# Revised Nutrient Modeling

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Appendix A

# 1.0 INTRODUCTION

A detailed water quality modeling study of the Ouachita River was completed on June 1, 2006 (GBMc, 2006), from near its confluence with Smackover Creek to just downstream of the Felsenthal Lock and Dam. Modeling was completed to asses the assimilative capacity of the river for a proposed discharge of oxygen demanding wastes and nutrients from the Joint Pipeline Group which includes three El Dorado industries and the City of El Dorado, AR. Over the months that followed the June 1, 2006 submittal of the study report, comments were received from the Arkansas Department of Environmental Quality (ADEQ) and the Louisiana Department of Environmental Quality (LDEQ) stating concerns related to river geometry and reach set-up. The main concern was that the river geometry, as modeled, was too shallow; causing the time of travel to be too fast and the resulting dissolved oxygen predictions to be too liberal. In a Memorandum to the ADEQ dated October 4, 2006, results of QUAL2K modeling runs competed with the river substantially deepened (nearly a meter deeper on average) were presented. Results of the modeling indicated that there was minimal change in the dissolved oxygen levels (0.1 mg/L less) as a result of a deeper river channel.

Continued concern over the accuracy and homogeneity of the river geometry used in the original study report (GBMc, 2006) has led to this detailed revision of the original model's reach spacing and geometry, and recalibration of the model. A summary of the changes to the model reaches and geometry is presented in Section 2.0. Results of the model calibration and modeling runs completed with the revised geometry are provided in Section 3.0.

# 2.0 REVISED OUACHITA RIVER GEOMETRY

As requested by the ADEQ, the following changes have been made to the original models of the Ouachita River:

1. Reaches 2 and 6 have been re-segmented so that each reach is less than 10 miles long.
2. A portion of the original reach 6 maintains similar channel geometry as used in the June 1, 2006 report, which is based on field data.

3. All other reaches have been restructured to match geometry (depth in particular) provided in the US Army Corps of Engineers (USACE) HEC-RAS model.
4. Where the HEC data shows transects with depths less than 9.0 feet, these transects have been adjusted (removed) to account for the USACE current navigation channel maintenance of 9.0 foot minimums.

The original reach 2 was subdivided into two reaches, each 13.6 km (8.5 mi) long. The original reach 6 was subdivided into four reaches, each 10.5 km (6.5 mi) long. The newly segmented QUAL2K model utilizes seventeen reaches, with all reaches well under 10 miles long. Reaches in similar segments of the river (geographically and hydrologically) were grouped for assignment of geometry. River geometry for reaches 1-5 and 9-17 was based on analysis of the USACE HEC-RAS data that was provided by the Vicksburg District Office. Geometry for reaches 6-8 was based on the field data collected for the original study (GBMc, 2006).

Revised river geometry was calculated from the USACE HEC-RAS model outputs. All river transects with maximum depths less than 9.0 feet were removed from the analysis, to account for USACE 9.0 foot navigation channel maintenance. The HEC model developed by the USACE was calibrated to known water surface elevations for 1,000 cfs and 10,000 cfs flow levels. The QUAL2K calibration run was for 1,200 cfs and the critical conditions run was for 765 cfs, closely bracketing the USACE HEC model flows, in such a way that the geometry predictions from the HEC model should be fairly accurate for the two model flow levels. To attain appropriate river geometry for each QUAL2K modeling scenario, the HEC-RAS model was run at 1,200 cfs, 765 cfs and 2,050 cfs, using the known water surface elevations from the 1,000 cfs USACE model. Geometry from the HEC-RAS modeling used as the basis for the QUAL2K model, is presented in the tables below.

Table 1.0 Ouachita River Geometry Predicted by HEC-RAS for Calibration Run, at 1,200 cfs.

| Reaches | Cs area ($ft^2$) | Top width (ft) | Maximum Depth (ft) | Average Depth[1] (ft) | Trapezoidal[2] Depth (ft) | Trapezoidal[2] Depth (m) | Revised Trapezoidal[3] Depth (ft) | Revised Trapezoidal[3] (m) |
|---|---|---|---|---|---|---|---|---|
| R1-R3 | 2066 | 244 | 13.23 | 8.33 | 10.78 | 3.29 | 11.27 | 3.44 |
| R4-R5 | 1914 | 180 | 16.92 | 10.71 | 13.81 | 4.21 | 14.43 | 4.40 |
| R6-R8 | 2291 | 236 | 15.25 | 9.67 | 12.46 | 3.80 | 13.02 | 3.97 |
| R9-R11 | 2192 | 234 | 14.85 | 9.34 | 12.10 | 3.69 | 12.65 | 3.86 |
| R12-R13 | 2889 | 273 | 16.19 | 10.76 | 13.47 | 4.11 | 14.02 | 4.27 |
| R14-R15 | 3799 | 383 | 16.70 | 10.33 | 13.51 | 4.12 | 14.15 | 4.31 |
| R16-R17 | 3905 | 330 | 19.61 | 11.89 | 15.75 | 4.80 | 16.52 | 5.04 |
| | | | | | | | | |
| Average | 2722 | 269 | 16.11 | 10.15 | 13.13 | 4.00 | 13.72 | 4.18 |
| Min | 1914 | 180 | 13.23 | 8.33 | 10.78 | 3.29 | 11.27 | 3.44 |
| Max | 3905 | 383 | 19.61 | 11.89 | 15.75 | 4.80 | 16.52 | 5.04 |

[1]Average depth is equal to Cs area divided by top width.
[2]Trapezoidal Depth is equal to the mean of average depth and maximum depth.
[3]Revised trapezoidal depth is equal to the average depth plus 60% of the difference between average depth and maximum depth.

