

Weekly Assessment of CVP and SWP Delta Operations on ESA-listed Species

1. Executive Summary

a. Operations anticipated during the week

See Weekly Fish and Water Operation Outlook document for November 16 – November 22.

See Attachment A for DCC forecast (conducted 10/26/2021).

b. Winter-run Chinook Salmon

No loss of natural winter-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the State or Federal fish salvage facilities. Loss of natural winter-run Chinook Salmon at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities could possibly occur over the next week based on hydrology but is unlikely based on life history. 20-29% of juvenile natural winter-run Chinook Salmon from brood year (BY) 21 are estimated to be present in the Delta. The Delta Cross Channel (DCC) gates closure reduces exposure of winter-run Chinook Salmon juveniles that are present in the Sacramento River near the DCC gates into the interior Delta. The effects of DCC closure would be positive if juveniles are present. DCC gates closure has the potential to impact water quality.

c. Spring-run Chinook Salmon

There are no juvenile natural spring-run Chinook Salmon from BY 21 near the DCC gates; CV spring-run Chinook Salmon adults are building redds and spawning upstream. The exposure and effects of DCC closure are unlikely for natural spring-run Chinook Salmon. Length-at-date spring run were observed in the Delta, however there is the potential that they are late emerging winter run. Furthermore, larger, older juveniles were observed that may be yearling spring run. 0-3% young of year spring-run Chinook Salmon are estimated to be in the Delta.

d. Central Valley Steelhead

Loss of natural California CV (CCV) steelhead has not occurred in the past week at the State and Federal fish salvage facilities. Loss of Central Valley steelhead at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities could possibly occur over the next week. 1-5% of juvenile CCV Steelhead are estimated to be present in the Delta. DCC closure reduces exposure to Central Valley steelhead juveniles that are potentially present in the Sacramento River near the DCC gates. The effects of DCC gate closure are likely to be positive if juveniles CCV steelhead are present.

e. DCC gates recommendation

The DCC gates were closed 11/13/2021 and will remain closed until further notice for Knights Landing Catch Index (KLCI) threshold exceeded.

f. Delta Smelt

Based on distribution patterns over the past decade and rare detections in this water year, Delta Smelt are unlikely to be prevalent in the South Delta. Limited detection data support Delta Smelt being present in the Sacramento Deep Water Ship Channel and life history information support their presence downstream of the confluence of the Sacramento and San Joaquin Rivers. The last Delta Smelt observed was in the Sacramento Deep Water Shipping channel on 8/20/2021. The likelihood of Delta Smelt subadult entrainment is low due to seasonal timing.

First flush conditions are not anticipated to occur within the next seven days. The regulations for Integrated Early Winter Pulse Protection does not go into effect until 12/1/2021.

g. Monitoring Teams Summary

There were no non-consensus issues to report from Salmon Monitoring Team. There were no non-consensus issues to report from Smelt Monitoring Team.

2. Winter-Run Chinook Salmon

a. How much loss has occurred in the past week?

No loss of juvenile winter-run Chinook Salmon has occurred in the past week at the CVP and SWP fish salvage facilities.

b. What is the distribution of fish within the Delta?

On 11/16/2021 SaMT estimated 20-29% of juvenile winter-run Chinook Salmon were present in the Delta.

c. What is the exposure to winter-run Chinook Salmon due to DCC gate closure?

Juvenile winter-run Chinook Salmon have been observed this year near the DCC gates and historical monitoring data indicates that juvenile winter-run Chinook Salmon would be present in the Delta at this time. Closure of the DCC gates would reduce exposure and possible entrainment of juvenile winter-run Chinook Salmon into the Interior Delta via the DCC gates.

d. What are the effects to winter-run Chinook Salmon due to DCC gate closure?

Juvenile winter-run Chinook Salmon are present near the DCC gates and have been observed at Tisdale, Knights Landing, and Sacramento monitoring stations in the past week. Closure of the gates would positively impact present juvenile winter-run Chinook Salmon.

