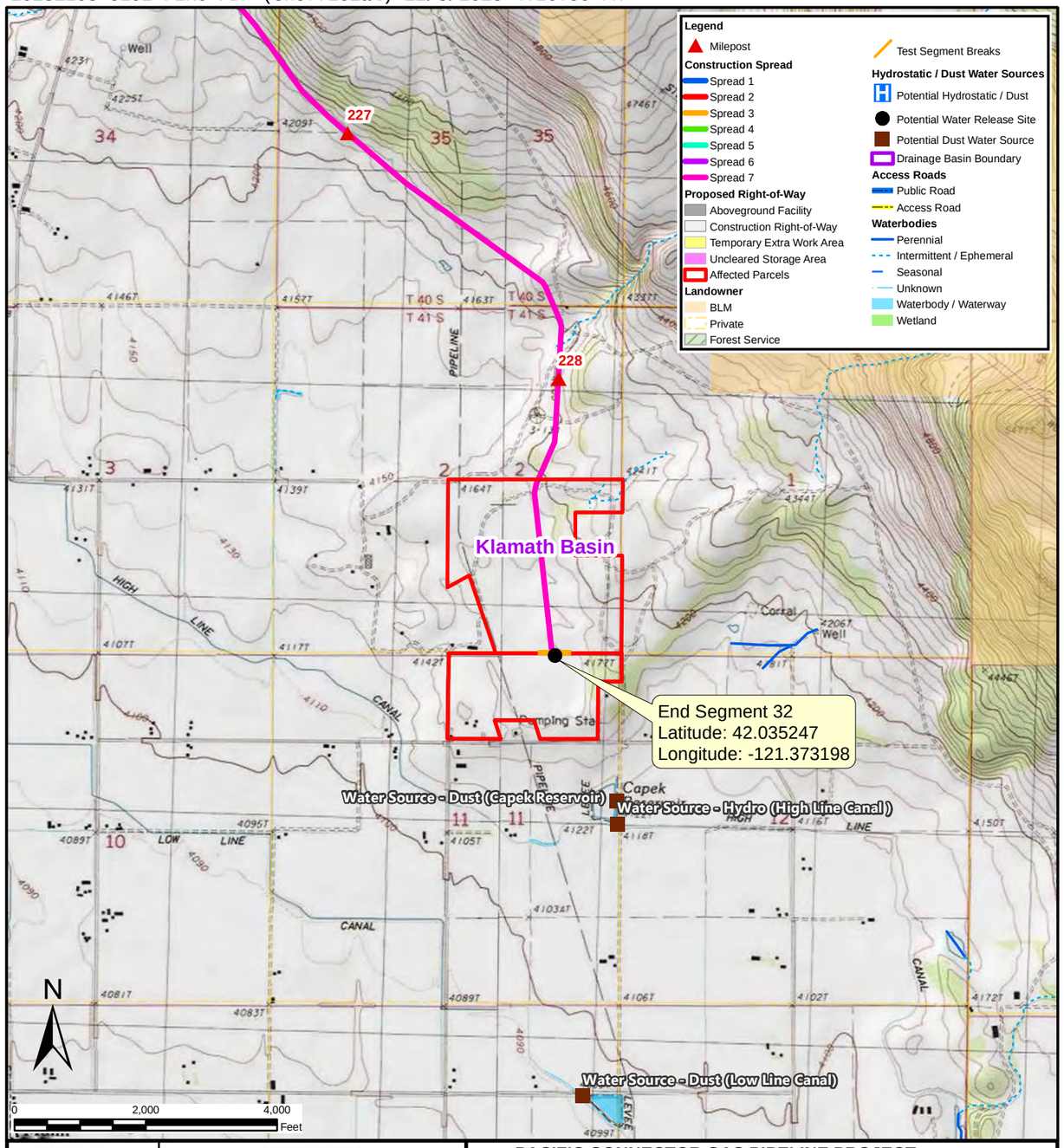

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36" PACIFIC CONNECTOR GAS PIPELINE
HYDROSTATIC TEST SEGMENT 32 END
MP 228.81
S-11, T-41-S, R-12-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP.

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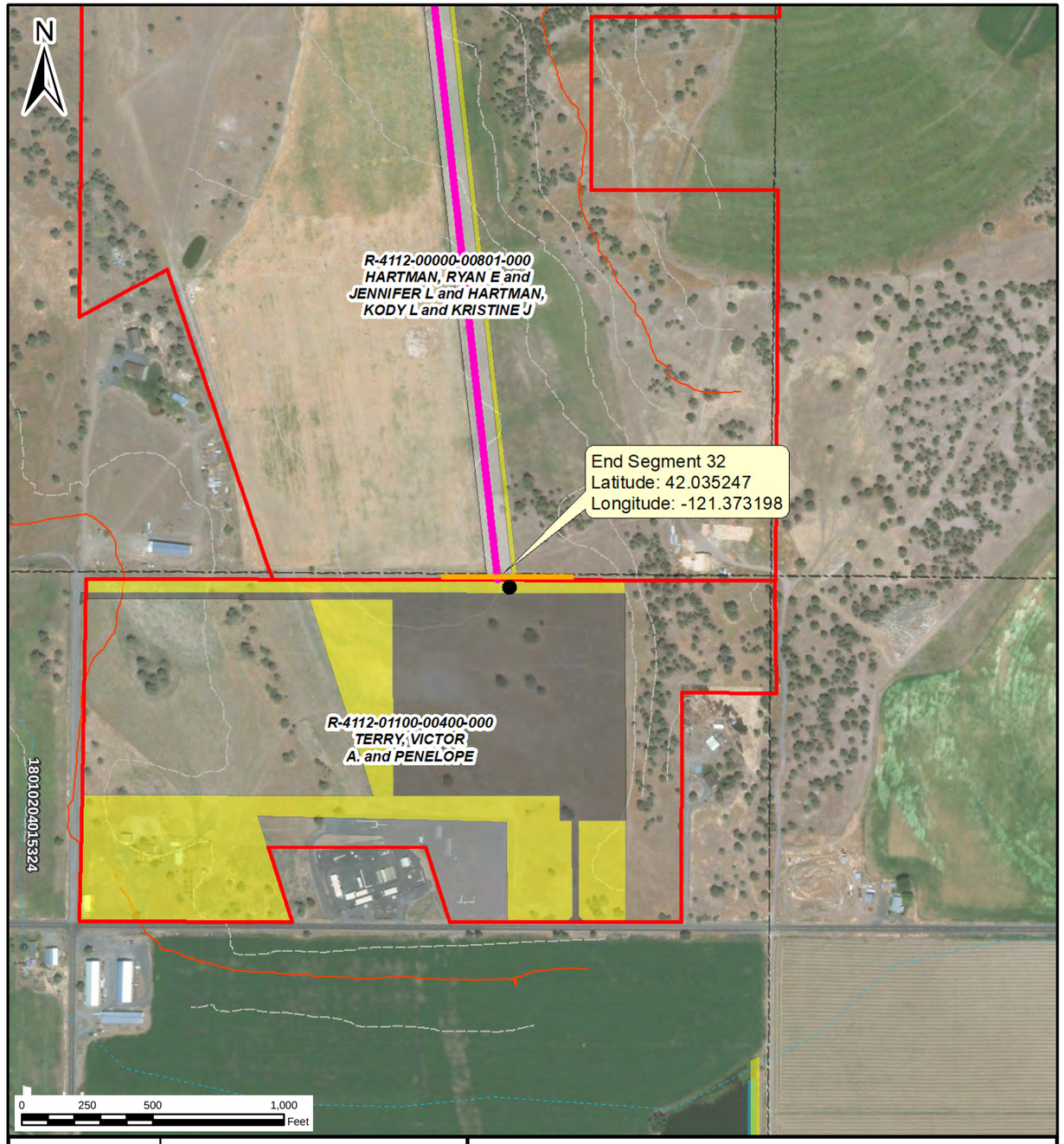

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MP 228.81
S-11, T-41-S, R-12-E
KLAMATH COUNTY, OREGON

Pacific Connector GAS PIPELINE

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APPR. BY:	DATE:	DRAWING NUMBER: Test Segment 32	SHEET 2 OF 2

Path: P:\PCGP_JCLNG\ArcMap\DEQ\Test Segments 32 End.mxd

Attachment E

Hydrostatic Test Plan Impacts Assessment

GeoEngineers

Memorandum

600 Dupont Street, Bellingham, Washington 98225, Telephone: 360.647.1510, Fax: 360.647.5044 www.geoengineers.com

To:	Michael Warson (Pacific Connector Gas Pipeline)
From:	Minda Troost, Fluvial Geomorphologist MCT
Date:	August 27, 2018
File:	22708-001-00
Subject:	Hydrostatic Test Plan Impacts Assessment

INTRODUCTION

This memo is prepared in response to questions posed by the Oregon Department of Environmental Quality (ODEQ) in the October 7, 2015 Data Request II related to potential impacts associated with water withdrawals for hydrostatic testing of the proposed Pacific Connector Gas Pipeline (PCGP). The proposed hydrostatic testing plan is fully documented in the Hydrostatic Testing Plan (HTP) (PCGP, 2018).

Limited licenses for water withdrawals are proposed for four waterbody types to fill the pipeline for pressure testing: natural streams, managed canals, reservoirs, and municipal water supply and are listed in the HTP. Thermal impacts were evaluated for the ten sites characterized as natural streams with open channel flow, two of which have two withdrawal scenarios for a total of twelve analyses (Table 1).

The remaining types of withdrawals were not included in the thermal impacts assessment. Two locations are municipal water supplies (North Spit Pump House Mile Post [MP] 0.00 and Fire Hydrant at MP 1.31). Thermal impacts are not applicable at these locations.

One reservoir, Star Reservoir (MP 141.00), is proposed for limited withdrawal to aid in hydrostatic testing of the pipeline. Thermal analysis was not completed to evaluate impacts to open waterbodies because the relative quantities of withdrawals in the open waterbody is insignificant and not expected to have thermal or other impacts beyond that experienced by typical lake level fluctuations during the period of use.

One manmade channel is proposed for limited withdrawal, the Medford Aqueduct (MP 133.38). This water source is owned and operated by an Irrigation District. The water that flows through this water body is managed by water calls; the water is fully allocated to patrons/users. The sole function of the Aqueduct is to provide those patrons with water via withdrawal for various beneficial uses. Thermal effects associated with a limited withdrawal by PCGP would be no different from other users putting their water to another beneficial use.

THERMAL IMPACTS ON NATURAL STREAMS CHANNELS

The United States Geological Survey's (USGS) Stream Segment Temperature Model (SSTEMP) v2.0.8 was used to estimate the potential thermal impacts of water withdrawals from ten natural channel crossing locations proposed for water use in Table 1. Models were run to simulate water withdrawals at various times of the year, the expected period of use for the limited withdrawal permits. Each withdrawal scenario was modeled for two conditions; to analyze thermal impacts at both 0.02 and 0.1 miles downstream of the withdrawal location.

SSTEMP is a mechanistic, one-dimensional heat transport model that predicts the daily mean and maximum water temperatures as a function of stream distance and environmental heat flux. Net heat flux is calculated as the sum of heat to or from long-wave atmospheric radiation, direct short-wave solar radiation, convection, conduction, evaporation, streamside vegetation (shading), streambed fluid friction, and the water's back radiation. The heat flux model includes the incorporation of groundwater influx. The heat transport model is based on the dynamic temperature-steady flow equation and assumes that all input data, including meteorological and hydrological variables, can be represented by 24-hour averages.

Model manipulations may include reservoir discharge and release temperatures, irrigation diversion, riparian shading, channel alteration, or thermal loading. The model was used in this study to help assess the effects of flow diversion on stream temperature.

Model Assumptions

Ambient flow conditions were modeled using a 50 percent exceedance value for the site based on flow data from the USGS StreamStats Oregon program or USGS gages (HTP - attachment F: Hydrostatic Test Water Withdrawal Hydrologic Assessment). Ambient weather data was derived from historic measurements during the specified period. Channel geometry data was provided through site survey completed by PCGP and/or light detection and ranging (LiDAR) data. An estimated withdrawal rate of 0.67 cubic feet per second (cfs) is assumed.

Withdrawal proposed from the Ben Irving Reservoir is a special condition in which water will be released from the reservoir, allowed to flow down Berry Creek and be withdrawn from the creek at the pipeline crossing. We assumed 2 cfs of water will be flowing in Berry Creek for the assessment.

Tables 1 and 2 summarize the key model assumptions.

TABLE 1. MODELED FLOWS

Stream Name	Mile Post Location (MP)	Estimated Time of Use (month)	50% Exceedance (cfs)	Withdrawal Rate (cfs)	Outflow Rate (cfs)
Coos River	11.08R	October	131	0.67	130.3
EF Coquille	29.64	October	27.4	0.67	26.7
MF Coquille	50.28	October	1.9	0.67	1.2
Ben Irving Reservoir via Berry Creek	55.90	October	2	0.67	1.3
Olalla/Lookingglass Creek	58.79	Jun/July	9.3	0.67	8.6
South Umpqua #1	71.25	Jun/July	642	0.67	641.3
South Umpqua #1	71.25	July/Aug	268	0.67	267.3
South Umpqua #2	94.73	July/Aug	137	0.67	136.3
South Umpqua #2	94.73	September	87	0.67	86.3
Rogue River	122.8	September	1,333	0.67	1,329.3
Klamath River	199.2	February	1,175	0.67	1,174.3
Lost River	212.0	February	88	0.67	87.3

TABLE 2. DATA SOURCES FOR SSTEMP PARAMETERS

Data	Source
Flow Data	HTP – Appendix F; USGS StreamStats for Oregon and USGS gage data
Stream Temperature	NorWeST Stream Temp, USGS; or NOAA
Accretion Temperature	Mean annual air temperature: PRISM Climate Group
Latitude	GIS
Elevation	LiDAR
Widths A and B terms	Utilized Federal Highways Administration's Hydraulic Toolbox 4.2 and Microsoft Excel. Channel Geometry for use in the tool was obtained from previous hydraulic models generated for a site or LiDAR with trapezoidal channel and/or low flow channel built in based on field observations.
Air Temperature	Monthly mean air temperature: PRISM Climate Group
Relative Humidity	Derived from Dew Point temperature from PRISM Climate Group
Wind Speed	http://weatherspark.com - median of average of hourly speeds
Ground Temperature	Mean annual air temperature: PRISM Climate Group
Possible Sun	http://weatherspark.com
Solar Radiation	PCGP - Thermal Impacts Assessment, August 2017 - Shade-a-lator v.6.2; based on solar load above riparian at site for time of year.
Total Shade	PCGP - Thermal Impacts Assessment, August 2017 - Shade-a-lator v.6.2; Construction scenario total shade for time of year was utilized for the 0.02 mi segment lengths. Total shade for 0.1 mi segments was estimated based on construction scenario and site potential total shade at the time of year.

SSTEMP Model Results

Results of the SSTEMP thermal predictions resulting from the twelve potential withdrawal scenarios from natural channels are presented in Attachment A. The stream and model run are shown in the bottom left corner of each screen shot. Each scenario is modeled for two conditions, at 0.02 and 0.1 miles downstream of the proposed withdrawal location. Model results are provided in terms of a predicted mean, maximum, and minimum outflow temperatures. Results and differences from inflow temperatures are summarized in Table 3. Some locations show lower mean temperatures for the segment than inflow temperature. Significant factors appear to be very low flows, less solar radiation during certain times of the year, and or lower air temperatures relative to inflow temperatures.

TABLE 3. ESTIMATED TEMPERATURES

Stream Name	Segment Length (mi)	Predicted Mean (°F)	Estimated Maximum (°F)	Estimated Minimum (°F)	Difference Between Inflow and Predicted Mean Outflow (°F)	Difference Between Inflow and Estimated Maximum Outflow (°F)
Coos River October	0.02	53.03	56.58	49.48	0.03	3.56
	0.10	53.14	55.47	50.81	0.14	2.46
EF Coquille October	0.02	55.99	57.55	54.42	0.00	0.72
	0.10	55.94	57.52	54.36	-0.02	1.74
MF Coquille October	0.02	55.94	60.25	51.63	-0.01	2.14
	0.10	55.56	59.11	52.00	-0.12	1.36
Ben Irving Reservoir via Berry Creek October	0.02	59.97	67.32	52.61	-0.02	10.07
	0.10	59.81	66.45	53.17	-0.15	8.43
Olalla Creek June/July	0.02	63.15	77.83	48.47	0.02	7.35
	0.10	63.57	78.63	48.52	0.09	9.74
South Umpqua #1 June/July	0.02	73.60	74.58	72.62	0.00	0.84
	0.10	73.60	76.11	71.09	0.00	2.14
South Umpqua #1 July/August	0.02	73.60	75.16	72.03	0.00	1.45
	0.10	73.59	77.39	69.80	0.00	3.54
South Umpqua #2 July/August	0.02	70.42	76.78	64.06	0.00	3.58
	0.10	70.45	79.65	61.24	0.02	6.08
South Umpqua #2 September	0.02	70.39	75.21	65.56	0.00	3.00
	0.10	70.31	77.40	63.22	-0.03	4.53
Rogue River September	0.02	52.00	55.54	48.47	0.00	3.46
	0.10	52.01	54.30	49.73	0.01	1.69
Klamath River February	0.02	39.20	41.62	36.78	0.00	1.89
	0.10	39.20	40.75	37.65	0.00	1.20
Lost River February	0.02	40.60	42.62	38.58	0.00	1.87
	0.10	40.59	41.88	39.30	-0.01	1.18

REFERENCES

Oregon Department of Environmental Quality, Shade-a-lator v.6.2, accessed August 2018.

Pacific Connector Gas Pipeline, 2017. “Thermal Impacts Assessment.” August 2017.

Pacific Connector Gas Pipeline, 2018. “Hydrostatic Testing Plan.” August 2018.

Umpqua Basin Watershed Council, 2003. “Olalla Lookingglass Watershed Assessment and Action Plan.” August 2003.

United States Geological Survey, Stream Segment Temperature Model (SSTEMP). Version 2.0.8. Accessed August 2018.