Table 1.1 Ouachita River Geometry Predicted by HEC-RAS for the Critical Runs, at 765 cfs.

| Reaches | Cs area ($ft^2$) | Top width (ft) | Maximum Depth (ft) | Average Depth[1] (ft) | Trapezoidal[2] Depth (ft) | Trapezoidal[2] Depth (m) | Revised Trapezoidal[3] Depth (ft) | Revised Trapezoidal[3] (m) |
|---|---|---|---|---|---|---|---|---|
| R1-R3 | 1787 | 235 | 12.05 | 7.50 | 9.77 | 2.98 | 10.23 | 3.12 |
| R4-R5 | 1671 | 173 | 15.54 | 9.76 | 12.65 | 3.86 | 13.22 | 4.03 |
| R6-R8 | 1997 | 225 | 13.96 | 8.78 | 11.37 | 3.47 | 11.89 | 3.62 |
| R9-R11 | 2090 | 231 | 14.42 | 9.02 | 11.72 | 3.57 | 12.26 | 3.74 |
| R12-R13 | 2841 | 272 | 16.02 | 10.61 | 13.31 | 4.06 | 13.85 | 4.22 |
| R14-R15 | 3755 | 382 | 16.56 | 10.22 | 13.39 | 4.08 | 14.02 | 4.28 |
| R16-R17 | 3864 | 329 | 19.49 | 11.80 | 15.64 | 4.77 | 16.41 | 5.00 |
| | | | | | | | | |
| Average | 2572.28 | 263.94 | 15.43 | 9.67 | 12.55 | 3.83 | 13.13 | 4.00 |
| Min | 1671.35 | 172.86 | 12.05 | 7.50 | 9.77 | 2.98 | 10.23 | 3.12 |
| Max | 3864.33 | 382.33 | 19.49 | 11.80 | 15.64 | 4.77 | 16.41 | 5.00 |

[1]Average depth is equal to Cs area divided by top width.
[2]Trapezoidal Depth is equal to the mean of average depth and maximum depth.
[3]Revised trapezoidal depth is equal to the average depth plus 60% of the difference between average depth and maximum depth.

Table 1.2 Ouachita River Geometry Predicted by HEC-RAS for the LTA Summer Flow Runs, at 2050 cfs.

| Reaches | Cs area ($ft^2$) | Top width (ft) | Maximum Depth (ft) | Average Depth[1] (ft) | Trapezoidal[2] Depth (ft) | Trapezoidal[2] Depth (m) | Revised Trapezoidal[3] Depth (ft) | Revised Trapezoidal[3] (m) |
|---|---|---|---|---|---|---|---|---|
| R1-R3 | 2530 | 262 | 15.09 | 9.54 | 12.32 | 3.76 | 12.87 | 3.92 |
| R4-R5 | 2308 | 193 | 19.03 | 12.00 | 15.51 | 4.73 | 16.21 | 4.94 |
| R6-R8 | 2701 | 247 | 16.94 | 10.88 | 13.91 | 4.24 | 14.52 | 4.43 |
| R9-R11 | 2450 | 242 | 15.92 | 10.11 | 13.01 | 3.97 | 13.60 | 4.14 |
| R12-R13 | 3030 | 275 | 16.71 | 11.19 | 13.95 | 4.25 | 14.50 | 4.42 |
| R14-R15 | 3935 | 386 | 17.11 | 10.65 | 13.88 | 4.23 | 14.52 | 4.43 |
| R16-R17 | 4029 | 333 | 19.99 | 12.15 | 16.07 | 4.90 | 16.85 | 5.14 |
| | | | | | | | | |
| Average | 2997 | 277 | 17.25 | 10.93 | 14.09 | 4.30 | 14.72 | 4.49 |
| Min | 2308 | 193 | 15.09 | 9.54 | 12.32 | 3.76 | 12.87 | 3.92 |
| Max | 4029 | 386 | 19.99 | 12.15 | 16.07 | 4.90 | 16.85 | 5.14 |

[1]Average depth is equal to Cs area divided by top width.
[2]Trapezoidal Depth is equal to the mean of average depth and maximum depth.
[3]Revised trapezoidal depth is equal to the average depth plus 60% of the difference between average depth and maximum depth.

In the original modeling study, river geometry for the calibrated model was based on field measurements (depth transects) taken in the mid section of the river between river mile 260 and 280. Since QUAL2K utilizes Manning's trapezoidal channel equation to calculate depth and velocity internally, a trapezoidal channel dimension, including depth, was developed for use in the model. Each reach was given a standard trapezoidal bottom width and side slope. River longitudinal slope in the original study was calculated from the water surface elevations from the HEC data and then river depth was calibrated by adjusting Manning's Coefficient until the appropriate depth was attained. This calibration was completed only for the "Calibrated" model in the original study. The QUAL2K model was then allowed to calculate new river depth as river flow was adjusted in the various model runs/scenarios (critical, LTA, etc.)

For the revised modeling presented in this report, the middle reaches (reaches 6-13) of the river retained the same trapezoidal bottom width of the original model (56.7 m), but the upstream reaches (reaches 1-5) were adjusted down to 48.5 m and the furthest downstream reaches (reaches 14-17) were adjusted up to 81.6 m, each consistent with the top width differences observed in the HEC-RAS modeling output (Tables 1.0-1.3). Each reach was assigned a side slope of 3.6:1, which is representative of the field data collected in the original report. River longitudinal slope was calculated from the Energy Grade Slope determined by HEC-RAS. Slope ranged from 0.0000199 ft/ft in the upper most reaches to 0.0000013 ft/ft in the lower most reaches. These are very flat slopes, all less than 0.15 feet per mile.