Supporting Information regarding Exposure of winter-run Chinook Salmon

Since 9/1/2021, the Glenn Colusa Irrigation District (GCID) rotary screw traps (RSTs) have observed over 125 winter-run Chinook Salmon juveniles (by length at date criteria) in their daily catches. Fish have been steadily arriving since the beginning of October. On 11/9/2021 the GCID cone was removed from the bypass channel due to anticipation of high water flows and was placed back in the water on 11/12/2021. Additionally, a log in the cone caused a trap malfunction on

11/16/2021

11/14/2021. Winter-run Chinook Salmon have been observed in RST monitoring locations farther downstream (Tisdale and Knights Landing) and the fish appear to no longer be holding in the middle reaches of the Sacramento River and are migrating downstream. Movement of winter-run Chinook Salmon juveniles into the lower reaches of the Sacramento River and upper Delta has occurred with recent precipitation events and increasing river flows and turbidity. Mill Creek and Deer Creek daily flows were recorded higher than 95 cfs over the past week.

Toxic runoff from the Dixie fire may impact the Deer and Mill Creek headwaters.

TABLE 1. Natural winter-run Chinook salmon distribution estimate.

Date	Yet to Enter Delta	In Delta	Exited Delta past Chipps Island
11/16/2021	70-80%	20-29%	0-1%

TABLE 2. Natural winter-run Chinook Salmon average percent of annual emigrating population (LAD) captured at following locations and salvaged at Delta fish facilities for Brood Years 2011 – 2020. The most recent RBDD bi-weekly report of daily estimates of passage for the period 10/22/2021 through 11/4/2021 is 502,999 fish for BY21 winter-run Chinook salmon.

Date	Red Bluff Diversion Dam	Tisdale RST	Knights Landing RST	Sac Trawl (Sherwood)	Chipps Island Trawl	Salvaged at Delta Facilities
11/14/2021	81.2% (74.1%,88.3%)	16.4% (3.7%,29.2%)	17.4% (1.1%,33.7%)	1.3% (0.7%,3.2%)	0.0% (0.0%,0.0%)	0.0% (0.0%,0.0%) WY: 2012 - 2021

TABLE 3. Knight’s Landing (KLCI) and Sacramento Seine and Trawl (SCI) Catch indices for juvenile salmonid migration. Knights Landing monitoring location was triggered in the past week.

Date	KLCI	SCI Trawl	SCI Seine	Trigger Exceeded?
11/9/2021	0.6	0	N.A.	Yes
11/10/2021	2.2	2.67	1	Yes
11/11/2021	2.1	N.A.	N.A.	Yes
11/12/2021	6.7	2	2	Yes (KLCI>5)
11/13/2021	17.5	N.A.	N. A.	Yes (KLCI)

Date	KLCI	SCI Trawl	SCI Seine	Trigger Exceeded?
11/14/2021	16.5	N.A.	N.A.	Yes (KLCI>5)

TABLE 4 Mean daily flow and percent change (Wilkins Slough, Deer Creek, Mill Creek; cfs from CDEC) and temperature and percent change (Knights Landing; °F from RST) Mill Creek and Deer Creek flows exceeded 95 cfs every day during the past week.

Date	Mill Creek flow (MLM)	MLM Δ (%)	MLM Alert	Deer Creek flow (DCV)	DCV Δ (%)	DCV Alert	Wilkins Slough flow (WLK)	Knights Landing temperature (°C)	Alert Triggered
11/14/2021	137.2	-6.8%	Flow>95cfs	104.6	-6.5%	Flow>95cfs	6275.2	N.A.	N.A.
11/13/2021	147.2	-7.8%	Flow>95cfs	111.9	-11.0%	Flow>95cfs	7540.6	45.2	WLK>7500cfs
11/12/2021	159.7	-5.9%	Flow>95cfs	125.7	-17.2%	Flow>95cfs	9612.4	45.2	and KNL<56.3F
11/11/2021	169.6	-20.4%	Flow>95cfs	151.7	-23.8%	Flow>95cfs	11197.7	45.7	WLK>7500cfs
11/10/2021	213.2	6.8%	Flow>95cfs	199.2	5.3%	Flow>95cfs	6318.0	45.5	and KNL<56.3F
11/9/2021	199.7	64.8%	Flow>95cfs Change>50%	189.2	96.5%	Flow>95cfs Change>50%	5815.0	45.5	WLK>7500cfs
11/8/2021	121.2	-6.4%	Flow>95cfs	96.3	-3.1%	Flow>95cfs	5993.0	46.1	and KNL<56.3F

Supporting Information regarding DCC Management Effects on winter-run Chinook Salmon

The DCC gates were closed on 11/13/2021. Closure of the gates would reduce entrainment of any juvenile winter-run Chinook Salmon near the DCC gates into the interior Delta.