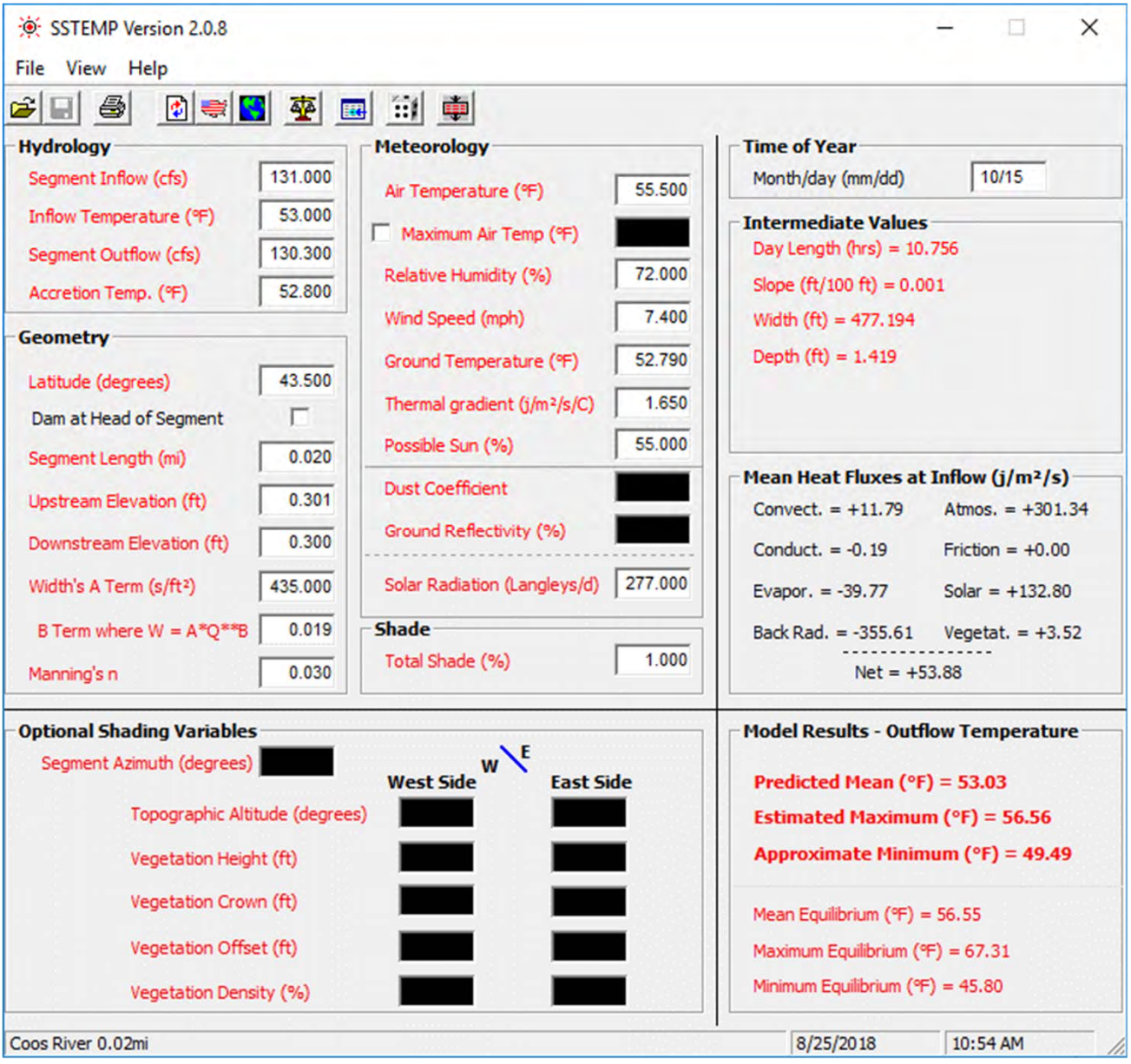
United States Fish and Wildlife Service, 2012. "Coquille River Basin Stream Temperature Assessment." November 29, 2012.

MLT:TNH:tln

Attachments:

Figures 1 through 22. SSTEMP Model Output

One copy submitted



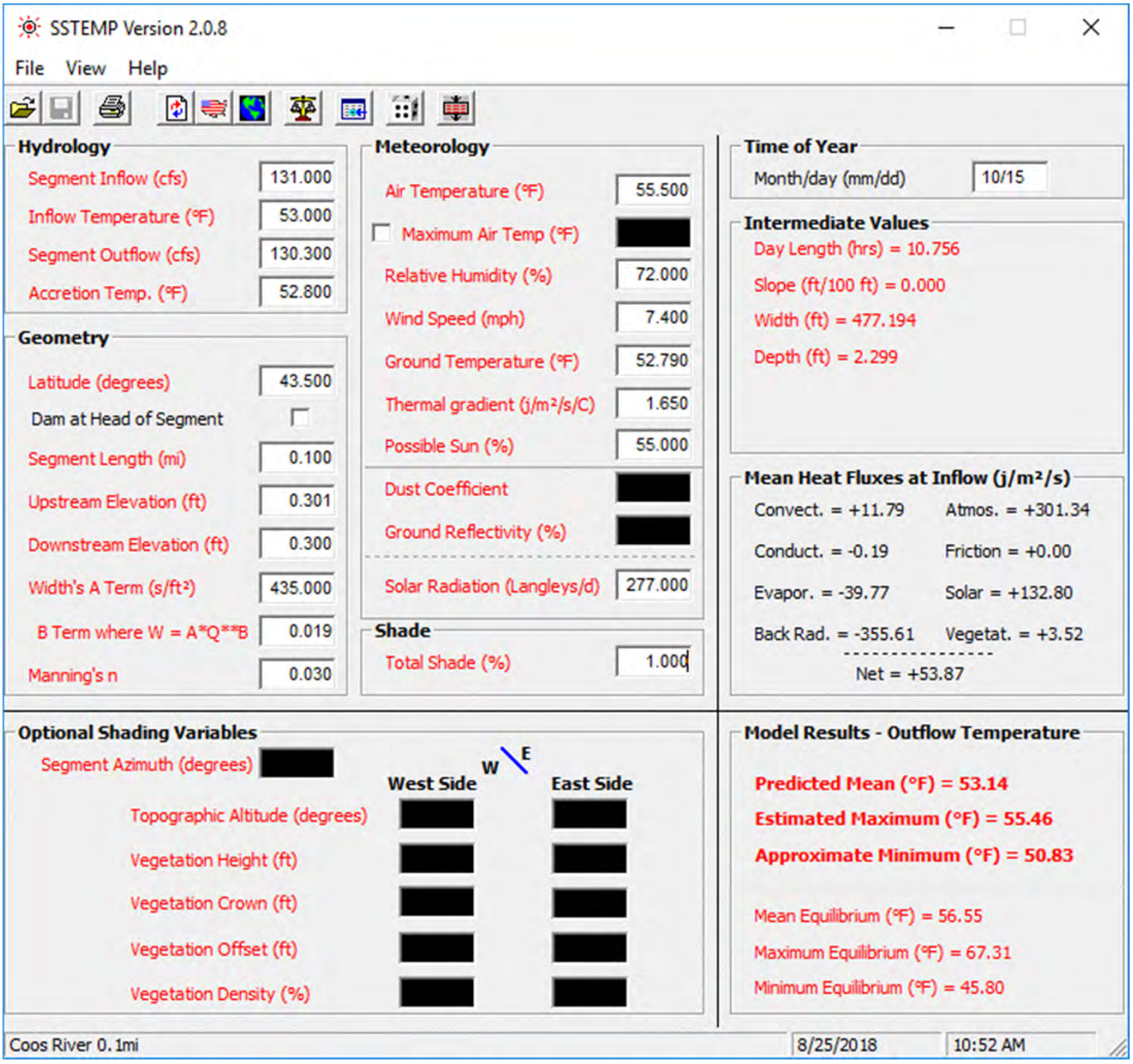
SSTEMP Model Output
Coos River 0.02 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 1

22708-001-00 Date Exported: 08/27/18



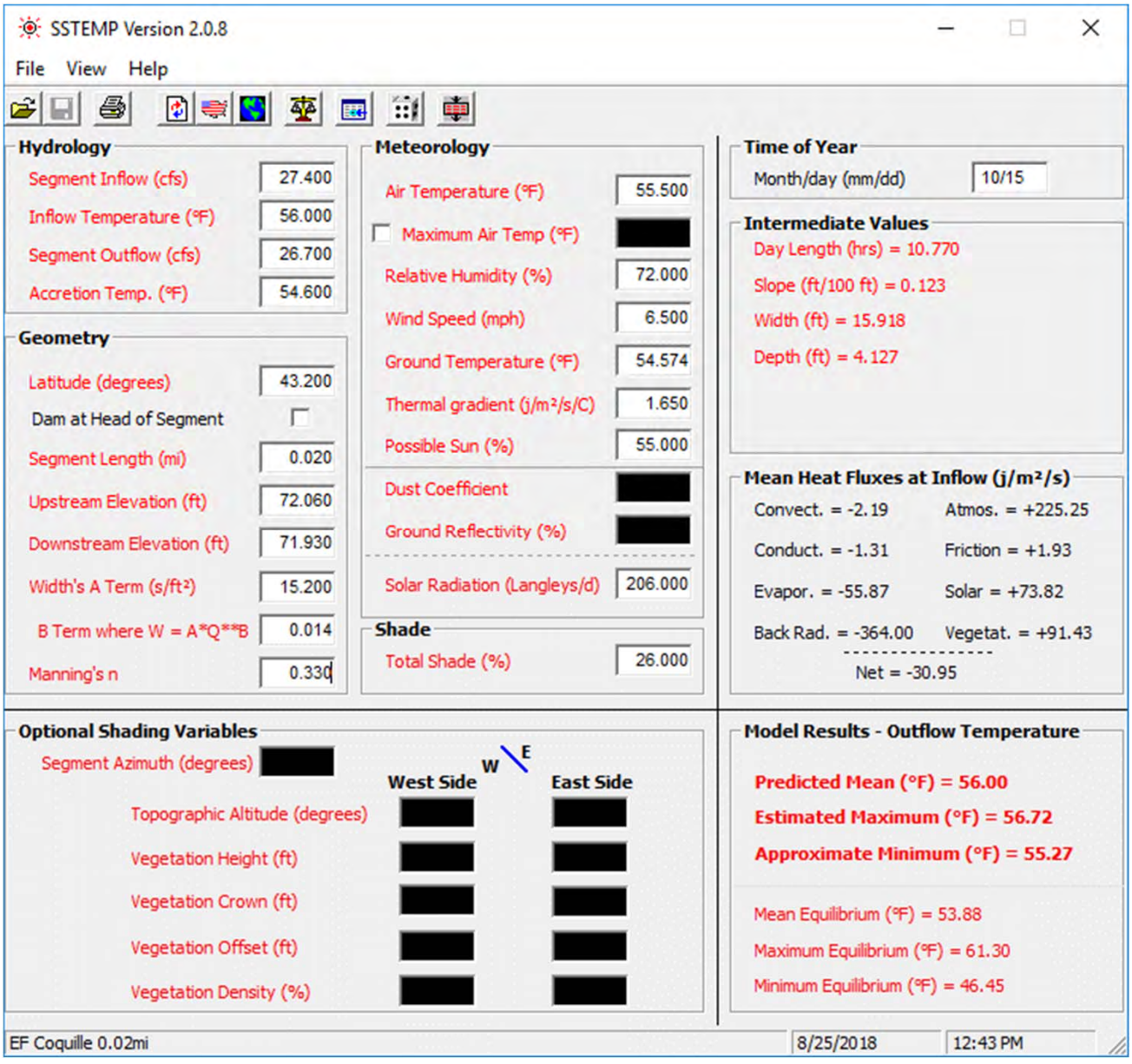
SSTEMP Model Output
Coos River 0.1 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 2

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
East Fork Coquille 0.02 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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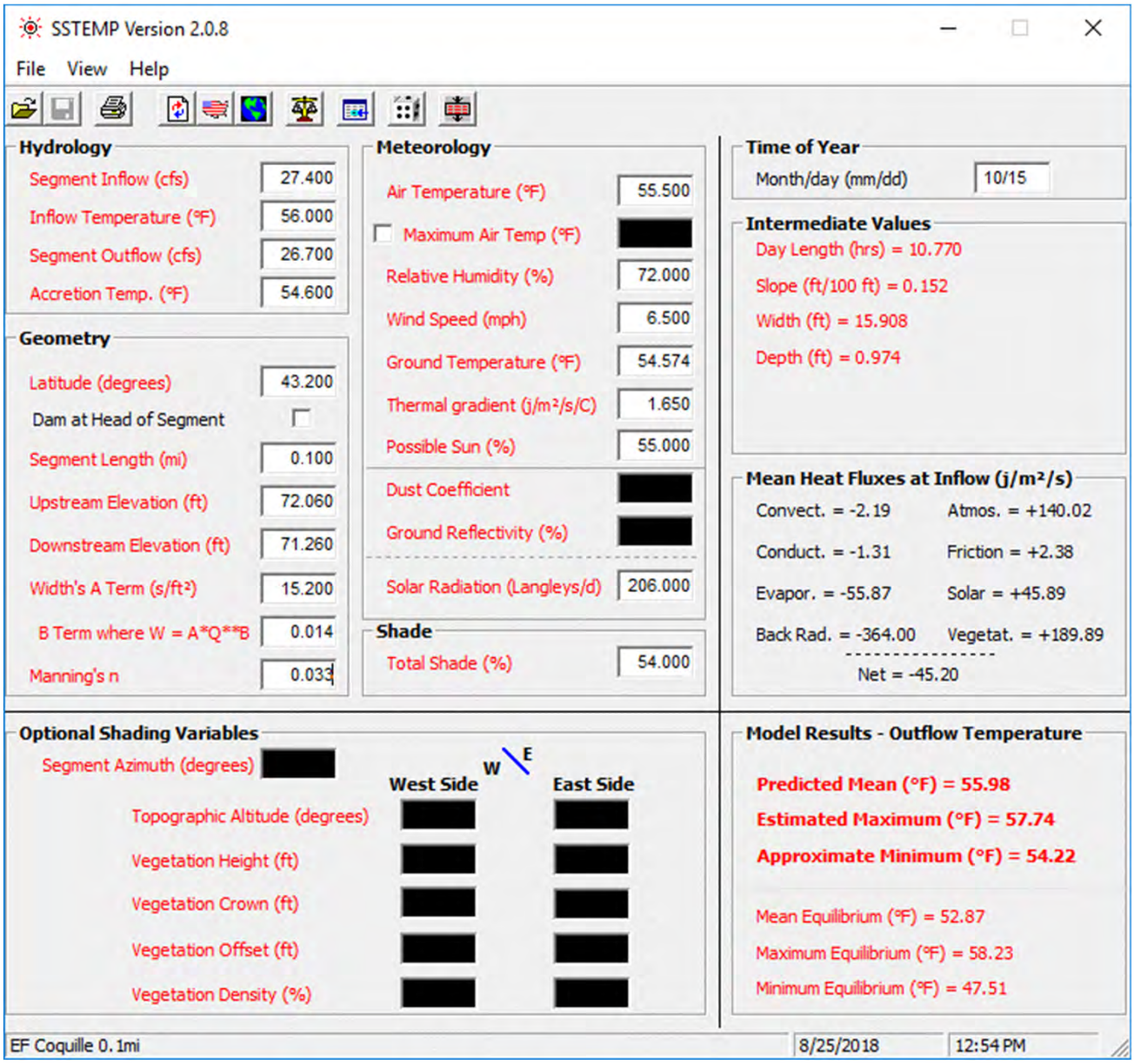
Figure 3

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
East Fork Coquille 0.1 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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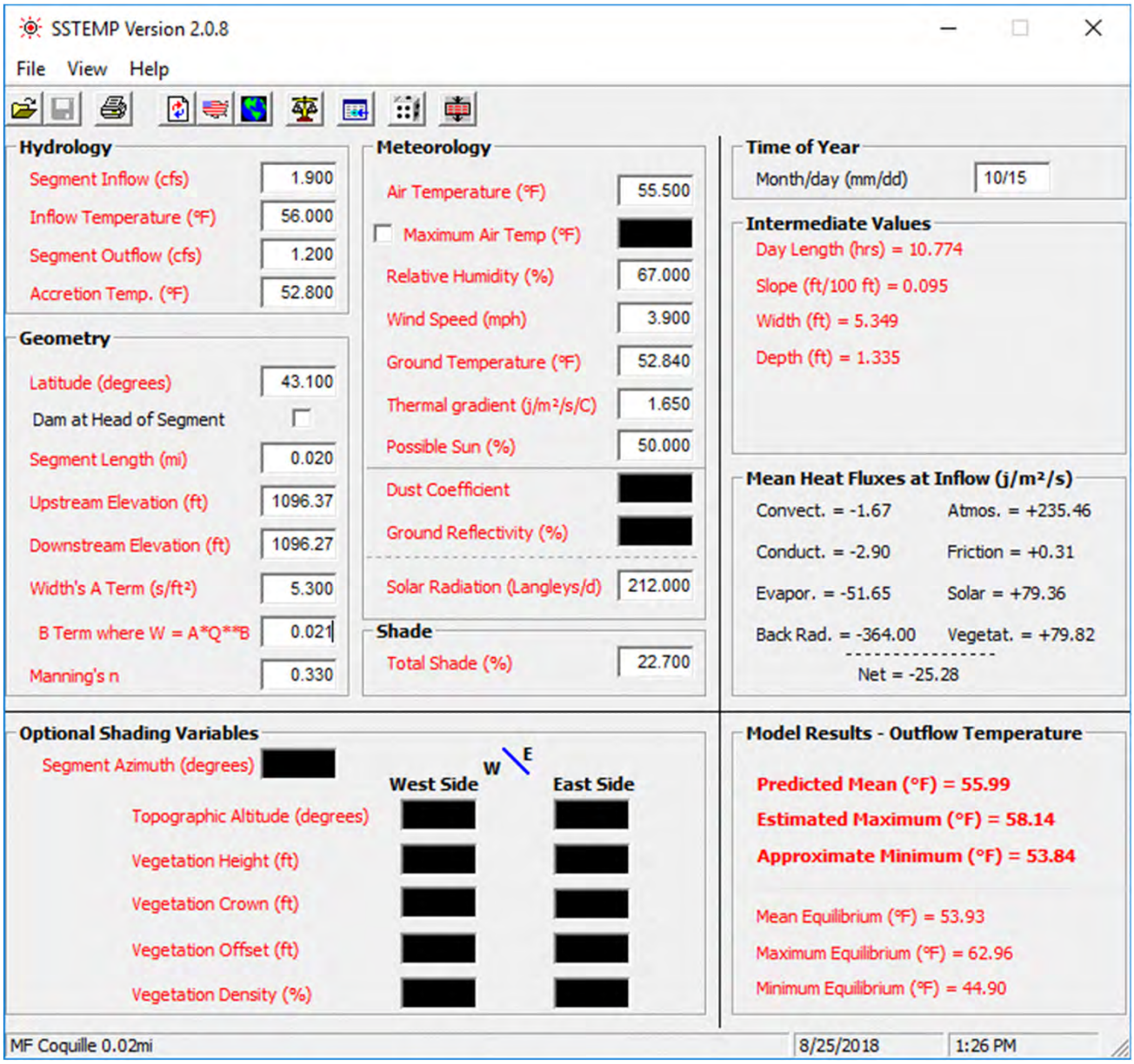
Figure 4