Depths were calculated from HEC-RAS data for each river reach. To arrive at accurate trapezoidal depths for the modeling that would be representative (or more conservative) compared to the HEC-RAS predicted cross sectional areas, trapezoidal depths for each HEC-RAS transect were calculated as the mean of the average and maximum depths along a transect. To provide for an additional level of conservatism, the trapezoidal depths were revised to a level 10% deeper than the mean of the average and maximum depths. These "revised trapezoidal depths" (Table 1.0-1.3) were used for the respective QUAL2K modeling.

To be more consistent with the USACE HEC data (and more conservative for the critical scenarios) each of the revised model scenario depths were "calibrated" to the depths predicted by the HEC-RAS model for the appropriate flow (Tables 1.0-1.3). That is, Manning's Coefficient was adjusted up or down until a depth within +/- 0.1 meters of the revised trapezoidal depth predicted by HEC-RAS was attained in each respective reach. The resulting hydraulics from each of the QUAL2K runs is provided in Appendix A of this report.

As discussed previously, geometry for reaches 6-8 was based on field data collected for the original study and not from the HEC data analysis. Therefore, river depths for reaches 6-8 were approximately 14.4 feet (4.4 m) for the calibrated models, 13.2 feet (4.0 m) for the critical models and 15.2 feet (4.6 m) for the LTA models, all slightly deeper than predicted by the HEC-RAS model.

A comparison of channel geometry predicted by the HEC-RAS modeling and that developed by the QUAL2K models is presented in Table 1.4.

Table 1.4 Comparison of Selected HEC-RAS Channel Geometry and QUAL2K Channel Geometry.

| Parameter | Cross Sectional Area (ft2) | | Top Width (ft) | | Average Depth (ft) | | Velocity (fps) | |
|---|---|---|---|---|---|---|---|---|
| | HEC-RAS | QUAL2K | HEC-RAS | QUAL2K | HEC-RAS | QUAL2K | HEC-RAS | QUAL2K |
| Calibrated Run | | | | | | | | |
| R1-R3 | 2066 | 2260 | 244 | 242 | 8.5 | 9.3 | 0.74 | 0.52 |
| R9-R11 | 2192 | 2982 | 234 | 278 | 9.4 | 10.7 | 0.60 | 0.39 |
| R14-R15 | 3799 | 4564 | 383 | 372 | 9.9 | 12.3 | 0.37 | 0.26 |
| Critical Runs | | | | | | | | |
| R1-R3 | 1787 | 1981 | 235 | 232 | 7.6 | 8.5 | 0.56 | 0.39 |
| R9-R11 | 2090 | 2723 | 231 | 271 | 9.0 | 10.0 | 0.40 | 0.26 |
| R14-R15 | 3755 | 4424 | 382 | 367 | 9.8 | 12.1 | 0.24 | 0.16 |

The cross sectional areas and average depths utilized by QUAL2K for the model predictions are more conservative than those provided by the HEC modeling. The conservatism is largely due to the use of the trapezoidal channel dimensions in QUAL2K, which create a larger, deeper river channel. The average depth and cross sectional area observed in the field data collected for the original study report was 11.8 feet and 3535 $ft^2$, respectively, for a flow of approximately 1100 cfs. These values fall within the range of those utilized for the revised modeling completed for this report (Table 1.4).

# 3.0 Modeling Results

To better match observed water quality a model calibration was completed. Minimal changes from the original model calibration were necessary. The only coefficient adjusted was the CBOD decay (fast) coefficient which was adjusted from 0.15/day to 0.1/day. This parameter remains conservatively high compared to the 0.075/day used in previous modeling studies of the river (AqAeTer, 1999). The calibrated model continued to under predict dissolved oxygen and over predict nitrate while the remainder of the calibration parameters remained similar to the observed data. Calibration charts are provided below which depict the model predictions against the observed data.