TABLE 5 STARS model simulations for route-specific entrainment, travel times, and survival

<u>Date</u>	<u>11/5/2021</u>	<u>N.A.</u>	<u>N.A.</u>	<u>N.A.</u>
<u>N.A.</u>	<u>DCC</u>	<u>Georgiana Slough</u>	<u>Sacramento River</u>	<u>Sutter and Steamboat</u>
<u>Proportion of Entrainment</u>	<u>0.22</u>	<u>0.19</u>	<u>0.34</u>	<u>0.24</u>
<u>Survival</u>	<u>10%</u>	<u>13%</u>	<u>34%</u>	<u>31%</u>
<u>Travel Time</u>	<u>21.8%</u>	<u>20.6 days</u>	<u>10.0 days</u>	<u>9.9 days</u>

3. Spring-Run Chinook Salmon

a. How much loss has occurred in the past week?

No loss of juvenile CV YOY spring-run Chinook Salmon has occurred in the past week at the CVP and SWP fish salvage facilities.

b. What is the distribution of fish within the Delta?

On 11/16/2021 SaMT noted that many juvenile CV YOY spring-run Chinook Salmon have yet to emerge. A few length at date spring run were observed in the Delta, however there is the potential that they are late emerging winter run. Furthermore, larger, older juveniles were observed that may be yearling spring run. 0-3% young of year spring-run Chinook Salmon are estimated to be in the Delta. Yearling CV spring run Chinook Salmon are likely beginning to move out from natal tributaries. Recent precipitation events have caused flow at Mill and Deer creeks to exceed 95 cfs indicating that yearling spring-run Chinook Salmon may begin to move and migrate into the mainstem Sacramento River.

c. What is the exposure to CV spring-run Chinook Salmon due to DCC gate closure?

No juvenile CV YOY spring-run Chinook Salmon (LAD) have been observed near the DCC gates and adults are building redds and spawning upstream. Historical monitoring data suggests that very few YOY spring-run Chinook Salmon (< 2% at Knight Landing RST) are present in the Delta at this time.

d. What are the effects to CV spring-run Chinook Salmon due to DCC gate closure?

The exposure and effects of DCC closure on natural CV spring-run Chinook Salmon are similar to winter-run Chinook Salmon. Closure of the gates would reduce entrainment of any juvenile CV spring-run Chinook Salmon near the DCC gates into the interior Delta.

Supporting Information regarding Exposure of spring-run Chinook Salmon

TABLE 6 Natural spring-run Chinook salmon distribution estimate

<u>Date</u>	<u>Yet to Enter Delta</u>	<u>In Delta</u>	<u>Exited Delta past Chipps Island</u>
11/16/2021	97-100	0-3%	0%

TABLE 7 Natural spring-run Chinook Salmon average percent of annual emigrating population (LAD) captured at following locations and salvaged at Delta fish facilities for Brood Years 2011 - 2020

<u>Date</u>	<u>Red Bluff Diversion Dam</u>	<u>Tisdale RST</u>	<u>Knights Landing RST</u>	<u>Sac Trawl (Sherwood)</u>	<u>Chipps Island Trawl</u>	<u>Salvaged at Delta Facilities</u>
11/14/2021	9.3%(-2.7%,21.3%)	0.2% (0.1%,0.3%)	1.7% (-1.7%,5.1%)	0.0% (0.0%,0.0%)	0.0% (0.0%,0.0%)	0.0% (0.0%,0.0%) WY: 2012 - 2021

Supporting Information regarding DCC Management Effects on spring-run Chinook Salmon

See additional supporting information in winter-run Chinook Salmon section (section 3.b.).

4. California Central Valley Steelhead

a. How much loss has occurred in the past week?

Loss of juvenile CCV steelhead has not occurred in the past week at the CVP fish salvage facility. There was an observation of one non-clipped steelhead at the CVP on 10/30/2021 (loss = 2.72 fish).

b. What is the distribution of fish within the Delta?

On 11/16/2021 SaMT estimated 1-5% of juvenile CCV steelhead were present in the Delta.

c. What is the exposure to CCV steelhead due to DCC gate closure?