22708-001-00 Date Exported: 08/27/18

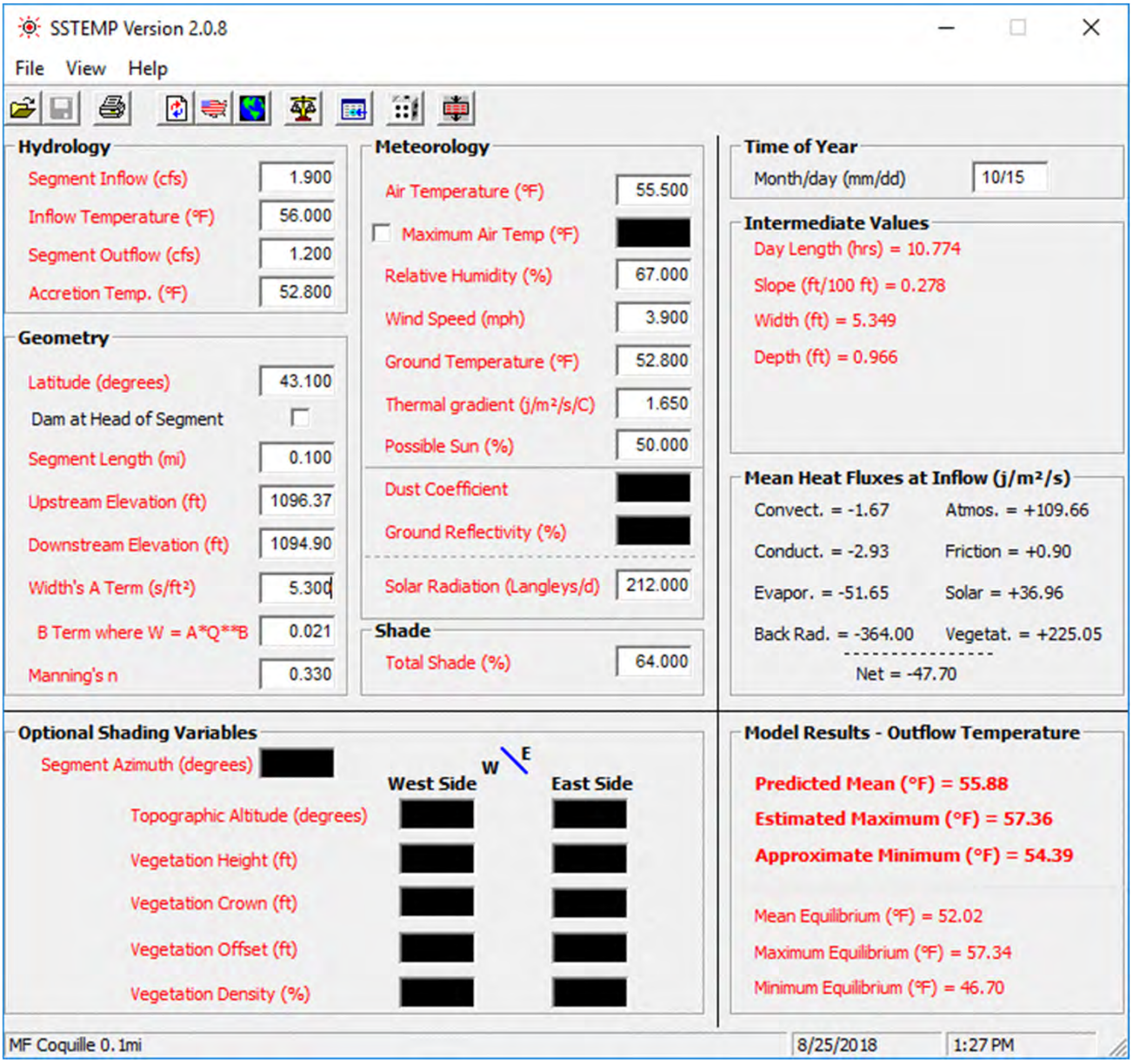


SSTEMP Model Output
Middle Fork Coquille 0.02 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 5



SSTEMP Model Output
Middle Fork Coquille 0.1 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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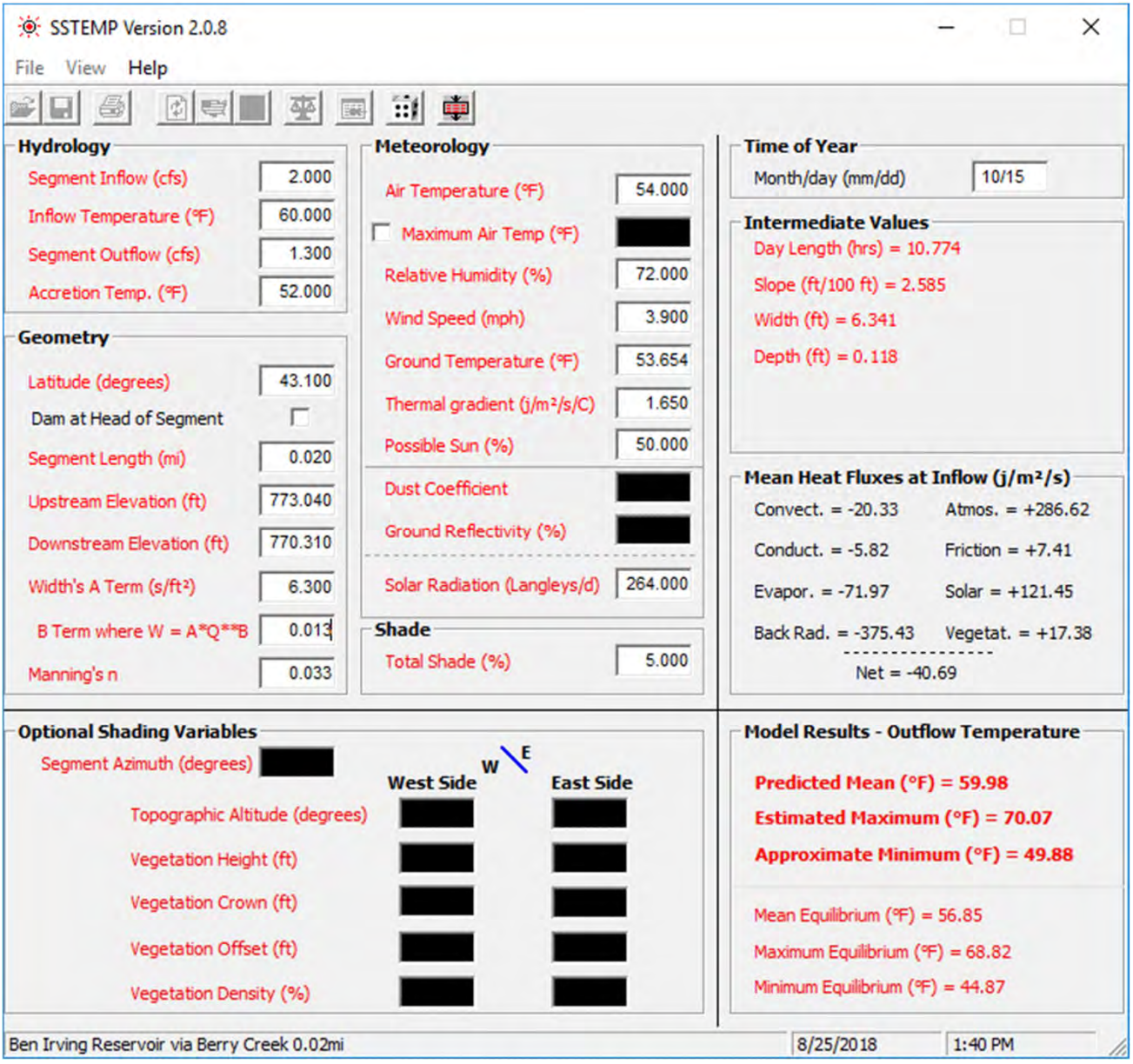
Figure 6



SSTEMP Model Output
Ben Irving Reservoir via Berry Creek 0.02 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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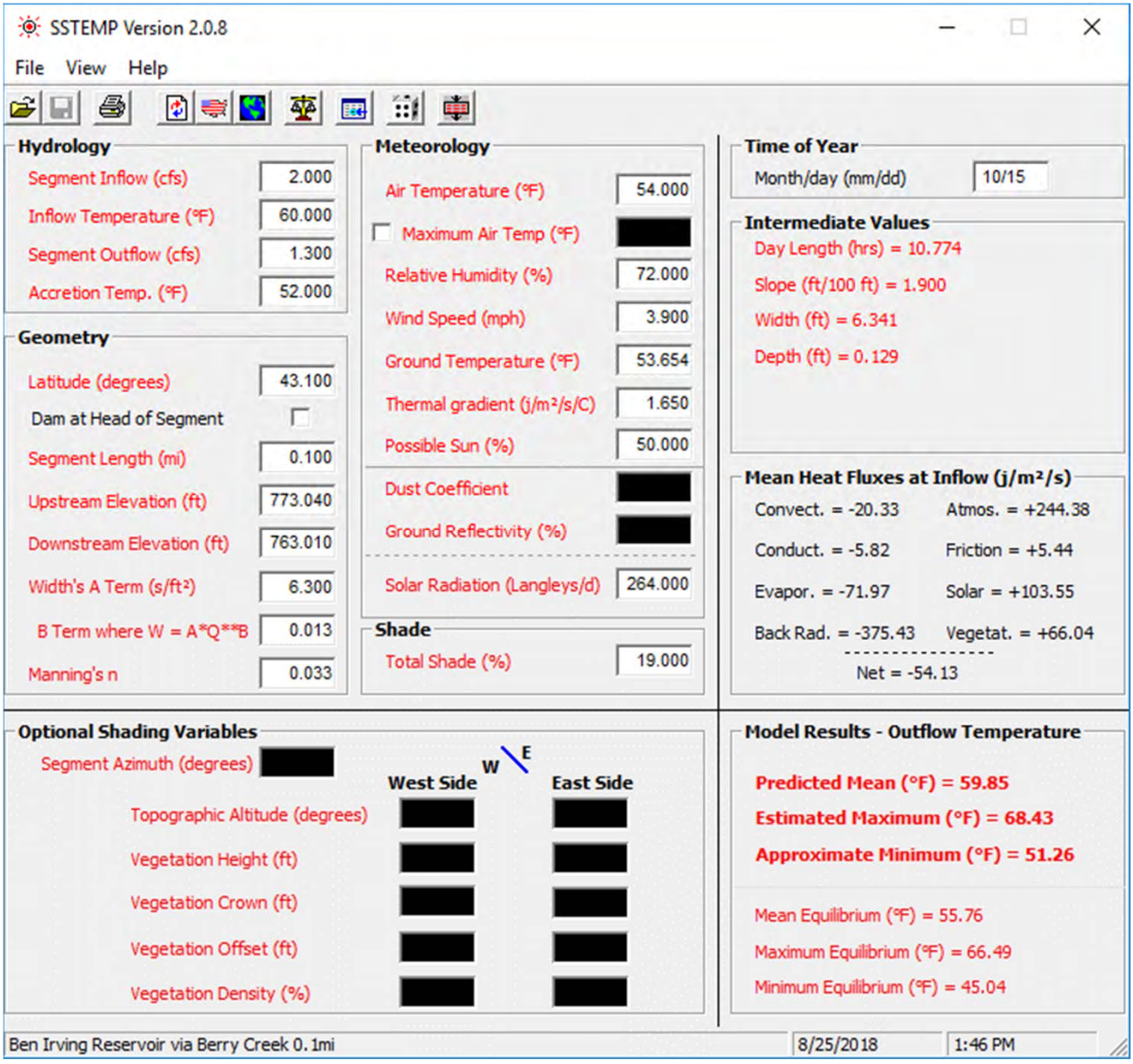
Figure 7

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
Ben Irving Reservoir via Berry Creek 0.1 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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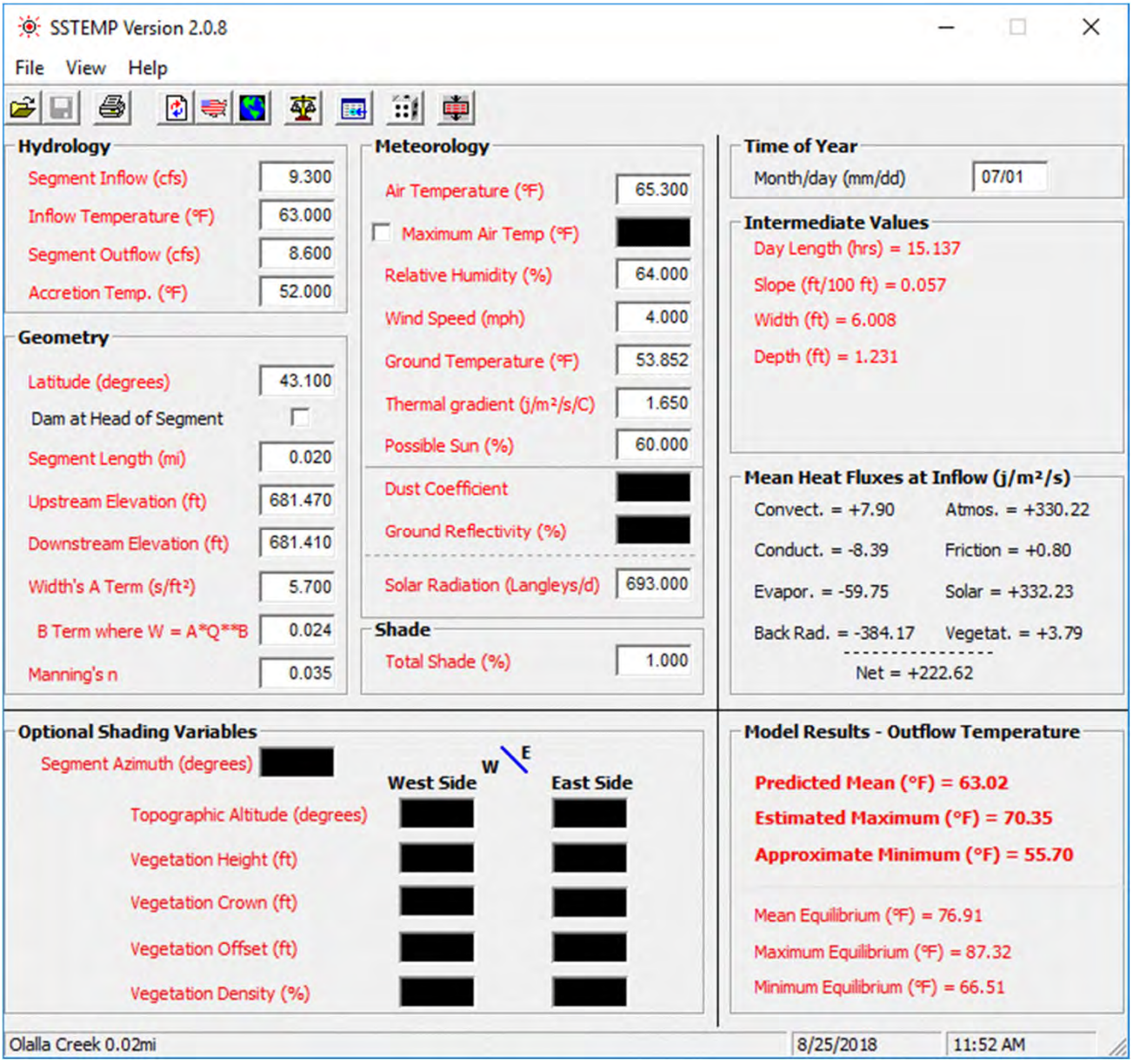
Figure 8



SSTEMP Model Output
Olalla Creek 0.02 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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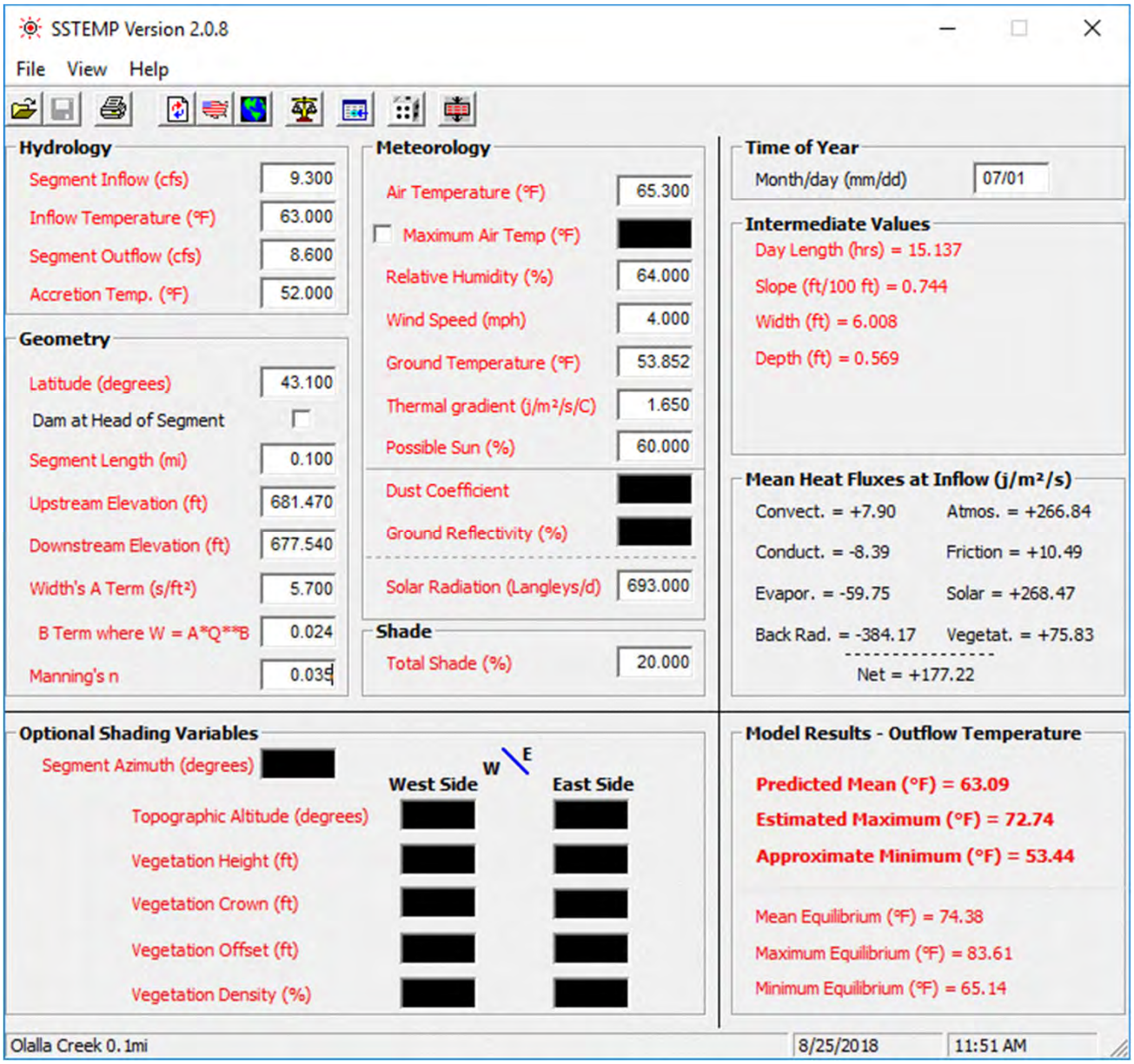
Figure 9