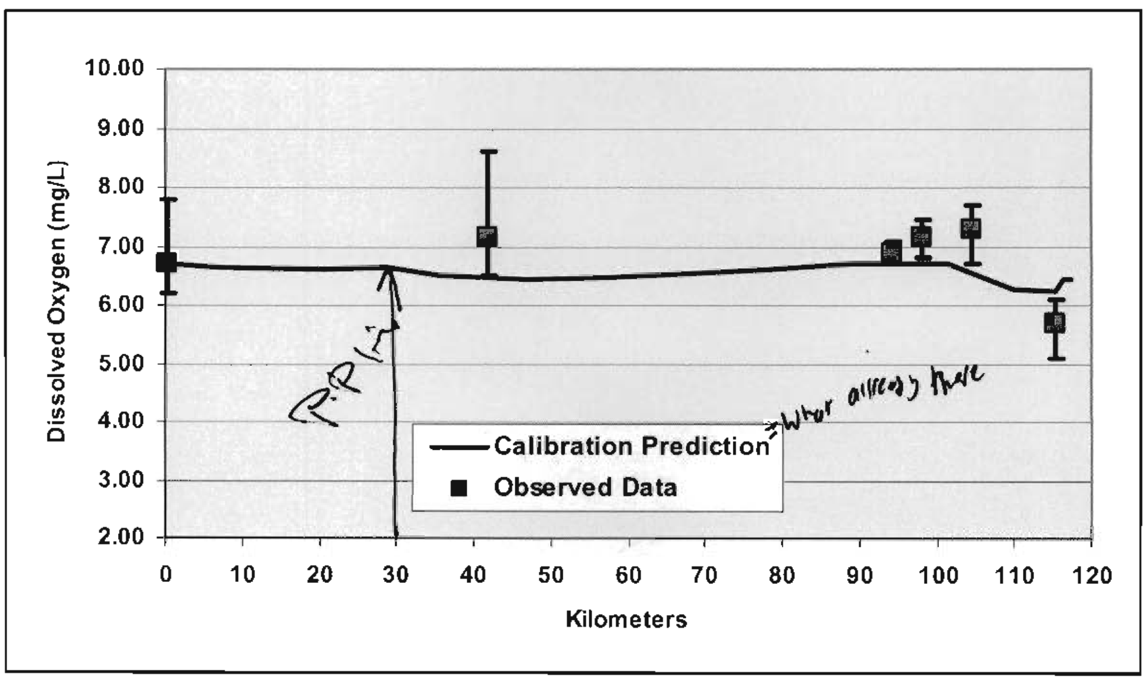


Figure 3.0. Dissolved oxygen calibration

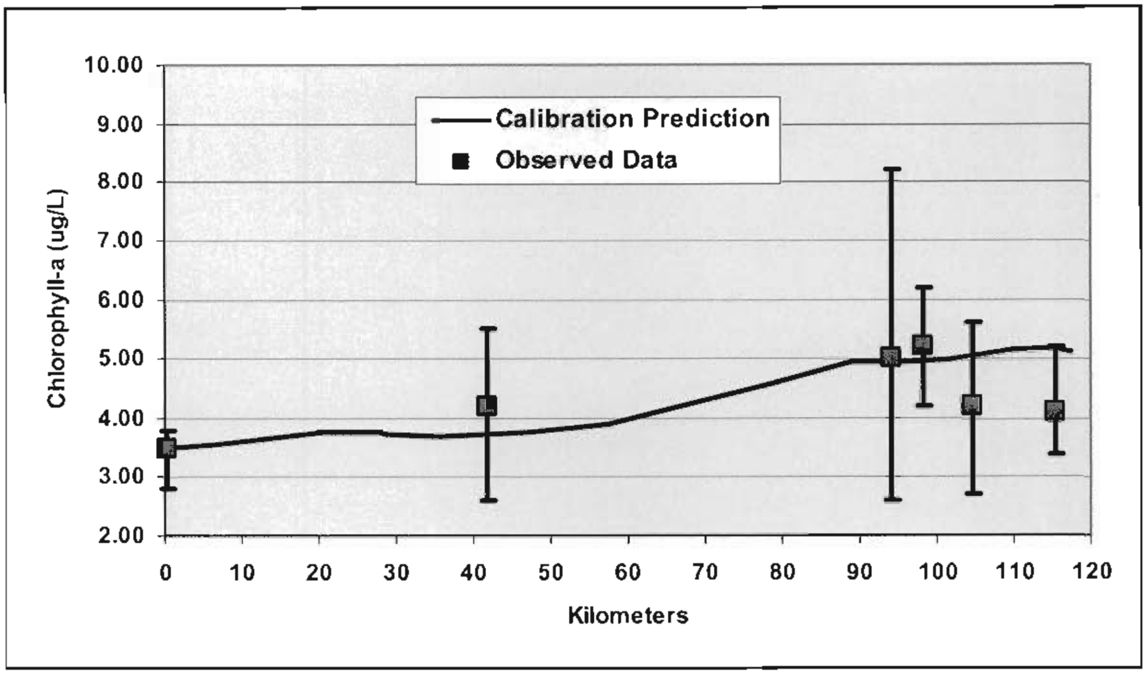


Figure 3.1. Chlorophyll-a calibration.

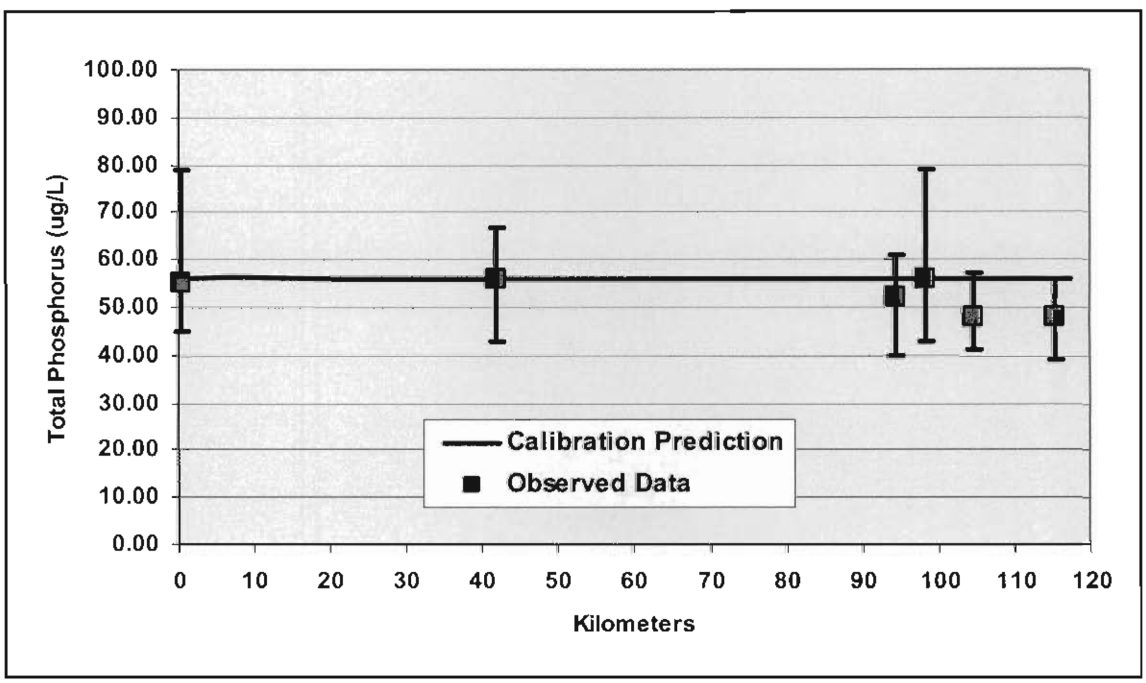


Figure 3.2. Total phosphorus calibration.