No juvenile Central Valley steelhead have been observed near the DCC gates in regional monitoring efforts at Tisdale and Knights Landing this past week and historical monitoring data does not show steelhead in the Delta at this time.

Closure of the DCC gates would reduce exposure and possible entrainment of juvenile CCV steelhead into the interior Delta via the DCC gates.

d. What are the effects to CCV steelhead due to DCC gate closure?

Juvenile Central Valley steelhead could be present near the DCC gates, albeit in small numbers. Closure of the gates would positively impact any present juvenile Central Valley steelhead.

Supporting Information regarding Exposure of CCV Steelhead

TABLE 8 Central Valley steelhead distribution estimate

Date	Yet to Enter Delta	In Delta	Exited Delta past Chipps Island
11/16/2021	95-99%	1-5%	0%

TABLE 9 Central Valley steelhead average percent of annual emigrating population salvaged at Delta fish facilities for Brood Years 2011 - 2020

Date	Salvaged at Delta Facilities
11/14/2021	0.0% (0.0%,0.0%) WY: 2012 - 2021

Supporting Information regarding DCC Management Effects on Central Valley steelhead
See additional supporting information found in winter-run Chinook Salmon (section 3.b).

5. Delta Smelt

POPULATION STATUS

a. Delta Smelt Life Stages:

- Subadults

b. Brood Year 2021:

Abundance estimate: No abundance estimate has been calculated in WY2022 so far. The most recent detection of a Delta Smelt was on 8/20/21 (EDSM) caught in the Sacramento Deep Water Ship Channel Stratum.

Biological Conditions: Subadult Delta Smelt expected to be present in the Deep Water Ship Channel and below the confluence of the Sacramento and San Joaquin Rivers. The Smelt Monitoring Team discussed the most recent monitoring data (Table 4) and considered professional opinion on the historical trends in regional distribution.

DISTRIBUTION

a. Current Distribution

- Real time detection data is currently limited to EDSM sampling, Chipps Island, Bay Study, and FMWT. Since there are no recent detections of Delta Smelt, the Smelt Monitoring Team’s capacity to estimate where they are within the Delta is limited.
- The last Delta Smelt detection was on 8/20/2021 in the Sacramento Deep Water Ship Channel stratum.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) will be initiated by the SMT in February.

TABLE 8. Summary of recently reported detections of Delta Smelt by Region and Salvage Facilities between 11/9/2021 and 11/16/2021. Start and End dates reflect period of time between updates to SMT. Regional categories are determined from EDSM sampling. Delta Smelt >58mm FL are considered adults.

Life Stage	North	South	West	Far West	Salvage
Adult	0	0	0	0	0
Larvae/Juvenile	0	0	0	0	0

TABLE 9. Summary of recent Delta Smelt detections reported since last assessment and the total detections for the current water year. Notes reflect latest information on reported detections or completion of survey for the water year and include both larval and adult detections.

Sampling Method	New Detections	WY2022	Notes
EDSM	0	0	Phase 3 began 6/28/2021
SKT	0	0	Begins :1/18/2022
SLS	0	0	Begins: 12/13/2021
20-mm	0	0	Begins: 3/21/2022
Summer Townet	0	0	Complete
Bay Study	0	0	Ongoing
FMWT	0	0	Ongoing
Chipps Island Trawl	0	0	Ongoing
FCCL Brood Stock Collections	0	0	November
LEPS	0	0	Begins when SLS detects LFS or by 1/15/2022
Total	—	0	Sum of all Delta Smelt observed during the OMR Management Season

b. Historical Trends

- Delta Smelt detections in the Sacramento Deep Water Ship Channel indicate presence upstream of the confluence, but the fish may be freshwater residents and not representative of the migratory life history patterns in Delta Smelt (Hobbs 2019).
- Historically, the highest peak in salvage is in May and the second highest is in June (Grimaldo et al 2009; figure 5).

c. Forecasted Distribution within Central Valley and Delta regions

- Predicting the distribution of subadult Delta Smelt is currently difficult because

detection data is limited to a few individuals and historic patterns may not be representative of the low population levels. No detections have been in the central or south delta.

- The SMT uses turbidity as a surrogate for Delta Smelt presence and in making assessments of the likelihood of entrainment for larval Delta Smelt after spawning begins.