SSTEMP Model Output
Olalla Creek 0.1 mi

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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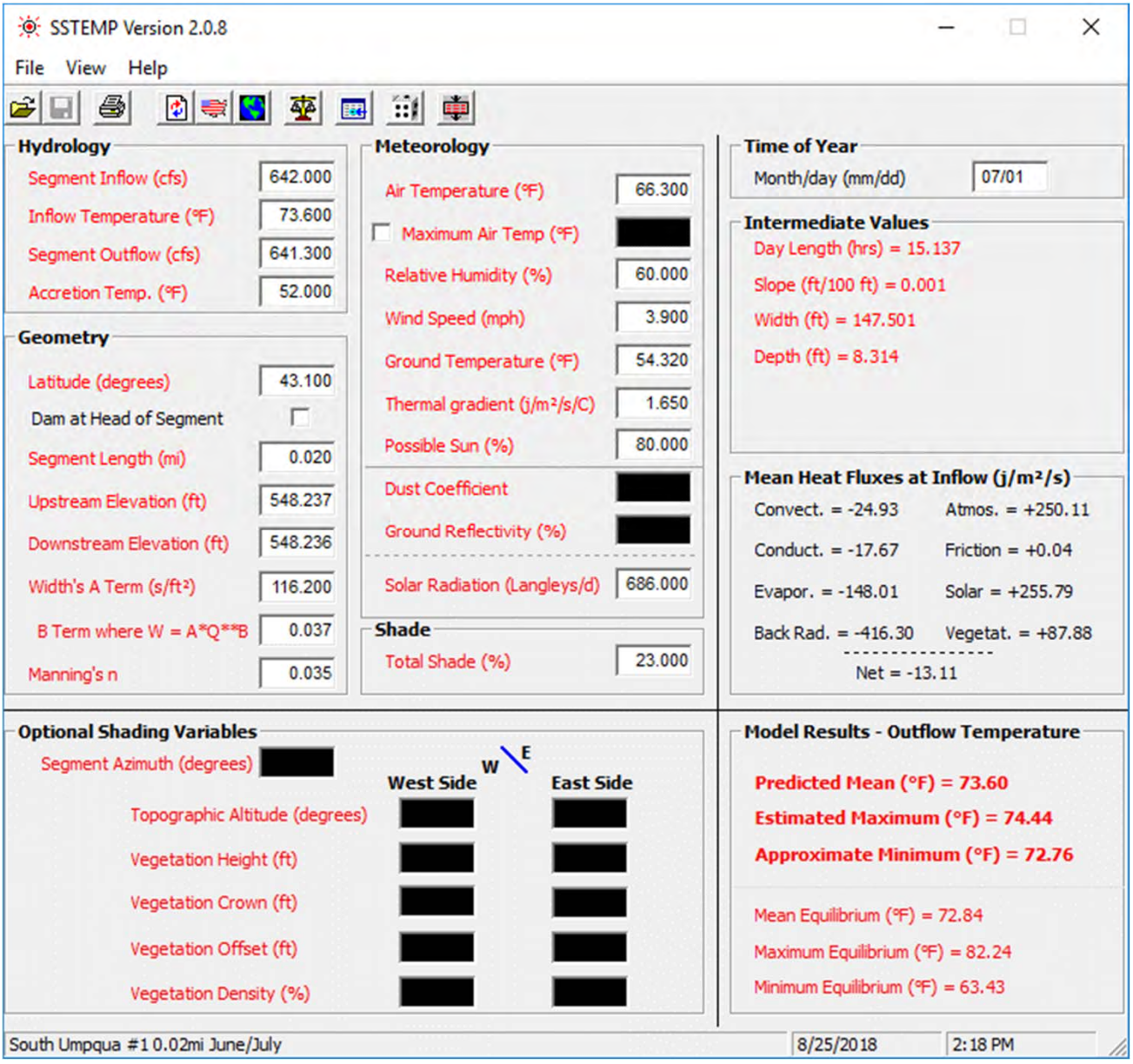
Figure 10

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
South Umpqua #1 0.02 mi June/July

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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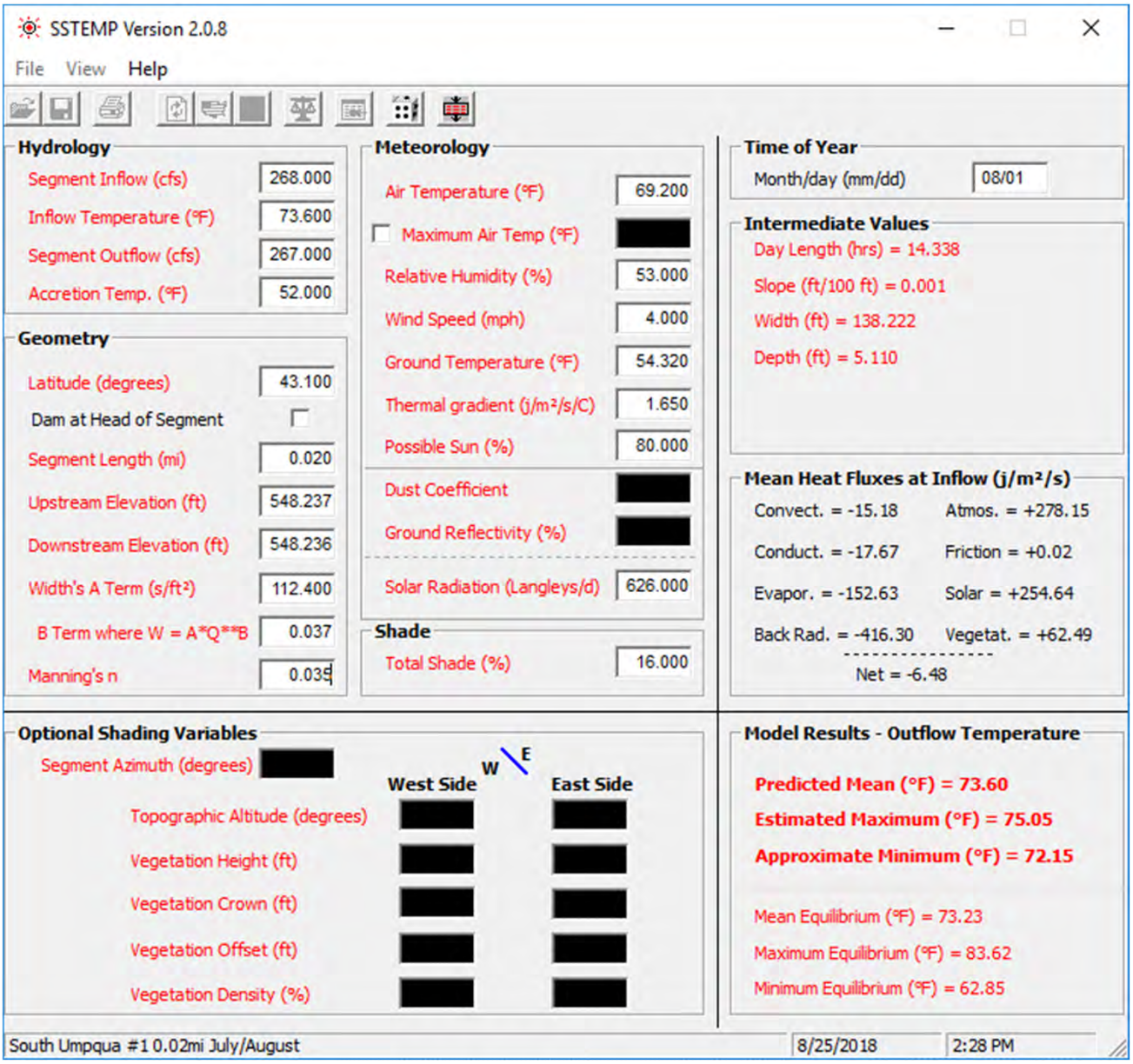
Figure 11

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
South Umpqua #1 0.02 mi July/August

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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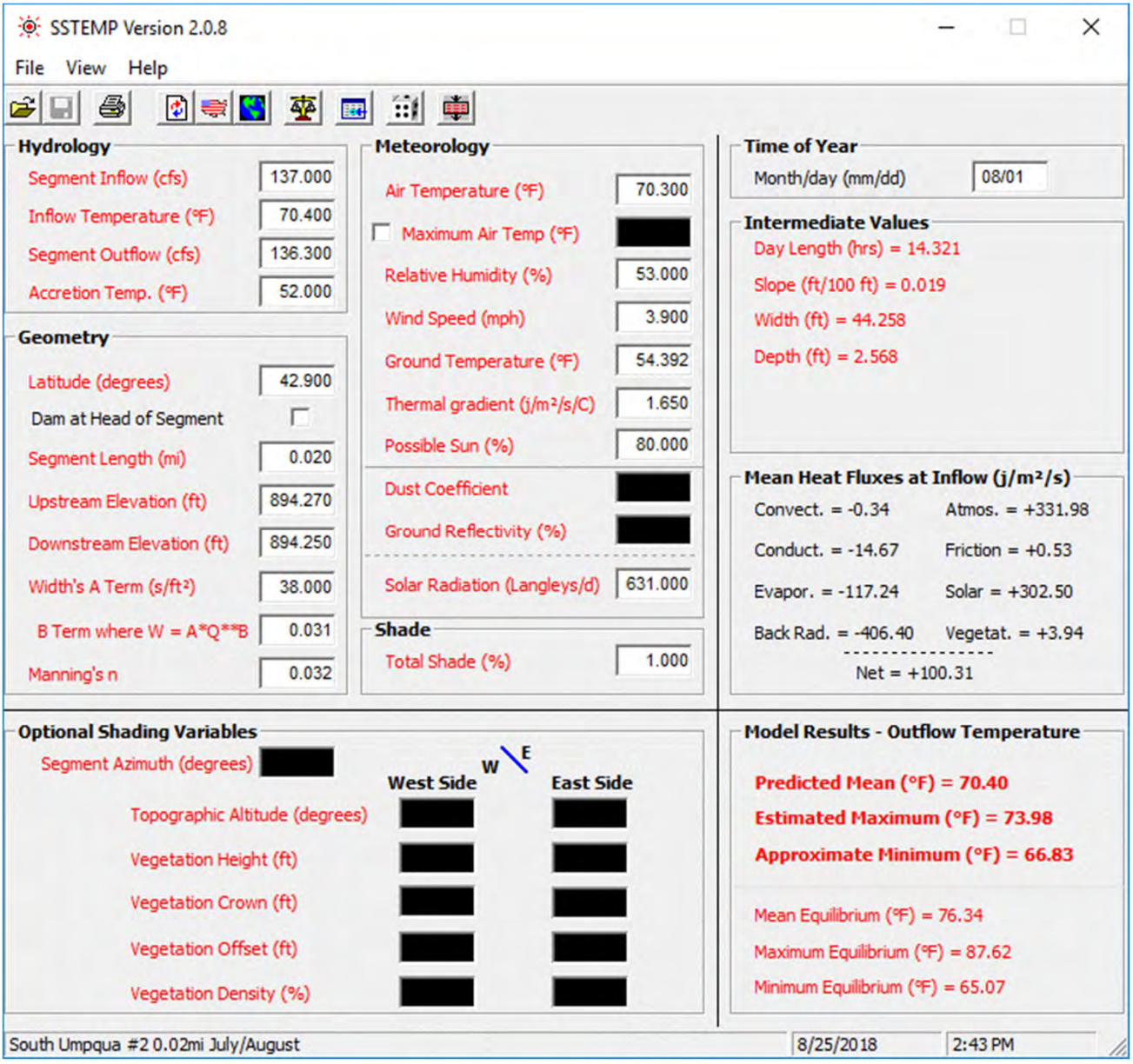
Figure 12

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
South Umpqua #2 0.02 mi July/August

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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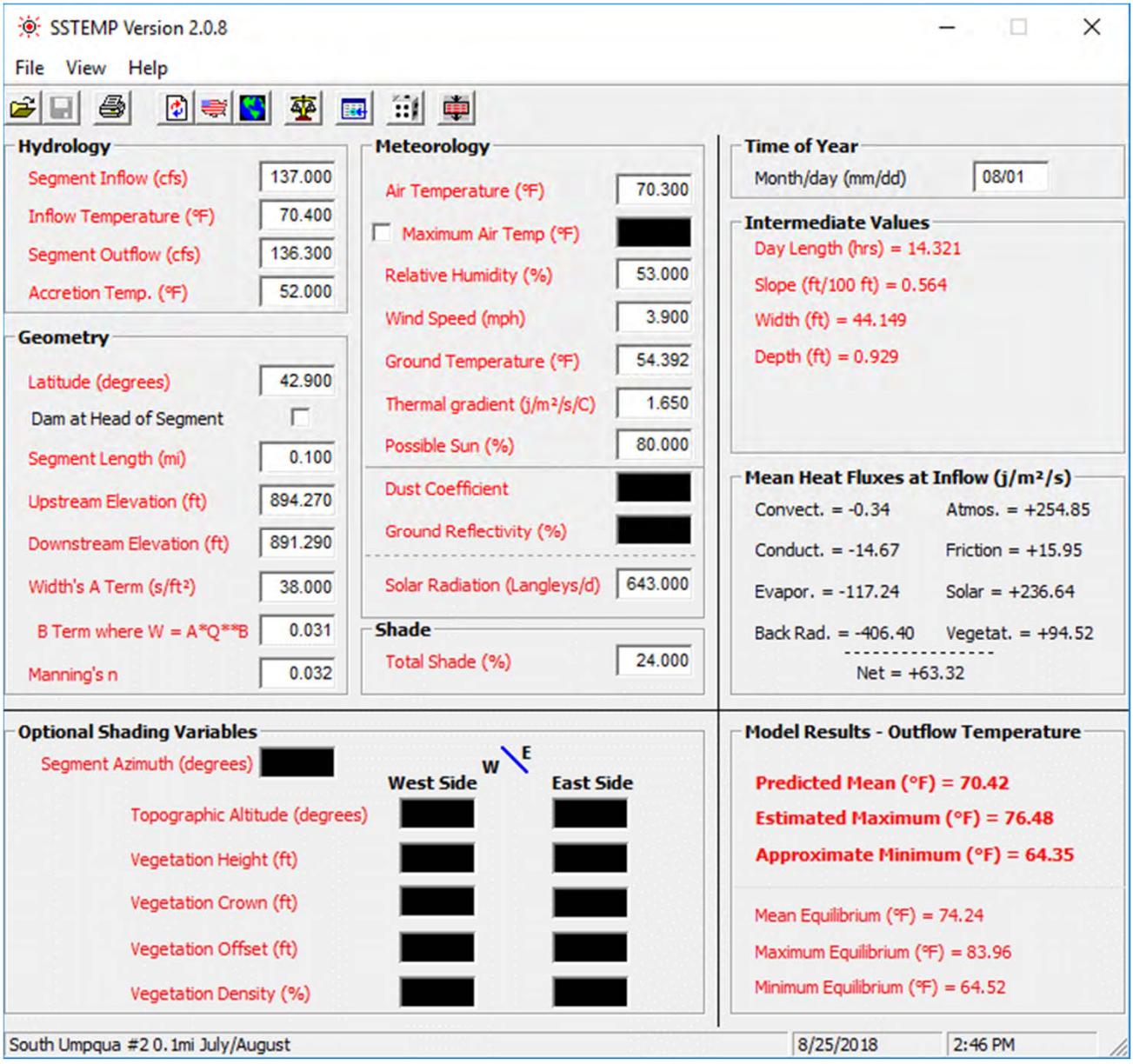
Figure 13

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
South Umpqua #2 0.1 mi July/August

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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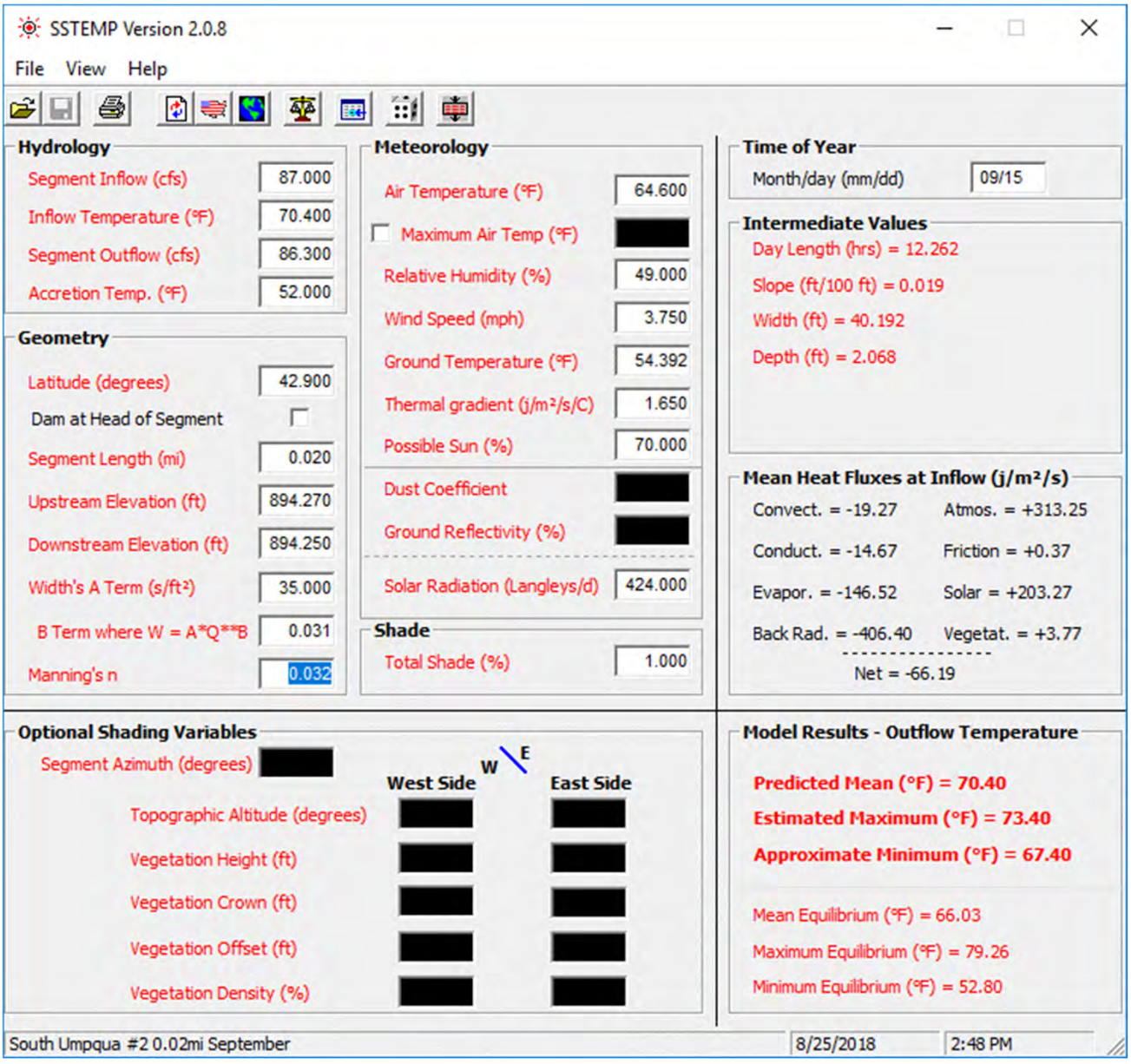
Figure 14