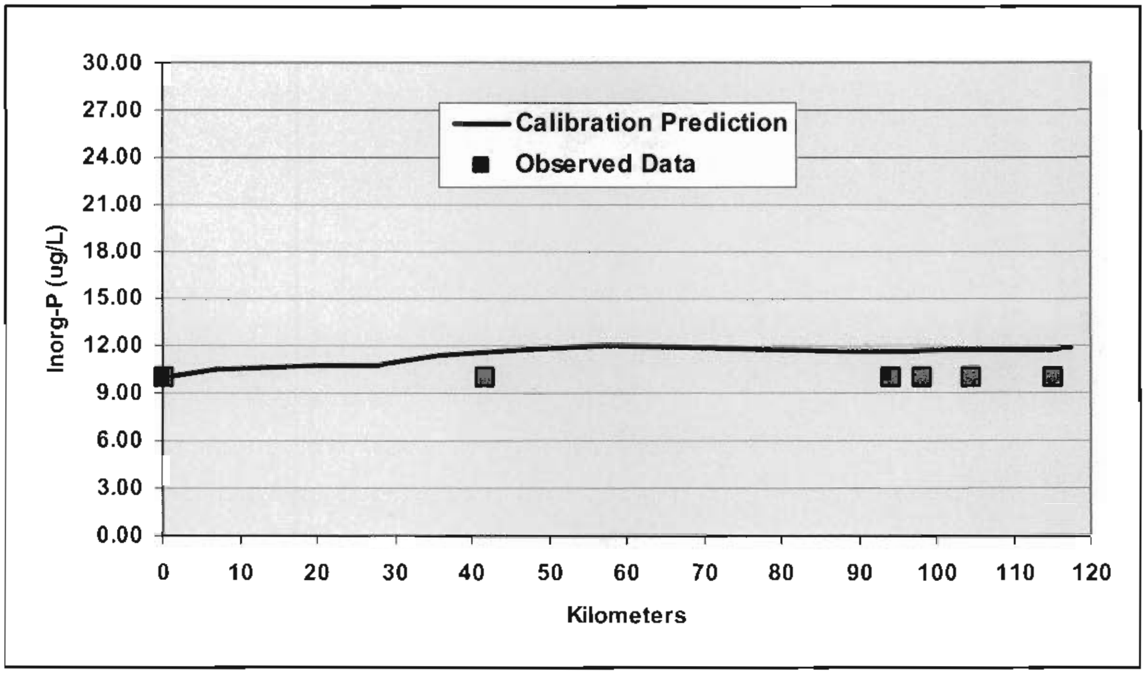


Figure 3.3. Inorganic Phosphorus calibration.

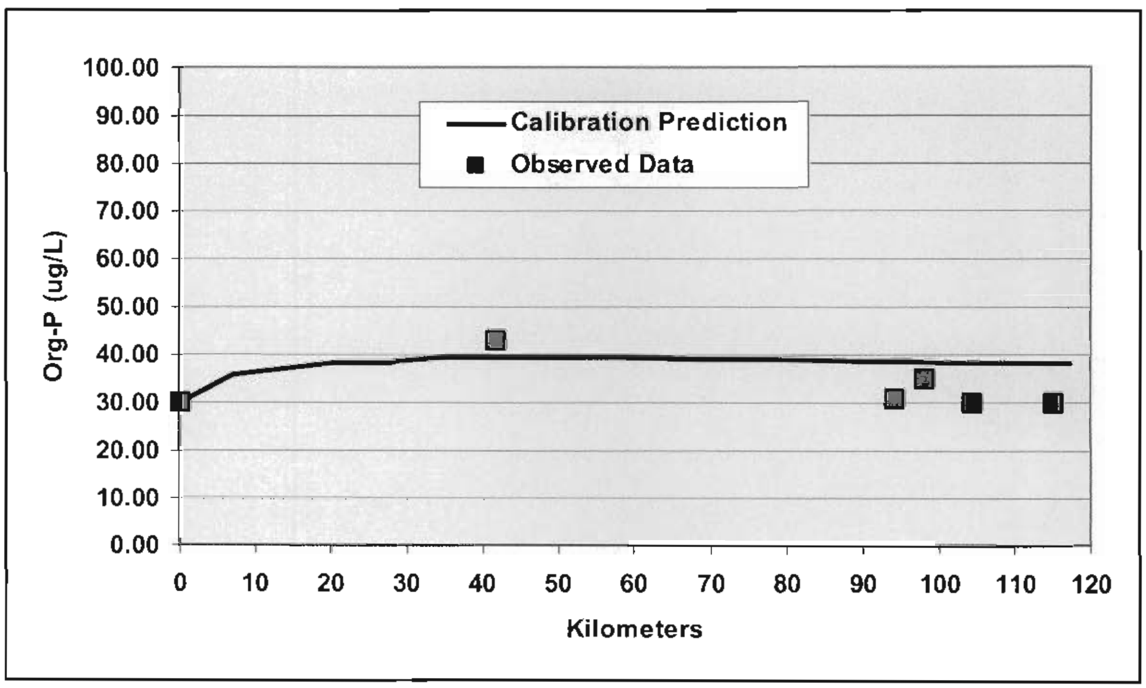


Figure 3.4. Organic phosphorus calibration.