ABIOTIC CONDITIONS

a. Turbidity

- First Flush Conditions can be triggered between Dec.1st and January 31st.
- Precipitation is expected in the next seven days.
- As of 11/16/2021 turbidity continues to be less than 12 FNU at OBI, and is stable at other central and south Delta stations. Precipitation on 11/9-10/2021 increased turbidity at Freeport.
- South Delta Turbidity is expected to remain stable and is not expected to influence the distribution of Delta Smelt and the likelihood of entraining Delta Smelt in the next seven days.

TABLE 10. Relevant Environmental Factors to the current management actions for Delta Smelt.

Date Reported	FPT 3 Day Running Avg. of Daily Flows (cfs)	FPT 3 Day Running Avg. of Turbidity (FNU)
11/16/2020	10603	12.23

b. X2 Conditions

- X2 is estimated to be at 89 km.
- When X2 is above 81 km, the SMT uses the X2_EC_Graph.xlsx tool to estimate the position of X2 for both the Sacramento and San Joaquin Rivers and assumes the average of the two is representative of an approximate X2 position.

c. Other Environmental Conditions

- The Fish and Water Operation Outlook OMR Index values are expected to range between -4,000 to -6,000 cfs from 11/16/2021 to 11/22/2021.
- Real time tracking of environmental conditions, relevant thresholds and Delta Smelt catch data are updated daily at:
http://www.cbr.washington.edu/sacramento/workgroups/delta_smelt.html

EVALUATION

- 1. Between December 1 and January 31, has any first flush condition been exceeded?**
 The question is not applicable until Dec. 1st
- 2. Do DSM have a high risk of migration and dispersal into areas at high risk of future entrainment? (December 1- January 31)**
 The question is not applicable until Dec. 1st
- 3. Has a spent female been collected?**

This question is not applicable until Turbidity Bridge Avoidance begins.

- 4. If OMR of -2000 does not reduce OBI turbidity below 12NTU/FNU, what OMR target is deemed protective between -2000 and -5000?**

This question is not applicable until Turbidity Bridge Avoidance begins.

- 5. If OBI is 12 NTU/FNU, what do other station locations show?**

OBI turbidity is currently below 12 FNU. The daily average turbidities on 11/15/2021 at Prisoners Point (5.35 NTU), Holland Cut (0.00 FNU; station likely down) and Victoria Canal (3.08 NTU) are stable and not expected to increase notably in the next seven days.

- 6. If OBI is 12 NTU/FNU, is a turbidity bridge avoidance action not warranted? What is the supporting information?**

This question is not applicable until Turbidity Bridge Avoidance begins.

- 7. After March 15 and if QWEST is negative, are larval or juvenile DSM within the entrainment zone of the CVP and SWP pumps based on surveys?**

This question is not applicable until March 15th.

- 8. Based on real-time spatial distribution of Delta Smelt and currently available turbidity information, should OMR be managed to no more negative than -3,500?**

This question is not applicable until March 15th.

- 9. What do hydrodynamic models, informed by EDSM or other relevant data, suggest the estimated percentage of larval and juvenile DSM that could be entrained may be?**

This question is not applicable until March 15th

DELTA SMELT REFERENCES

Lenny F. Grimaldo, Ted Sommer, Nick Van Ark, Gardner Jones, Erika Holland, Peter B. Moyle, Bruce Herbold & Pete Smith (2009) Factors Affecting Fish Entrainment into Massive Water Diversions in a Tidal Freshwater Estuary: Can Fish Losses be Managed?, North American Journal of Fisheries Management, 29:5, 1253-1270, DOI: 10.1577/M08-062.1

Hobbs, J. A., Lewis, L. S., Willmes, M., Denney, C., & Bush, E. (2019). Complex life histories discovered in a critically endangered fish. Scientific Reports, 9(1).
<https://doi.org/10.1038/s41598-019-52273-8>

Polansky, L., Newman, K.B., Nobriga, M.L. et al. Spatiotemporal Models of an Estuarine Fish Species to Identify Patterns and Factors Impacting Their Distribution and Abundance. Estuaries and Coasts 41, 572–581 (2018). <https://doi.org/10.1007/s12237-017-0277-3>

Attachment A.

DCC forecast conducted 10/26/2021.