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output
South Umpqua #2 0.02 mi September

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

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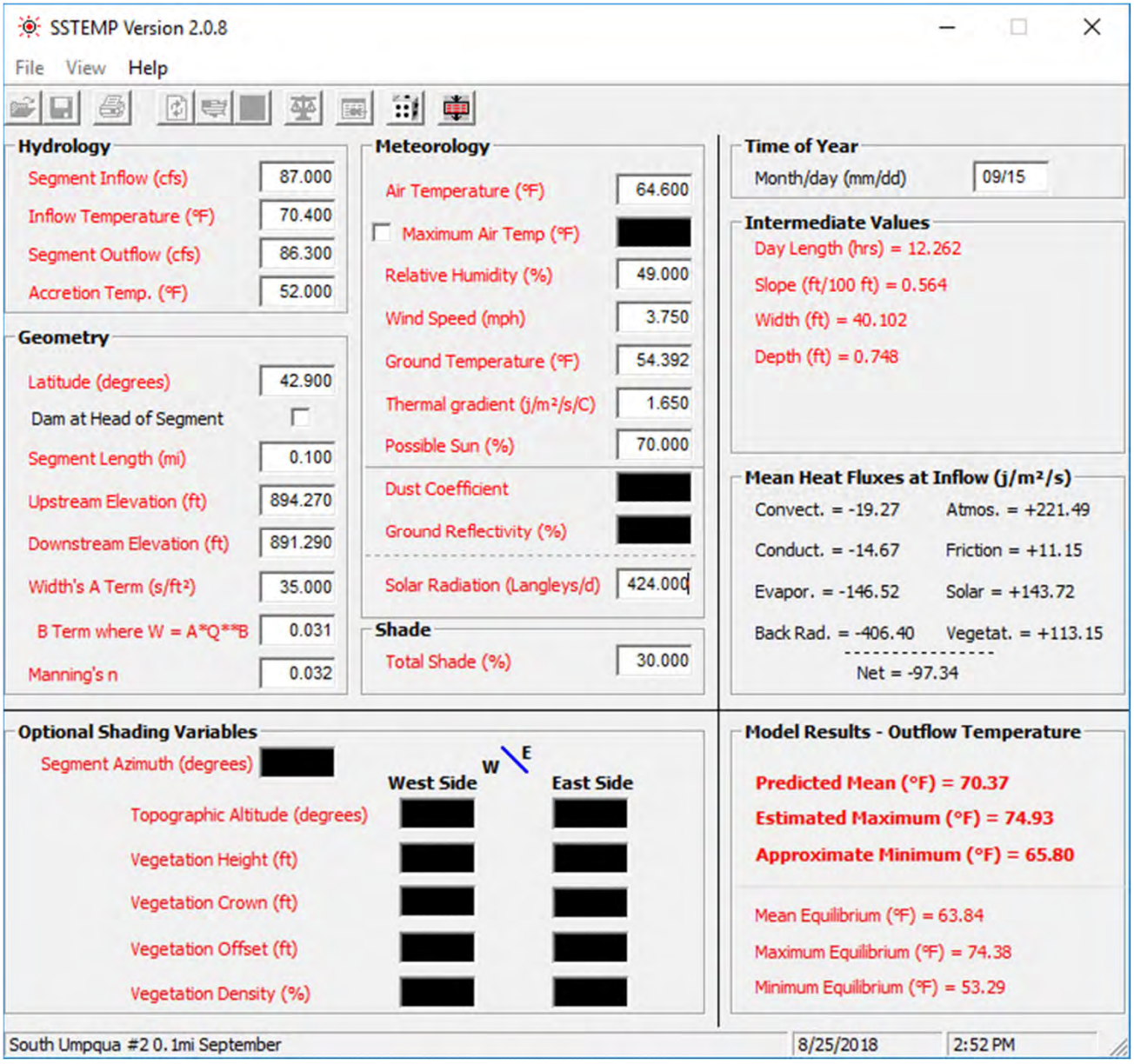
Figure 15

22708-001-00 Date Exported: 08/27/18

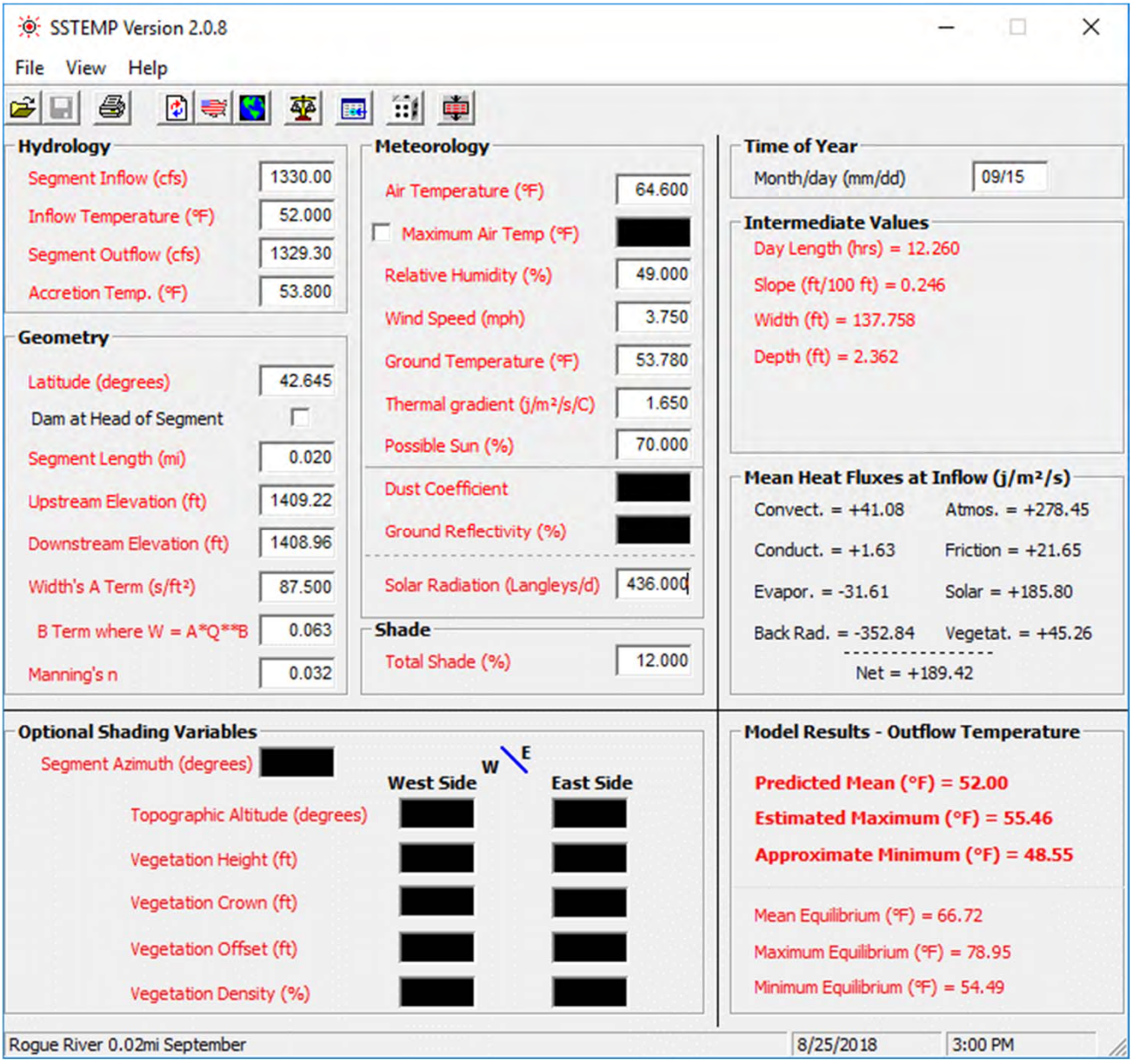


SSTEMP Model Output
South Umpqua #2 0.1 mi September

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 16



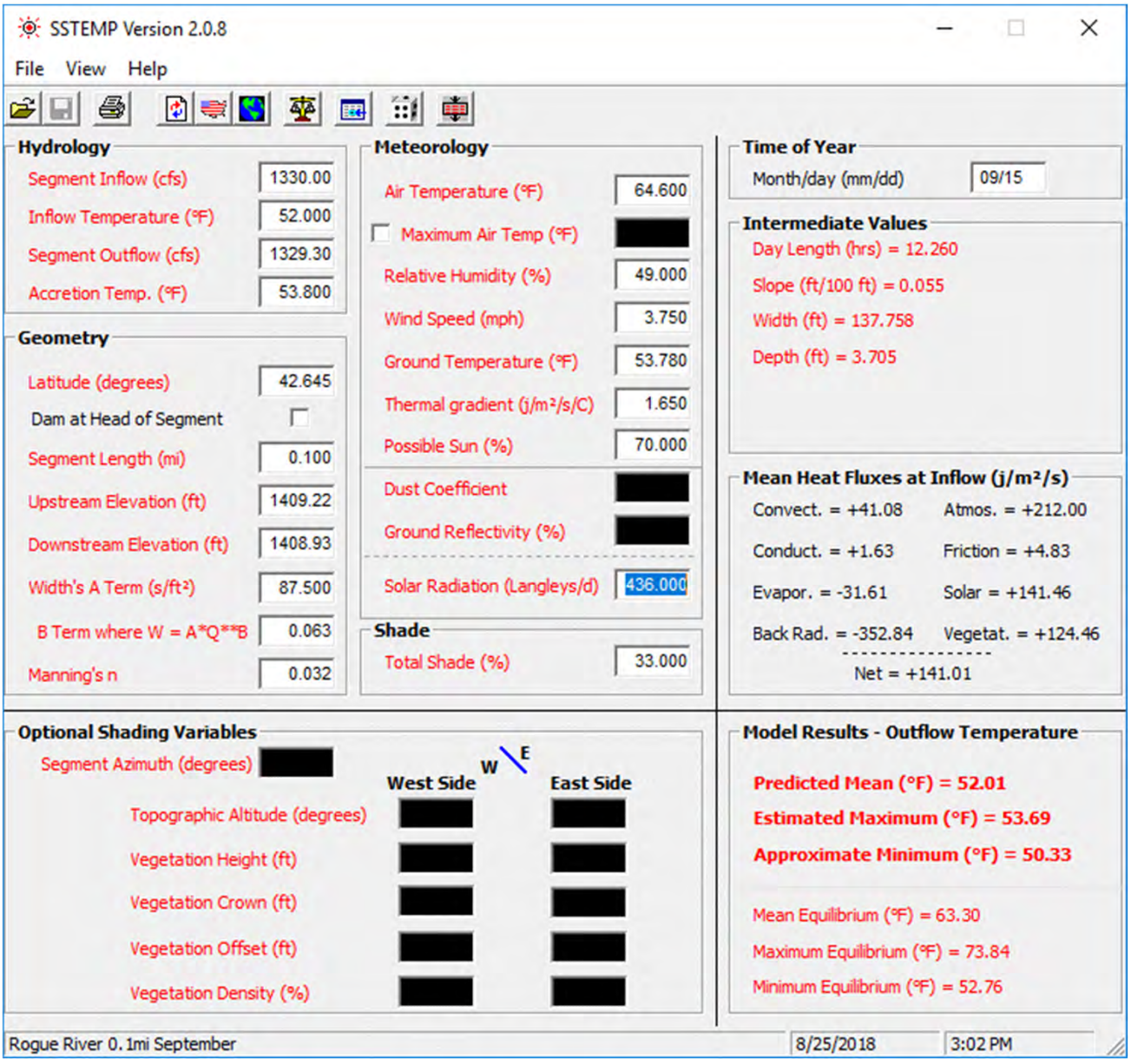
SSTEMP Model Output
Rogue River 0.02 mi September

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 17

22708-001-00 Date Exported: 08/27/18



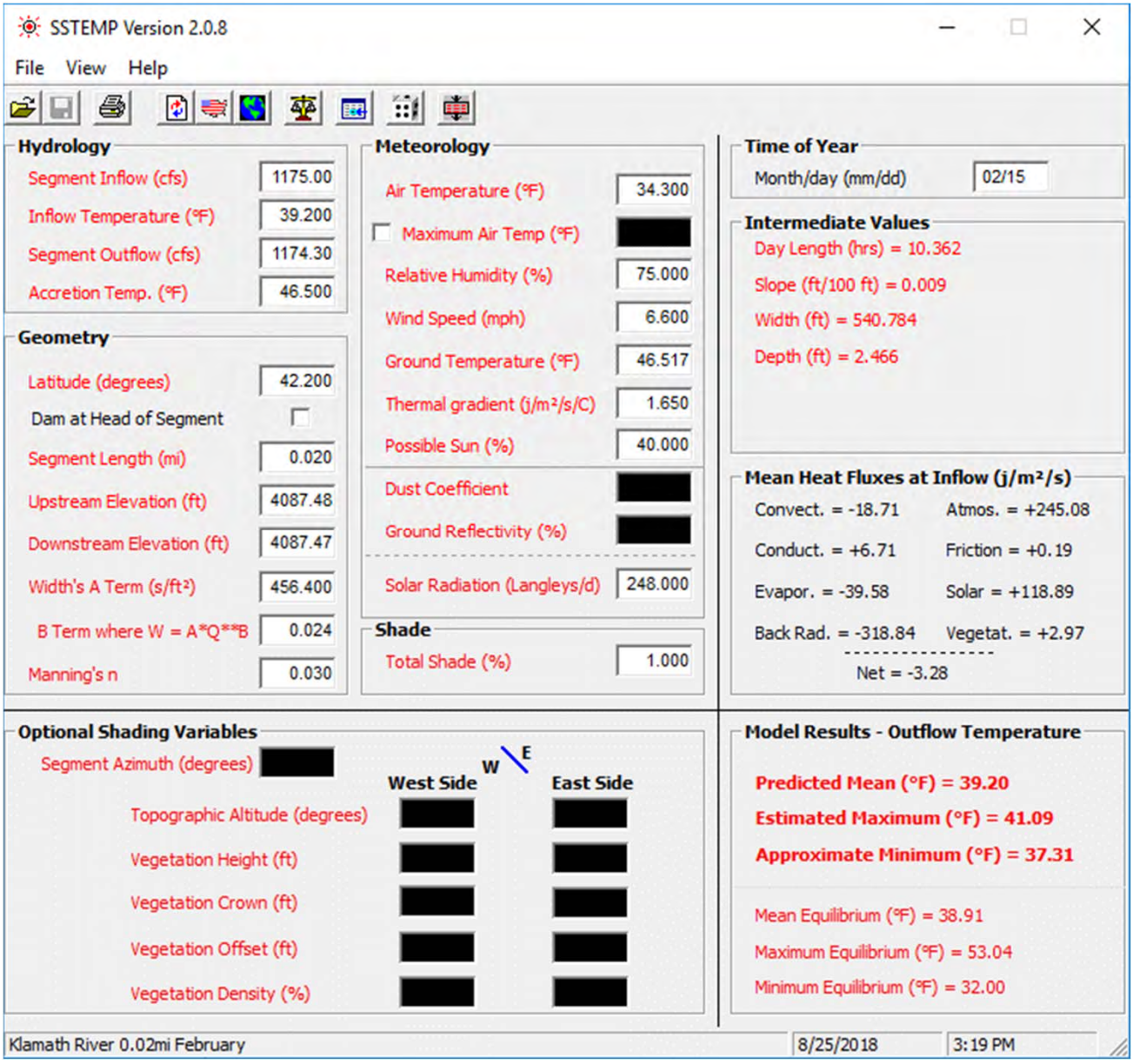
SSTEMP Model Output
Rogue River 0.1 mi September

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 18

22708-001-00 Date Exported: 08/27/18



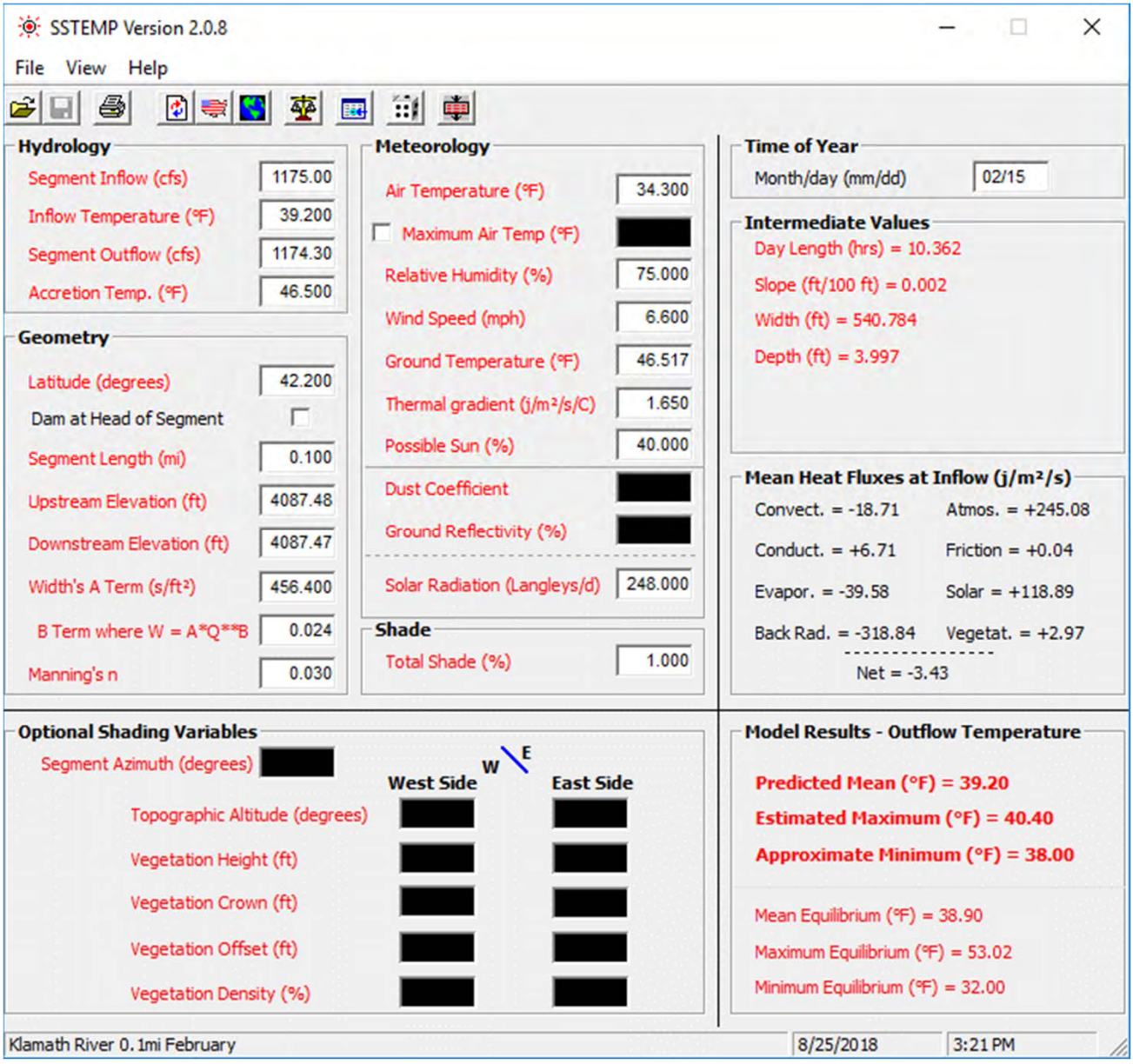
SSTEMP Model Output
Klamath River 0.02 mi February