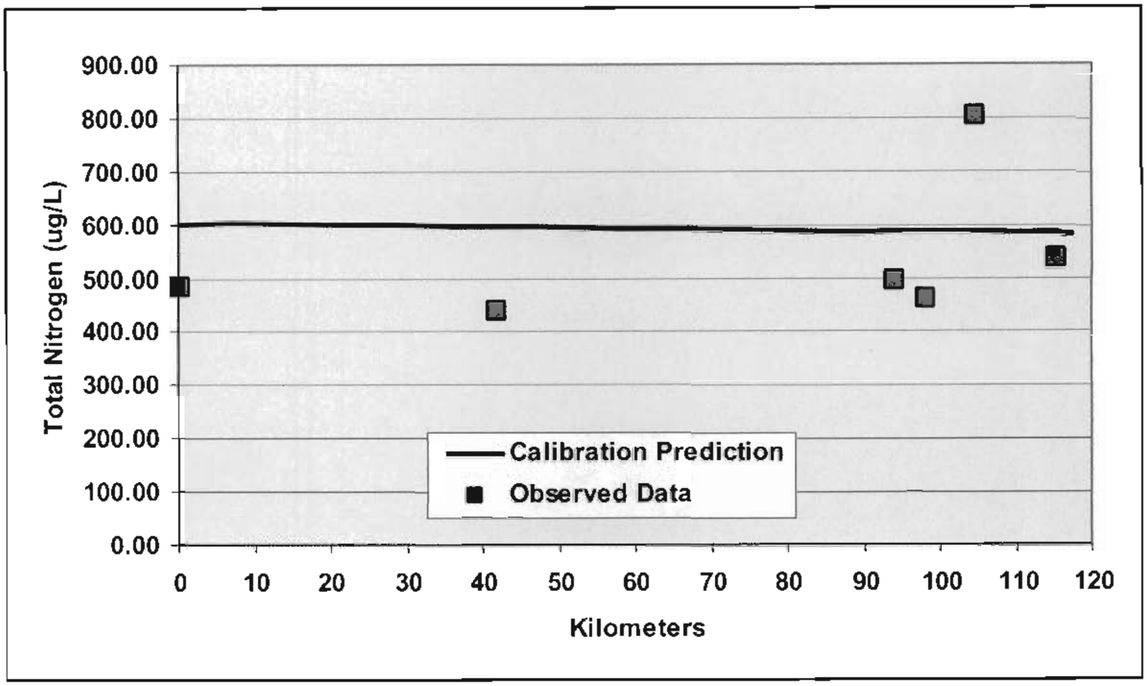


Figure 3.5. Total nitrogen calibration

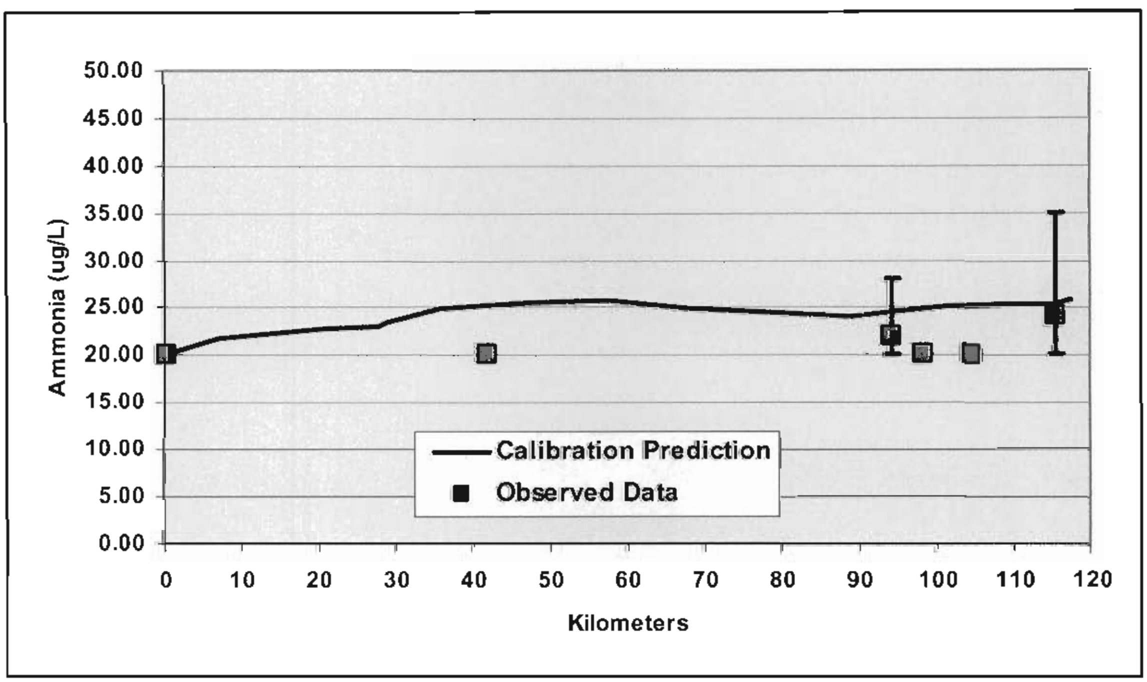


Figure 3.6. Ammonia calibration

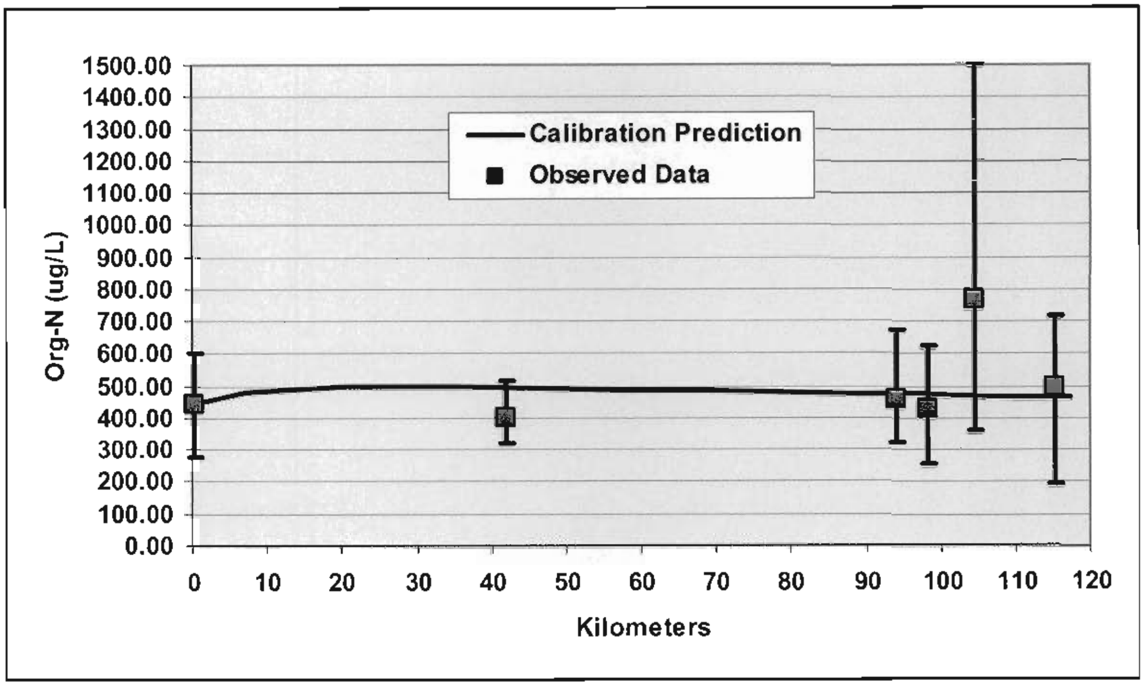


Figure 3.7. Organic nitrogen calibration

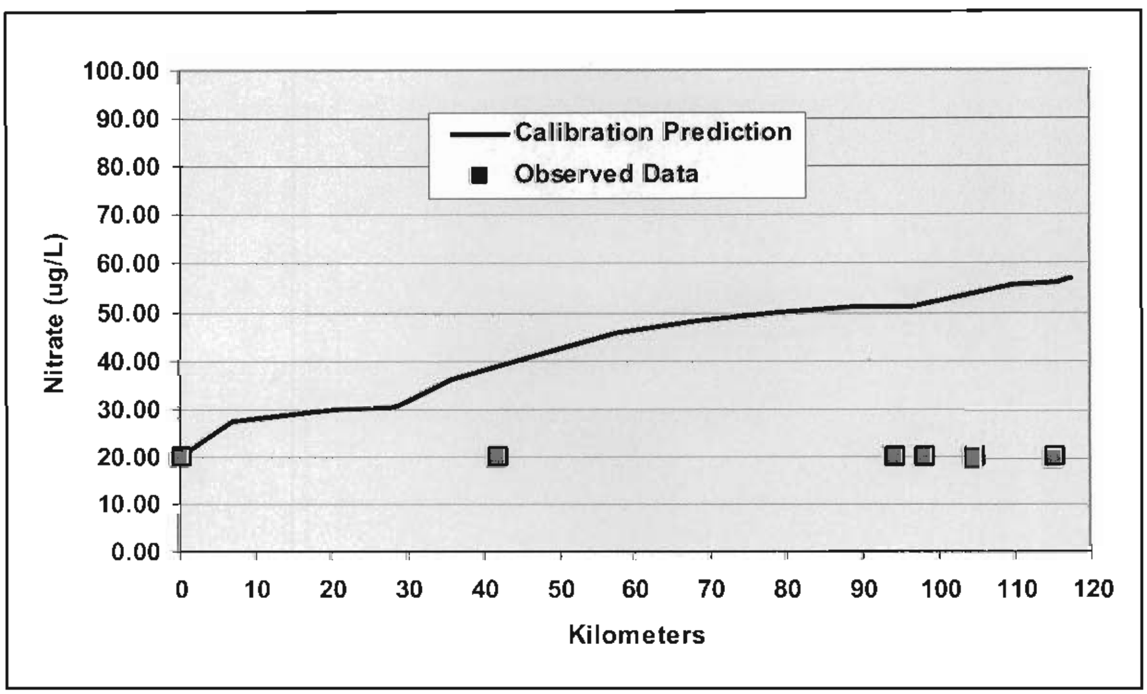


Figure 3.8. Nitrate calibration

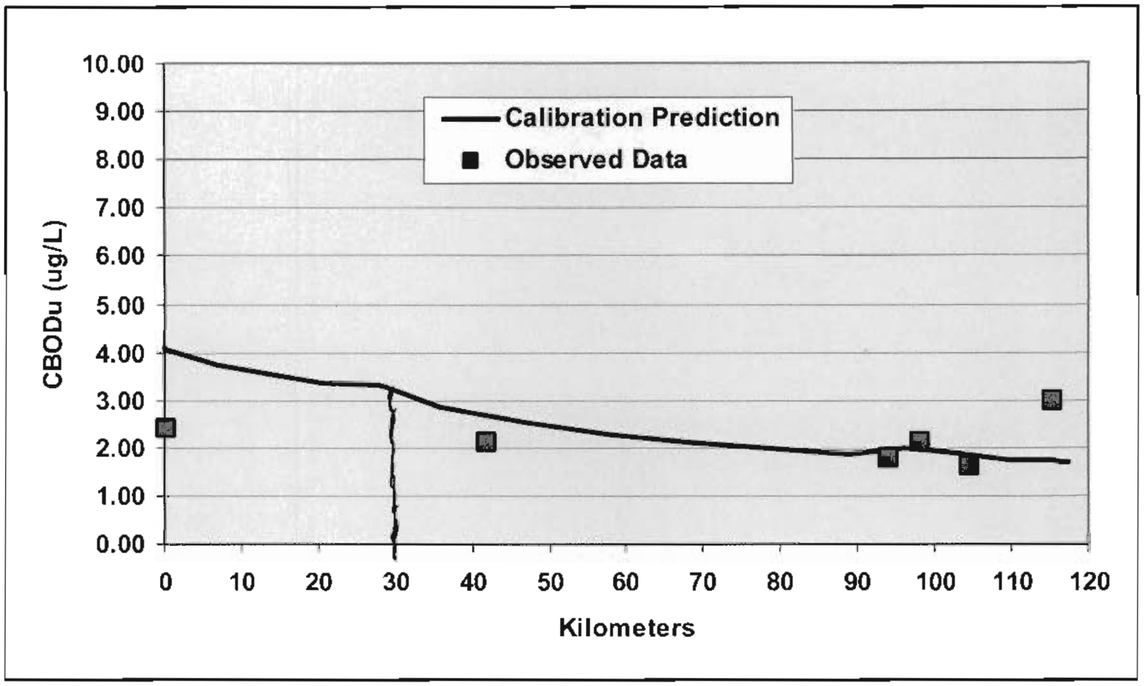


Figure 3.9. CBODu calibration.

## 3.1 Ouachita River Modeling Scenario Results

Revised modeling scenarios mimicked those found in the original Final Report (GBMc, 2006). The modeling scenarios run using QUAL2K for the Ouachita River are described in the following paragraphs and the key model inputs are shown in Table 3.1.

**Scenario 1. Critical stream conditions using full permitted discharge.** This scenario describes the stream condition where the effects of the permitted discharge would exhibit the most pronounced change in water quality. The upstream river flow was set at 7Q10, the discharge volume was at the fully permitted level and load of phosphorus, nitrogen, and BOD were also set at their respective fully permitted levels. This scenario, which is based on multiple conservative assumptions, projects the result of the pipeline discharge on the Ouachita River that would occur only when water levels in the river are at a statistically derived low point (that would be predicted to occur for a one week period once each 10 years), coupled simultaneously with the pipeline discharging at its fully permitted capacity for BOD, phosphorus and nitrogen. This scenario represents a "worst case condition" that is unlikely to ever occur.

**Scenario 2. Critical stream conditions using anticipated discharge loads.