Figure B1. Forecasted daily EC at Holland Cut. Simulation period 10/20/2021 through 11/15/2021.

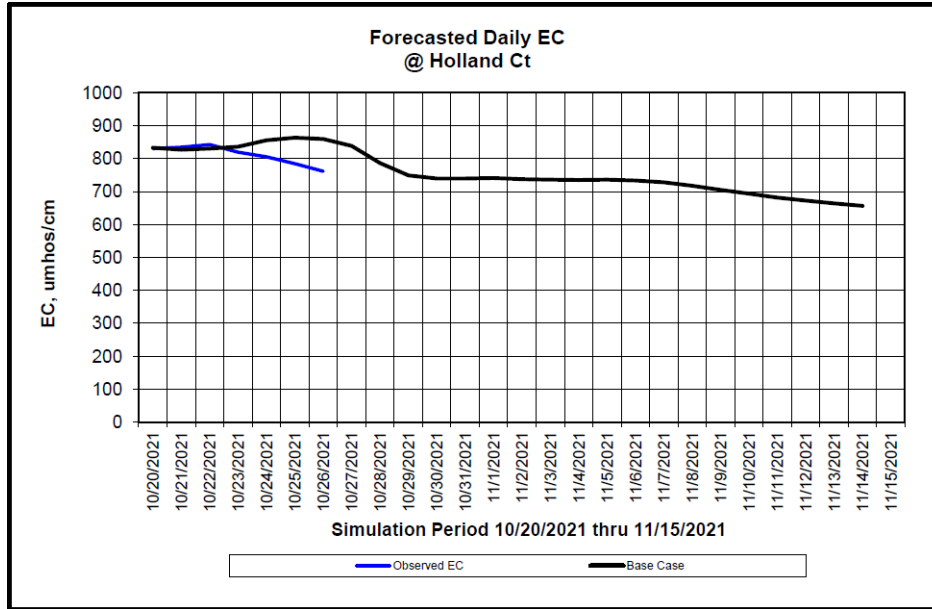


Figure B2. Forecasted daily EC at Jersey Point. Simulation period 10/20/2021 through 11/15/2021.

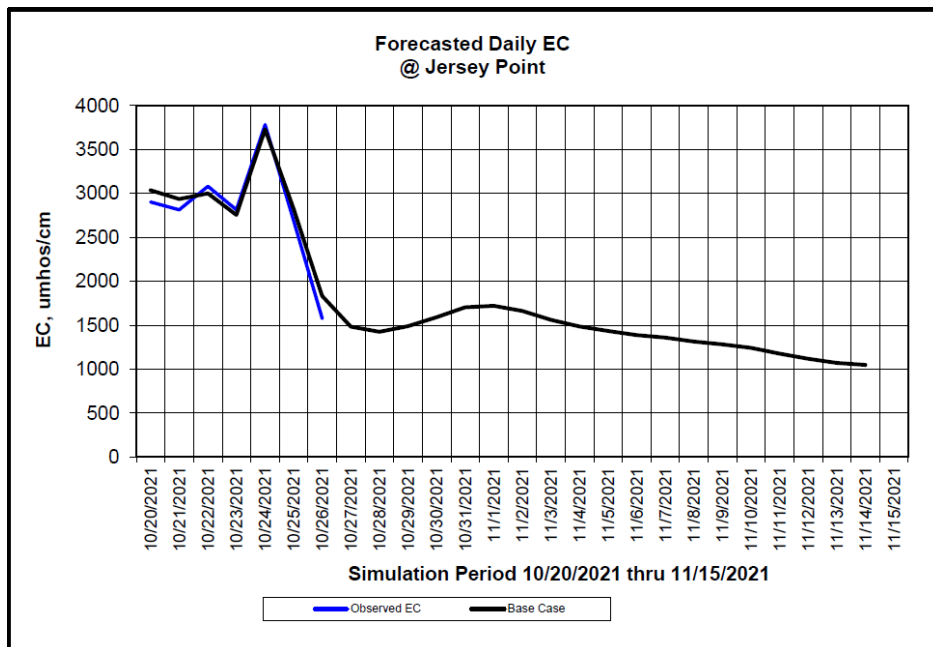


Figure B3. Forecasted daily EC at Bethel. Simulation period 10/20/2021 through 11/15/2021.