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 19

22708-001-00 Date Exported: 08/27/18



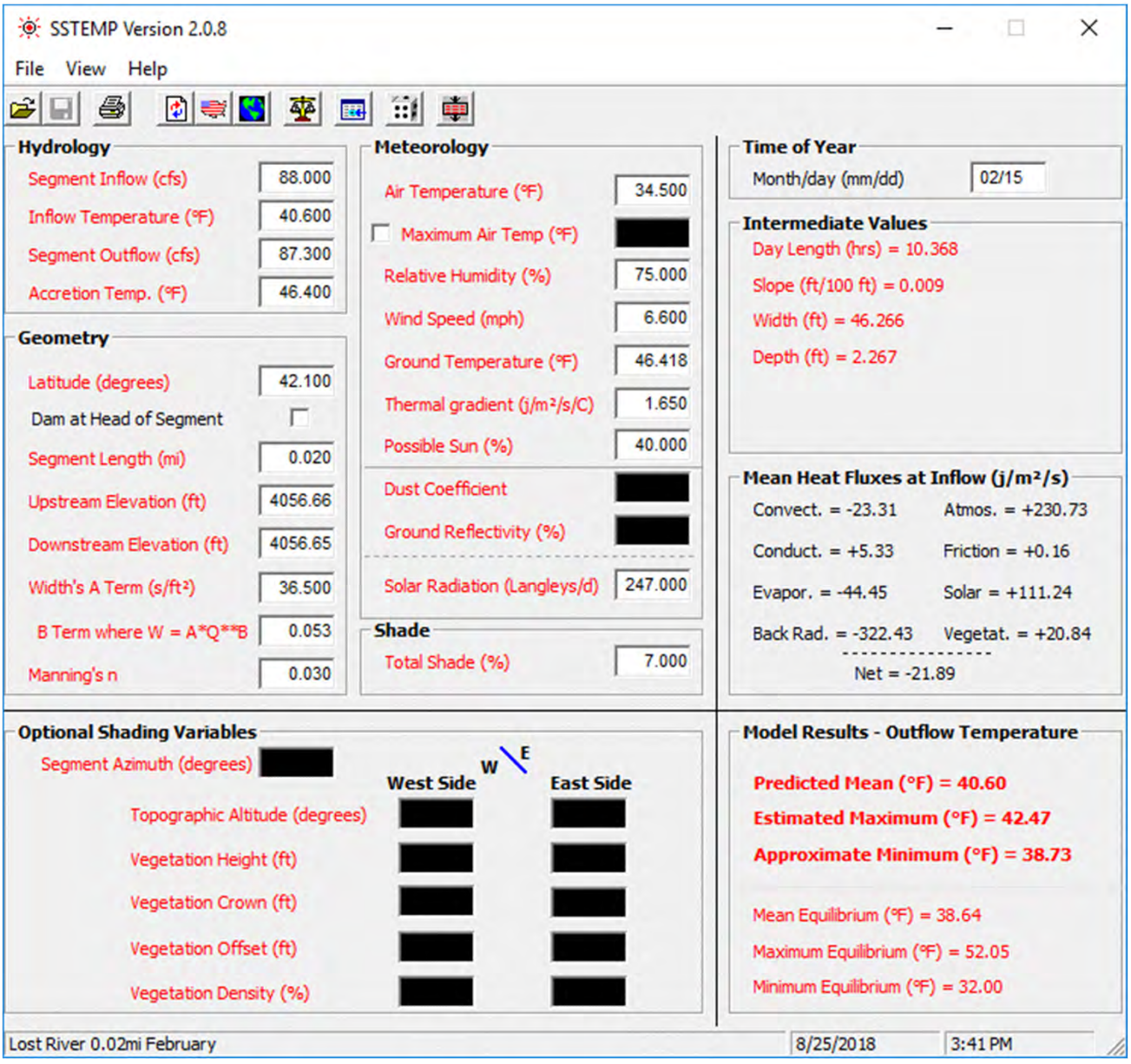
SSTEMP Model Output
Klamath River 0.1 mi February

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 20

22708-001-00 Date Exported: 08/27/18



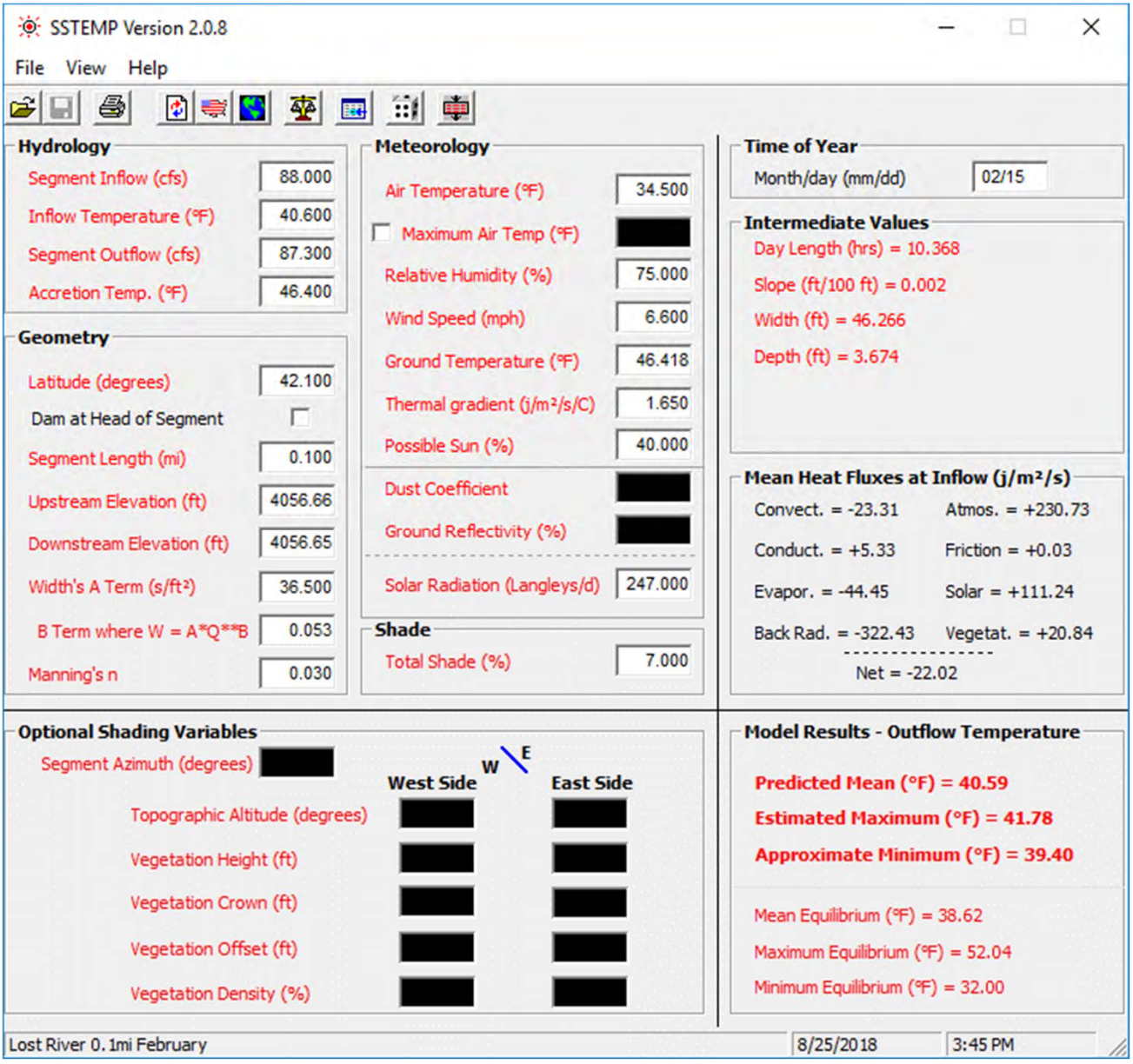
SSTEMP Model Output
Lost River 0.02 mi February

Pacific Connector Gas Pipeline
Malin to Jordan Cove, Oregon

GeoEngineers

Figure 21

22708-001-00 Date Exported: 08/27/18



SSTEMP Model Output Lost River 0.1 mi February
Pacific Connector Gas Pipeline Malin to Jordan Cove, Oregon
GeoEngineers — Figure 22

Attachment F

Hydrostatic Test Water Withdrawal Hydrologic Assessment

Technical Memorandum

Date: July 9, 2018

To: Trevor Hoyles-GeoEngineers; Dan Duce-Edge Environmental; Mike Warson, Jordan Cove Energy; Trey Broughton, Ensite USA.

From: Jonathan Ambrose, Principal Hydrologist

RE: **Pacific Connector Gas Pipeline-Hydrostatic Test Water Withdrawal Hydrologic Assessment**

1.0 Introduction

This memo presents the methods used to estimate the hydrologic impacts on streams and rivers as a result of water withdrawals for the purpose of hydrostatic testing of the Pacific Connector Gas Pipeline. This analysis was requested by Jordan Cove Energy and Ensite USA to support data requests from regulatory agencies raised during project permitting. Cardno is completing the analysis under contract to GeoEngineers.

2.0 Methods

Water withdrawals are proposed from water bodies along the PCGP alignment to conduct integrity tests on the pipeline prior to commencing operations. The locations and volumetric requirements of these hydrostatic test locations were provided to Cardno by Ensite USA. Only stream and river withdrawals were considered in this analysis. For this analysis, a pumping rate of 300 gallons per minute (gpm), or 0.67 cubic feet per second (cfs) was assumed for all water withdrawal locations.

To estimate the ambient stream flow, the State of Oregon module for the United States Geological Survey (USGS) Streamstats flow estimation software was utilized. Streamstats provides a variety of flow estimates for both gauged and ungauged streams. For Oregon, the analysis generally follows procedures developed by Cooper (2005) and Risley et al (2008). For ungauged locations, Streamstats calculates the necessary regression variable from which to estimate both peak flows and monthly flow statistics. See https://water.usgs.gov/osw/streamstats/appinfo/OR_ss_appinfo.html for detailed information on the algorithm and data supporting the analysis. For this analysis, flow estimates were made for the 50% exceedance flow during the expected month(s) of water withdrawals. For sites where the expected withdrawals are expected to occur during two different months, the 50% exceedance flow from each month was calculated and averaged.

3.0 Results

The results of the analysis are presented in the attached Table 1. Table 1 presents the following data:

- Alignment/Spread Location
- Pump Rate (assumed 300 gpm for all sites)

- Total Estimated Volume Needs
- Water Source Name
- Water Source Milepost Intersection
- Water Source Basin Area
- Reference Gage (if applicable)
- Reference Gage Basin Area (if applicable)
- Estimated Period of Use
- 50% Exceedance Flow for Reference Gage
- 50% Exceedance Flow for Water Source
- Adjusted Flow Based on Hydrostatic Test Water Use
- Estimated Flow Reduction Duration
- % Flow Reduction from Ambient

4.0 References

Cooper, Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon. USGS Scientific Investigations Report 2005-5116. Prepared in cooperation with the Oregon Water Resources Department, 2005.

Risley, Estimating Flow-Duration and Low-Flow Frequency Statistics for Unregulated Streams in Oregon, USGS Scientific Investigations Report 2008–5126, Revision 1.1. 2008

Streamstats, USGS <https://streamstats.usgs.gov/ss/>

5.0 Attachments

Streamstats Reports

Pacific Connector Gas Pipeline

Table 1. Hydrostatic Testing Water Requirements and Flow Impacts on Water Sources

Assumptions:

1. Water Sources and Volumes Provided by Ensight Engineering
2. Fill (diversion) locations provided in .kmz file by Ensight Engineering
3. Pump rate of 300 gallons per minute
4. Streamstats reports provided separately

Alignment Location	Pump Rate (gallons per minute)	Pump Rate (cfs)	Total Estimated Volume Needs (gallons)	Water Source Name	Water Source MP Intersection (MP)	Water Source Basin Area (sq miles)	Reference Gage	Reference Gage Basin Area (sq miles)	Esimated Time of Use (month)	50% Exceedance Flow for Reference Gage (cfs)	50% Exceedance Flow for Water Source (cfs)	Adjusted Flow Based on Hydrostatic Test Water Use (cfs)	Estimated Flow Reduction Duration (days)	% Flow Reduction
Spread 1	300	0.67	2,800,000	Coos River	11.08	400	streamstats	n/a	October	n/a	131	130.3	6.5	0.51%
Spread 1	300	0.67	2,800,000	EF Coquille River	29.64	101	streamstats	n/a	October	n/a	27.4	26.7	6.5	2.44%
Spread 2	300	0.67	2,500,000	EF Coquille River	29.64	101	streamstats	n/a	October	n/a	27.4	26.7	5.8	2.44%
Spread 2	300	0.67	2,500,000	MF Coquille River	50.28	17.5	streamstats	n/a	October	n/a	1.91	1.2	5.8	35.06%
Spread 3	300	0.67	4,000,000	Olalla Creek	58.79	68	streamstats	n/a	June/July	n/a	9.25	8.6	9.3	7.24%
Spread 3	300	0.67	4,000,000	S. Umpqua River	71.25	1410	streamstats	n/a	June/July	n/a	642	641.3	9.3	0.10%
Spread 4	300	0.67	2,800,000	S. Umpqua River	71.25	1410	streamstats	n/a	July/Aug	n/a	268	267.3	6.5	0.25%
Spread 4	300	0.67	2,800,000	S. Umpqua River	94.70	571	streamstats	n/a	July/Aug	n/a	137	136.3	6.5	0.49%
Spread 5a	300	0.67	2,500,000	S. Umpqua River	94.70	571	streamstats	n/a	Sept	n/a	87	86.3	5.8	0.77%
Spread 5b	300	0.67	2,800,000	Rogue River	122.80	1090	streamstats	n/a	Sept	n/a	1330	1329.3	6.5	0.05%
Spread 7	300	0.67	4,800,000	Klamath River	199.20	___	USGS 11509500	3920	February	1175	1175	1174.3	11.1	0.06%
Spread 7	300	0.67	4,800,000	Lost River	212.00	1350	streamstats	n/a	February	n/a	88	87.3	11.1	0.76%

Primary Water Source

Secondary Water Source

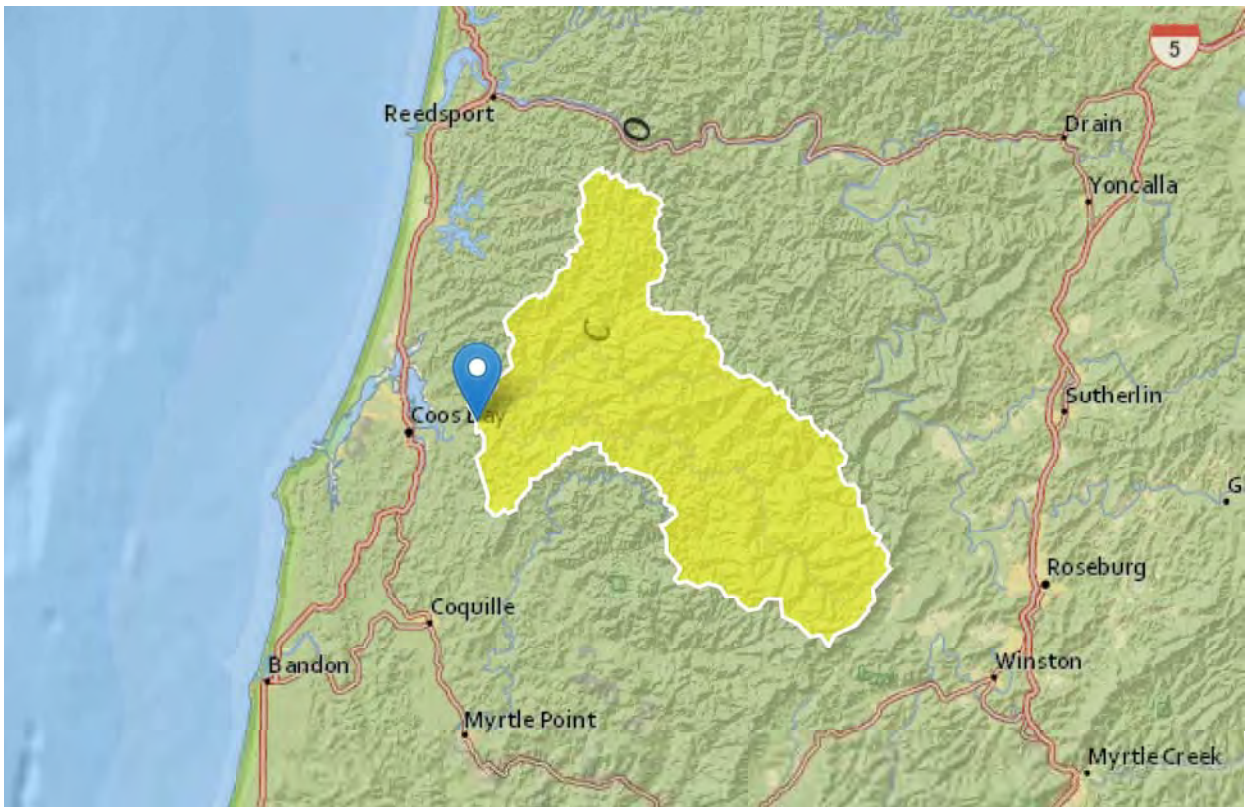
*Klamath River Flow Estimate Based on Mean of February Monthly Means (2000-2017) at USGS Gage 11509500

Analysis completed by:

Jonathan Ambrose, Principal Hydrologist
Cardno

StreamStats Report-Coos River Hydrostatic Test Location October Data

Region ID: OR
Workspace ID: OR20180705210824312000
Clicked Point (Latitude, Longitude): 43.37798, -124.12459
Time: 2018-07-05 14:08:40 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	404	square miles
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	60.6	degrees F
PRECIP	Mean Annual Precipitation	76.9	inches

Parameter Code	Parameter Description	Value	Unit
WATCAPORR	Available water capacity from STATSGO data using methods from SIR 2008-5126	0.13	inch per inch

October Flow-Duration Statistics Parameters [100 Percent (404 square miles) LowFlow Oct Region10 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	404	square miles	6.282	3938.2
MAXTEMP	Mean Annual Max Temperature	60.6	degrees F	57.475	65.111
PRECIP	Mean Annual Precipitation	76.9	inches	37.0618	121.96
WATCAPORR	Available_Water_Capacity_OR_Risley	0.13	inch per inch	0.073	0.167