** This scenario describes the same stream condition as Scenario 1, that is, a stream condition where the effects of the permitted discharge would exhibit the most pronounced change in water quality. The upstream river flow was set at 7Q10, however the discharge volume was set at a volume that is representative of the actual volume of water discharged by the combined pipeline group. The nitrogen load was set at the anticipated load when the pipeline begins discharging. The phosphorus load was set at an anticipated level based on maximum measured phosphorus values. This scenario projects the result of the pipeline discharge on the Ouachita River that would occur only when water levels in the river are at a statistically derived low point (that would be predicted to occur for a one week period each 10 years), but with the pipeline discharging loads of BOD, phosphorus and nitrogen that would be anticipated to occur.

**Scenario 3. Average summer stream flow conditions using full permitted discharge.** This scenario differs from Scenario 1 only in the upstream flow used in the model. A harmonic mean summer flow calculated for July-October was used in the model instead of 7Q10 flow conditions. This scenario projects the result of the pipeline discharge on the Ouachita River at conditions that would be anticipated to occur during a typical summer, provided that the pipeline was discharging at its fully permitted levels for BOD, phosphorus and nitrogen. This scenario is not likely to occur, since it requires that each discharger be at their fully permitted level simultaneously.

**Scenario 4. Average summer stream flow conditions at anticipated discharge loads.