October Flow-Duration Statistics Flow Report [100 Percent (404 square miles) LowFlow Oct Region10 2008 5126]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu
October 5 Percent Duration	1320	ft^3/s	678	2310
October 10 Percent Duration	757	ft^3/s	393	1320
October 25 Percent Duration	298	ft^3/s	145	540
October 50 Percent Duration	131	ft^3/s	52.7	271
October 95 Percent Duration	51.3	ft^3/s	15.6	125

October Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

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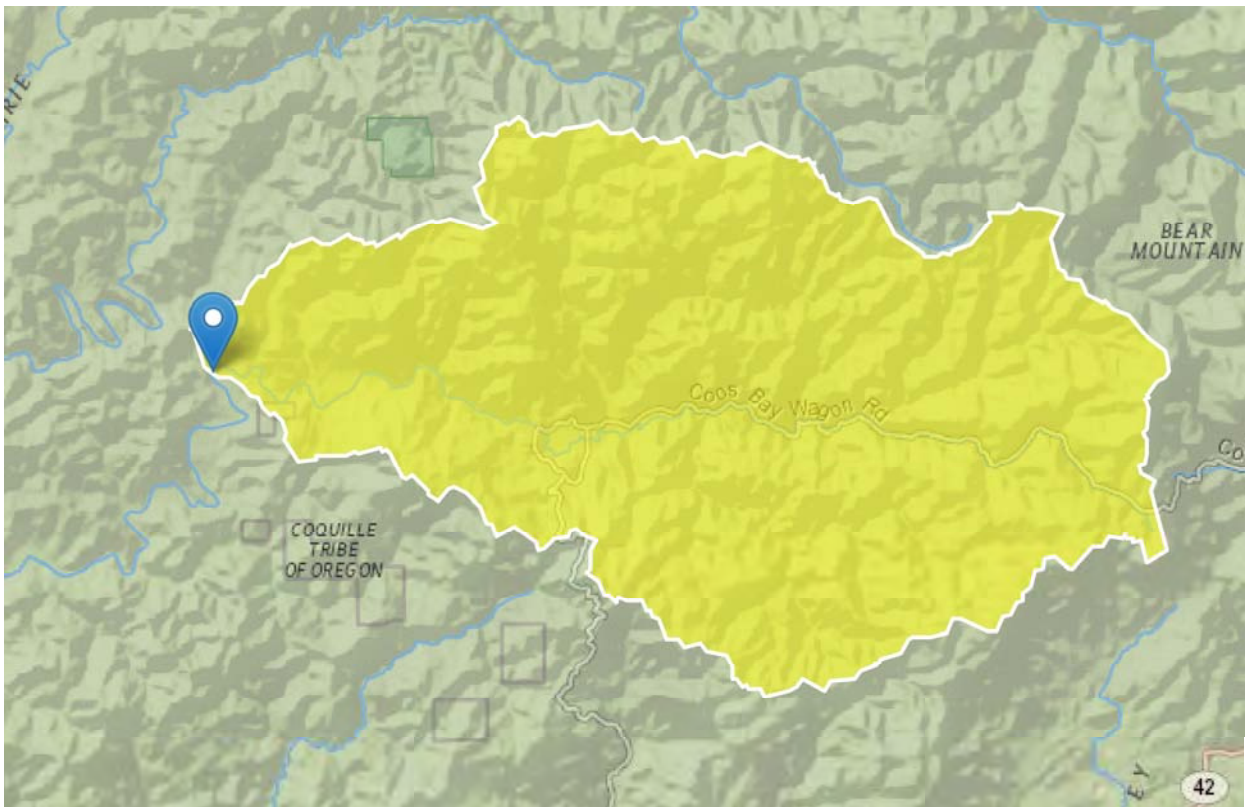
Application Version: 4.2.1

StreamStats Report-EF Coquille at Hydrostatic Test Location October Data

Region ID: OR
Workspace ID: OR20180705224016927000
Clicked Point (Latitude, Longitude): 43.16017, -123.99480
Time: 2018-07-05 15:40:33 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	101	square miles
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	60.3	degrees F
PRECIP	Mean Annual Precipitation	80.8	inches

Parameter Code	Parameter Description	Value	Unit
WATCAPORR	Available water capacity from STATSGO data using methods from SIR 2008-5126	0.12	inch per inch
JANMAXTMP	Mean Maximum January Temperature	46.5	degrees F
MINBELEV	Minimum basin elevation	73.5	feet
OR_HIPERMG	Percent basin surface area containing high permeability geologic units as defined in SIR 2008-5126	0	percent

October Flow-Duration Statistics Parameters [100 Percent (101 square miles) LowFlow Oct Region10 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	101	square miles	6.282	3938.2
MAXTEMP	Mean Annual Max Temperature	60.3	degrees F	57.475	65.111
PRECIP	Mean Annual Precipitation	80.8	inches	37.0618	121.96
WATCAPORR	Available_Water_Capacity_OR_Risley	0.12	inch per inch	0.073	0.167

October Flow-Duration Statistics Flow Report [100 Percent (101 square miles) LowFlow Oct Region10 2008 5126]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	Plu
October 5 Percent Duration	355	ft^3/s	183	616
October 10 Percent Duration	190	ft^3/s	99	327
October 25 Percent Duration	69.1	ft^3/s	33.9	124
October 50 Percent Duration	27.4	ft^3/s	11.1	56
October 95 Percent Duration	10.1	ft^3/s	3.15	24.1

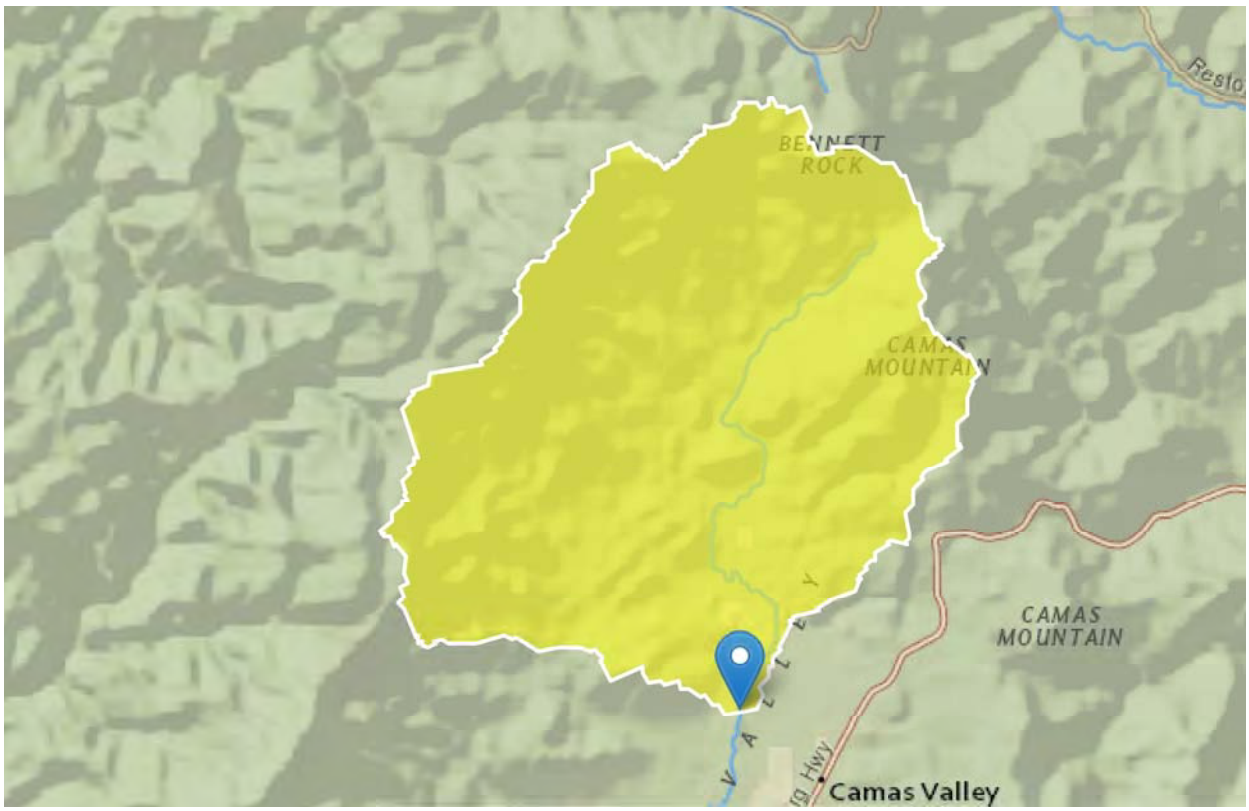
October Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

Application Version: 4.2.1

StreamStats Report MF Coquille Hydrostatic Test Location, Oct Stats

Region ID: OR
Workspace ID: OR20180705232314562000
Clicked Point (Latitude, Longitude): 43.04283, -123.68772
Time: 2018-07-05 16:23:30 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	17.4	square miles
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	60.7	degrees F
PRECIP	Mean Annual Precipitation	54.8	inches

Parameter Code	Parameter Description	Value	Unit
WATCAPORR	Available water capacity from STATSGO data using methods from SIR 2008-5126	0.14	inch per inch

October Flow-Duration Statistics Parameters [100 Percent (17.4 square miles) LowFlow Oct Region10 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	17.4	square miles	6.282	3938.2
MAXTEMP	Mean Annual Max Temperature	60.7	degrees F	57.475	65.111
PRECIP	Mean Annual Precipitation	54.8	inches	37.0618	121.96
WATCAPORR	Available_Water_Capacity_OR_Risley	0.14	inch per inch	0.073	0.167

October Flow-Duration Statistics Flow Report [100 Percent (17.4 square miles) LowFlow Oct Region10 2008 5126]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	Plu
October 5 Percent Duration	21.3	ft^3/s	10.8	37.4
October 10 Percent Duration	10.4	ft^3/s	5.37	18.2
October 25 Percent Duration	3.86	ft^3/s	1.87	7.05
October 50 Percent Duration	1.91	ft^3/s	0.751	4.02
October 95 Percent Duration	0.322	ft^3/s	0.0952	0.806

October Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

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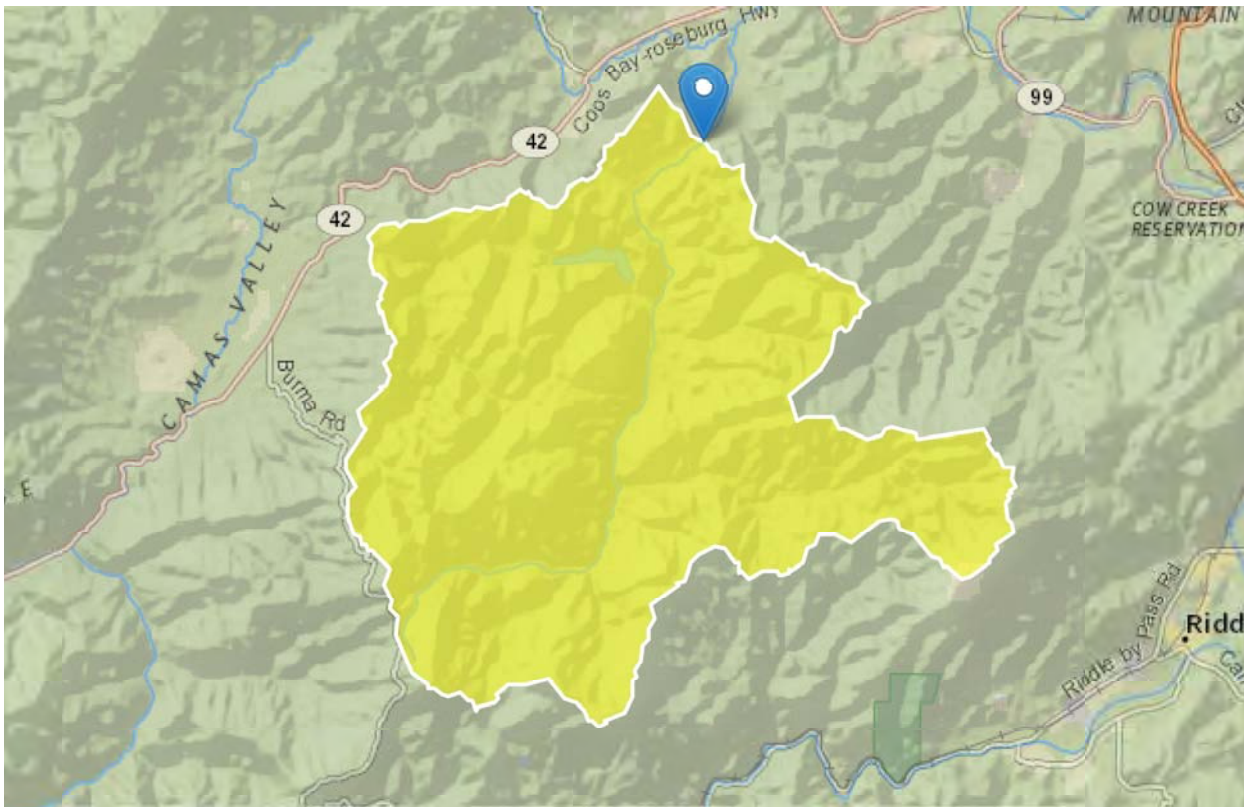
Application Version: 4.2.1

StreamStats Report-Olalla Creek Hydrostatic Test Location, June/July Flows

Region ID: OR
Workspace ID: OR20180706183536478000
Clicked Point (Latitude, Longitude): 43.07542, -123.53057
Time: 2018-07-06 11:36:00 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	67.9	square miles
OR_HIPERMG	Percent basin surface area containing high permeability geologic units as defined in SIR 2008-5126	0	percent
PRECIP	Mean Annual Precipitation	44.7	inches

Parameter Code	Parameter Description	Value	Unit
ELEVMAX	Maximum basin elevation	3490	feet
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	62.6	degrees F
SOILPERM	Average Soil Permeability	1.61	inches per hour
DRNDENSITY	Basin drainage density defined as total stream length divided by drainage area.	0.65	dimensionless

July Flow-Duration Statistics Parameters [100 Percent (67.9 square miles) LowFlow Jul Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	67.9	square miles	8.061	2456.37
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
PRECIP	Mean Annual Precipitation	44.7	inches	33.6853	75.8026
ELEVMAX	Maximum Basin Elevation	3490	feet	1938.2508	9470.18
MAXTEMP	Mean Annual Max Temperature	62.6	degrees F	54.146	64.948

July Flow-Duration Statistics Flow Report [100 Percent (67.9 square miles) LowFlow Jul Region09 2008 5126]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu
July 5 Percent Duration	13.8	ft^3/s	5.63	28.1
July 10 Percent Duration	11.5	ft^3/s	4.8	23.3
July 25 Percent Duration	8.66	ft^3/s	3.44	17.9

Statistic	Value	Unit	PII	PIu
July 50 Percent Duration	6.69	ft^3/s	2.34	15
July 95 Percent Duration	4.6	ft^3/s	1.71	9.84

July Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

June Flow-Duration Statistics Parameters [100 Percent (67.9 square miles) LowFlow Jun Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	67.9	square miles	8.061	2456.37
PRECIP	Mean Annual Precipitation	44.7	inches	33.6853	75.8026
SOILPERM	Average Soil Permeability	1.61	inches per hour	0.914	5.087
ELEVMAX	Maximum Basin Elevation	3490	feet	3180.0436	9470.18
DRNDENSITY	Basin Drainage Density	0.65	dimensionless	0.465	0.819

June Flow-Duration Statistics Flow Report [100 Percent (67.9 square miles) LowFlow Jun Region09 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
June 5 Percent Duration	33.8	ft^3/s	14.2	68.2
June 10 Percent Duration	25.3	ft^3/s	11.1	49.2
June 25 Percent Duration	17.4	ft^3/s	4.39	59.5
June 50 Percent Duration	11.8	ft^3/s	4.91	23.8
June 95 Percent Duration	4.56	ft^3/s	1.86	9.25

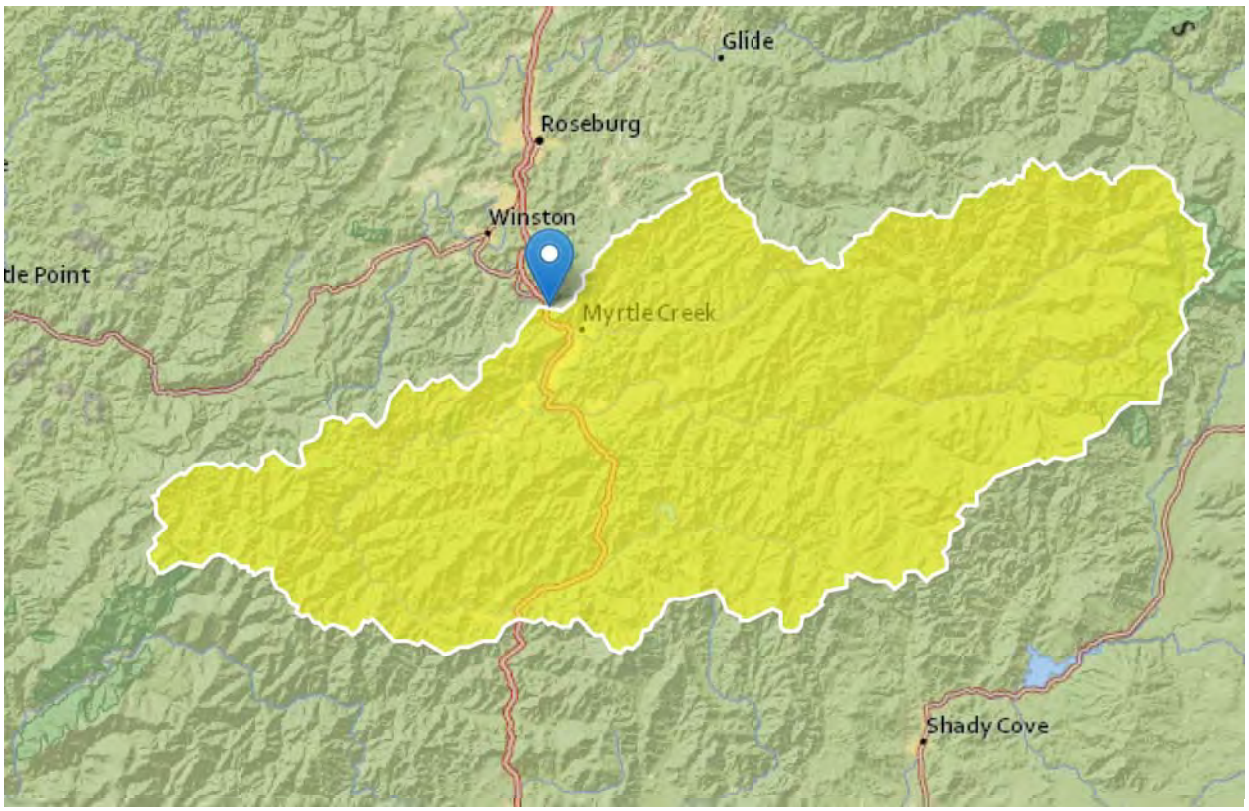
June Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

Application Version: 4.2.1

StreamStats Report-S Umpqua Hydrostatioc Test Location, June July August Stats

Region ID: OR
Workspace ID: OR20180706185837863000
Clicked Point (Latitude, Longitude): 43.04725, -123.32927
Time: 2018-07-06 11:58:57 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1410	square miles
OR_HIPERMG	Percent basin surface area containing high permeability geologic units as defined in SIR 2008-5126	0	percent
PRECIP	Mean Annual Precipitation	46.1	inches

Parameter Code	Parameter Description	Value	Unit
ELEVMAX	Maximum basin elevation	6770	feet
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	62.7	degrees F
SOILPERM	Average Soil Permeability	1.99	inches per hour
DRNDENSITY	Basin drainage density defined as total stream length divided by drainage area.	0.67	dimensionless

July Flow-Duration Statistics Parameters [100 Percent (1410 square miles) LowFlow Jul Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1410	square miles	8.061	2456.37
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
PRECIP	Mean Annual Precipitation	46.1	inches	33.6853	75.8026
ELEVMAX	Maximum Basin Elevation	6770	feet	1938.2508	9470.18
MAXTEMP	Mean Annual Max Temperature	62.7	degrees F	54.146	64.948

July Flow-Duration Statistics Flow Report [100 Percent (1410 square miles) LowFlow Jul Region09 2008 5126]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu
July 5 Percent Duration	839	ft^3/s	341	1730
July 10 Percent Duration	662	ft^3/s	273	1350
July 25 Percent Duration	464	ft^3/s	183	969

Statistic	Value	Unit	PIl	Plu
July 50 Percent Duration	344	ft^3/s	119	781
July 95 Percent Duration	214	ft^3/s	77.2	470

July Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

June Flow-Duration Statistics Parameters [100 Percent (1410 square miles) LowFlow Jun Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1410	square miles	8.061	2456.37
PRECIP	Mean Annual Precipitation	46.1	inches	33.6853	75.8026
SOILPERM	Average Soil Permeability	1.99	inches per hour	0.914	5.087
ELEVMAX	Maximum Basin Elevation	6770	feet	3180.0436	9470.18
DRNDENSITY	Basin Drainage Density	0.67	dimensionless	0.465	0.819

June Flow-Duration Statistics Flow Report [100 Percent (1410 square miles) LowFlow Jun Region09 2008 5126]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	Plu
June 5 Percent Duration	2510	ft^3/s	1060	5010
June 10 Percent Duration	2000	ft^3/s	889	3850
June 25 Percent Duration	1370	ft^3/s	609	2640
June 50 Percent Duration	940	ft^3/s	395	1880
June 95 Percent Duration	431	ft^3/s	177	869

June Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

August Flow-Duration Statistics Parameters [100 Percent (1410 square miles) LowFlow Aug Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1410	square miles	8.061	2050.193
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
PRECIP	Mean Annual Precipitation	46.1	inches	33.6853	75.8026
ELEVMAX	Maximum Basin Elevation	6770	feet	1938.2508	9470.18

August Flow-Duration Statistics Flow Report [100 Percent (1410 square miles) LowFlow Aug Region09 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
August 5 Percent Duration	353	ft^3/s	136	756
August 10 Percent Duration	306	ft^3/s	112	676
August 25 Percent Duration	243	ft^3/s	82.1	566
August 50 Percent Duration	202	ft^3/s	53.2	544
August 95 Percent Duration	138	ft^3/s	41.4	342

August Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

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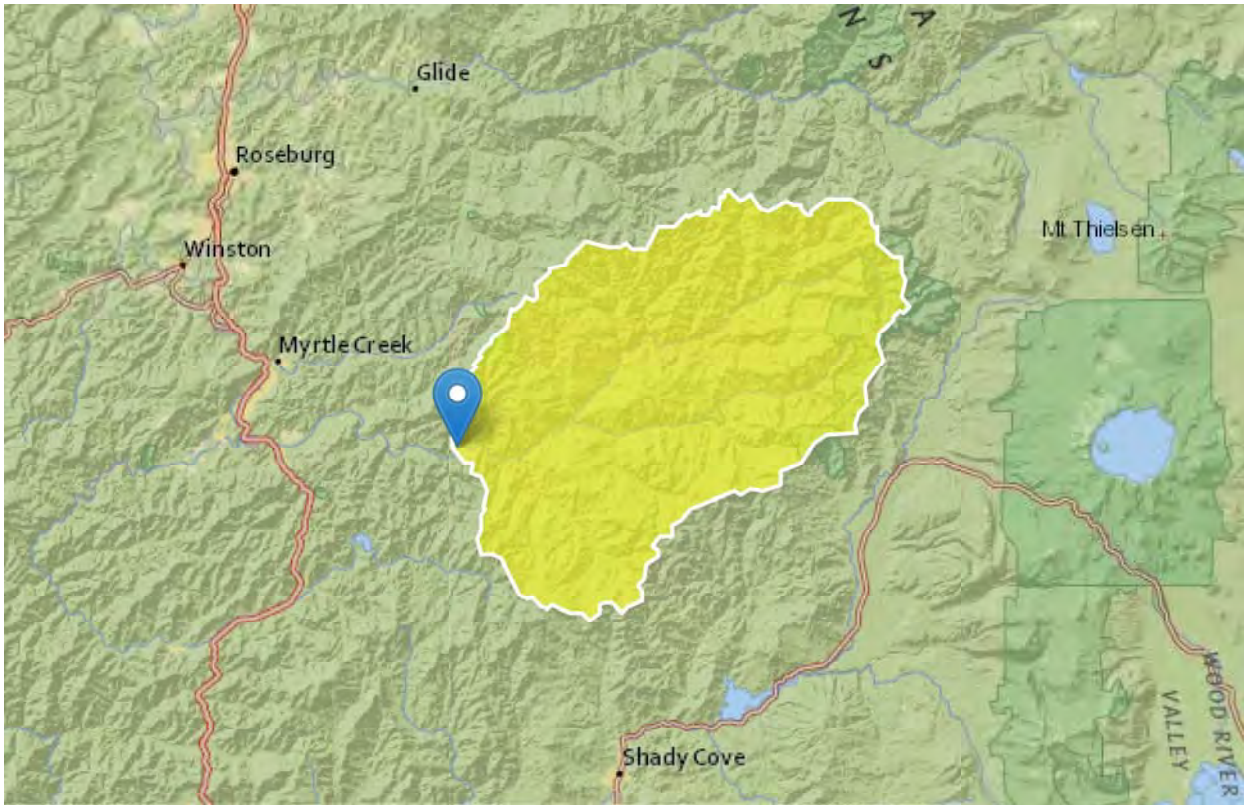
Application Version: 4.2.1

StreamStats Report-SF Umpqua MP 94 Hydrostatic Test Location, July Aug Sep Flow Stats

Region ID: OR
Workspace ID: OR20180706194628066000
Clicked Point (Latitude, Longitude): 42.93799, -123.03786
Time: 2018-07-06 12:46:44 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	571	square miles

Parameter Code	Parameter Description	Value	Unit
OR_HIPERMG	Percent basin surface area containing high permeability geologic units as defined in SIR 2008-5126	0	percent
PRECIP	Mean Annual Precipitation	49.9	inches
ELEVMAX	Maximum basin elevation	6770	feet
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	61.7	degrees F
IMPERV	Percentage of impervious area	0	percent

July Flow-Duration Statistics Parameters [LowFlow Jul Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	571	square miles	8.061	2456.37
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
PRECIP	Mean Annual Precipitation	49.9	inches	33.6853	75.8026
ELEVMAX	Maximum Basin Elevation	6770	feet	1938.2508	9470.18
MAXTEMP	Mean Annual Max Temperature	61.7	degrees F	54.146	64.948

July Flow-Duration Statistics Flow Report [LowFlow Jul Region09 2008 5126]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu
July 5 Percent Duration	424	ft^3/s	175	857
July 10 Percent Duration	336	ft^3/s	141	672
July 25 Percent Duration	235	ft^3/s	94.3	482

Statistic	Value	Unit	PII	PIu
July 50 Percent Duration	173	ft^3/s	61.2	384
July 95 Percent Duration	98.9	ft^3/s	36.4	213

July Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

September Flow-Duration Statistics Parameters [LowFlow Sep Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	571	square miles	8.061	2050.193
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
IMPERV	Percent Impervious	0	percent	0	3.953
ELEVMAX	Maximum Basin Elevation	6770	feet	1938.2508	9470.18
MAXTEMP	Mean Annual Max Temperature	61.7	degrees F	54.146	64.948
PRECIP	Mean Annual Precipitation	49.9	inches	33.6853	75.8026

September Flow-Duration Statistics Flow Report [LowFlow Sep Region09 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
September 5 Percent Duration	249	ft^3/s	90.6	547
September 10 Percent Duration	180	ft^3/s	63.2	406
September 25 Percent Duration	128	ft^3/s	43.1	298

Statistic	Value	Unit	PII	PIu
September 50 Percent Duration	86.6	ft^3/s	23.1	230
September 95 Percent Duration	55.1	ft^3/s	21.2	117

September Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

August Flow-Duration Statistics Parameters [LowFlow Aug Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	571	square miles	8.061	2050.193
OR_HIPERMG	OR Percent HighPerm Geologic	0	percent	0	100
PRECIP	Mean Annual Precipitation	49.9	inches	33.6853	75.8026
ELEVMAX	Maximum Basin Elevation	6770	feet	1938.2508	9470.18

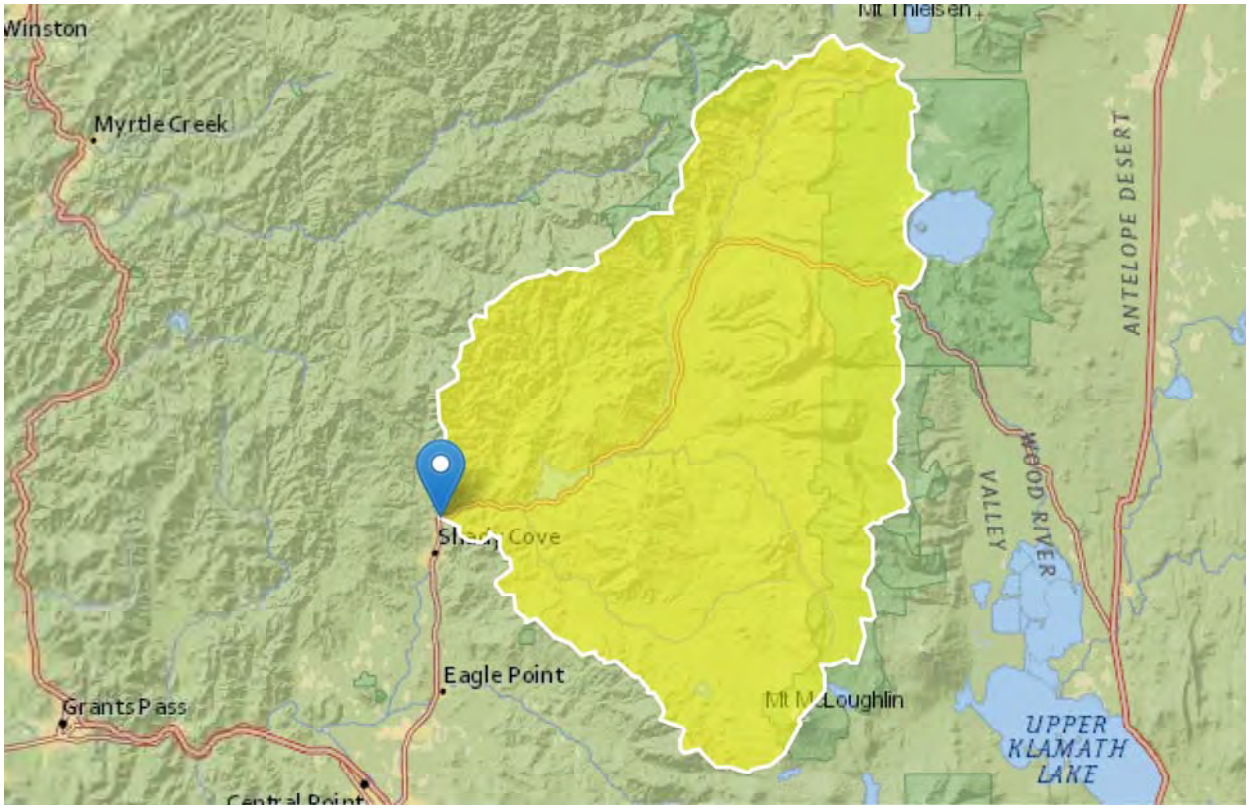
August Flow-Duration Statistics Flow Report [LowFlow Aug Region09 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
August 5 Percent Duration	179	ft^3/s	70.7	374
August 10 Percent Duration	154	ft^3/s	58.1	333
August 25 Percent Duration	122	ft^3/s	42.2	276
August 50 Percent Duration	101	ft^3/s	27.4	263
August 95 Percent Duration	66.1	ft^3/s	20.5	159

StreamStats Report-Rogue River Nr Shady Grove Hydrostatic Test Location, Sept Flow Stats

Region ID: OR
Workspace ID: OR20180706201013568000
Clicked Point (Latitude, Longitude): 42.64695, -122.80811
Time: 2018-07-06 13:10:29 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1090	square miles

Parameter Code	Parameter Description	Value	Unit
OR_HIPERMG	Percent basin surface area containing high permeability geologic units as defined in SIR 2008-5126	67.8	percent
IMPERV	Percentage of impervious area	0.0107	percent
ELEVMAX	Maximum basin elevation	9470	feet
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	58	degrees F
PRECIP	Mean Annual Precipitation	49.8	inches

September Flow-Duration Statistics Parameters [100 Percent (1090 square miles) LowFlow Sep Region09 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1090	square miles	8.061	2050.193
OR_HIPERMG	OR Percent HighPerm Geologic	67.8	percent	0	100
IMPERV	Percent Impervious	0.0107	percent	0	3.953
ELEVMAX	Maximum Basin Elevation	9470	feet	1938.2508	9470.18
MAXTEMP	Mean Annual Max Temperature	58	degrees F	54.146	64.948
PRECIP	Mean Annual Precipitation	49.8	inches	33.6853	75.8026

September Flow-Duration Statistics Flow Report [100 Percent (1090 square miles) LowFlow Sep Region09 2008 5126]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu
September 5 Percent Duration	1720	ft^3/s	626	3780
September 10 Percent Duration	1580	ft^3/s	554	3560

Statistic	Value	Unit	PII	PIu
September 25 Percent Duration	1410	ft^3/s	473	3270
September 50 Percent Duration	1330	ft^3/s	351	3560
September 95 Percent Duration	629	ft^3/s	239	1350

September Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

Application Version: 4.2.1

August Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

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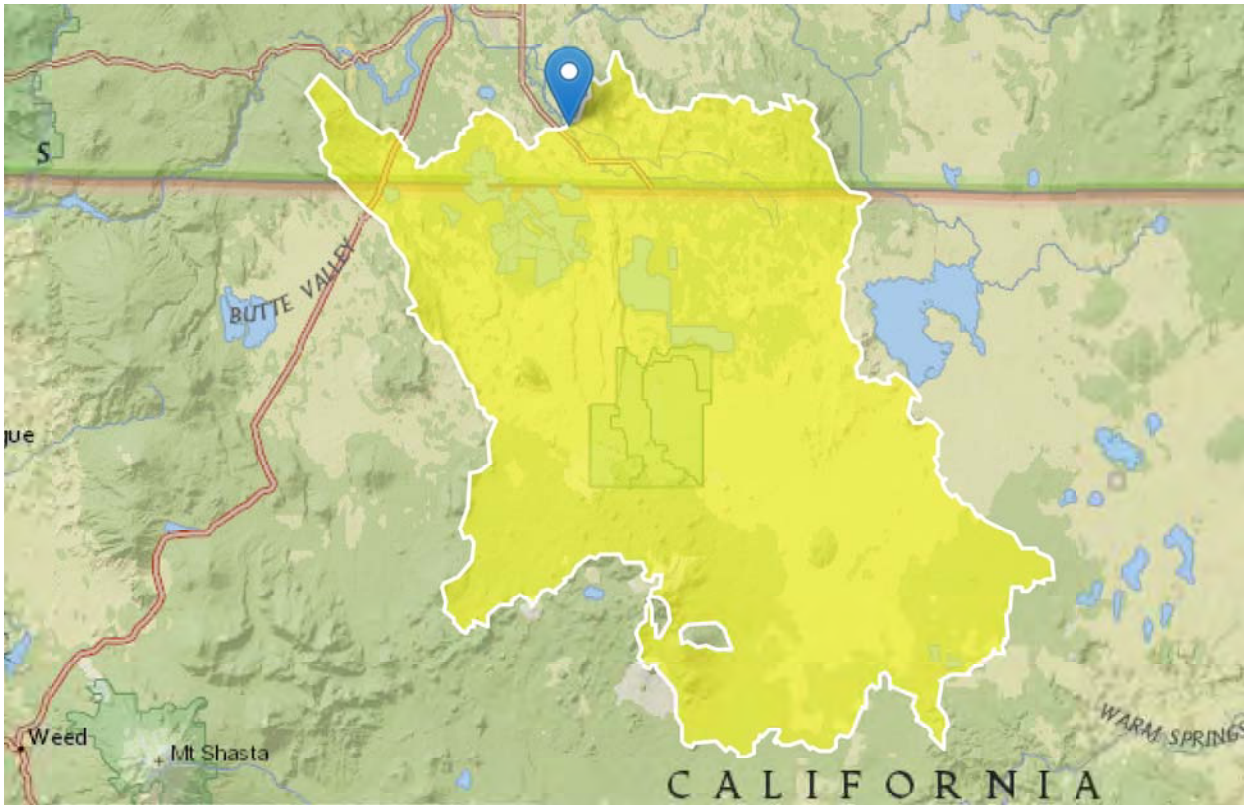
StreamStats Report-Lost River Hydrostatic Test Location, Feb Flow Stats

Region ID: OR
Workspace ID: OR20180706211205703000
Clicked Point (Latitude, Longitude): 42.05942, -121.63658
Time: 2018-07-06 14:12:24 -0700



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1350	square miles
PRECIP	Mean Annual Precipitation	16.7	inches
SOILPERM	Average Soil Permeability	2.56	inches per hour

February Flow-Duration Statistics Parameters [100 Percent (1350 square miles) LowFlow Feb Region08 2008 5126]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1350	square miles	18.324	677.22
PRECIP	Mean Annual Precipitation	16.7	inches	13.8701	80.1552
SOILPERM	Average Soil Permeability	2.56	inches per hour	0.904	15.467

February Flow-Duration Statistics Disclaimers [100 Percent (1350 square miles) LowFlow Feb Region08 2008 5126]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

February Flow-Duration Statistics Flow Report [100 Percent (1350 square miles) LowFlow Feb Region08 2008 5126]

Statistic	Value	Unit
February 5 Percent Duration	1780	ft^3/s
February 10 Percent Duration	935	ft^3/s
February 25 Percent Duration	233	ft^3/s
February 50 Percent Duration	88.4	ft^3/s
February 95 Percent Duration	38.7	ft^3/s

February Flow-Duration Statistics Citations

Risley, John, Stonewall, Adam, and Haluska, Tana,2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p. (http://pubs.usgs.gov/sir/2008/5126/)

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