** This scenario differs from Scenario 2 only in the upstream flow used in the model. The summer harmonic mean flow (July-October) was used in the model instead of 7Q10 flow conditions. This scenario projects the result of the pipeline discharge on the Ouachita River at conditions that would be anticipated to occur during a typical summer, and with the pipeline discharging at loads of BOD, phosphorus and nitrogen that would be anticipated to occur. This scenario would be anticipated to be a common occurrence.

**Baseline Conditions,** The various modeling scenarios also describe "baseline conditions" which are the modeling runs made without the pipeline discharging to the system. Baseline modeling scenarios are used to depict the change (if any) projected by the model to occur when the discharge is added to the river. There was a "baseline conditions" model run for each of the modeling scenarios described. The baseline condition results are slightly different for each scenario because the existing discharges to Smackover Creek had to be addressed in order to accurately portray each scenario. Appendix E of the original report (GBMc, 2006) provides detailed input values.

Table 3.1 shows the key input parameters for each of the modeling scenarios described in section 3.0.

Table 3.1. Scenarios modeled using QUAL2K, showing the key input parameters for each scenario.

| Scenario | Key Input Parameter | | |
|---|---|---|---|
| | Upstream River Flow (cfs)[1] | Pipeline Discharge Flow (mgd) | Discharge Loads for BOD, TP, $NH_3$, Organic N and $NO_3$ (lbs/d) |
| Scenario 1 (critical stream condition at full discharge) | 765 cfs | 20 mgd | BOD 2,919 lb/d<br>TP 167 lb/d<br>$NH_3$ 1328 lb/d<br>ON 235 lb/d<br>$NO_3$ 1,406 lb/d |
| Scenario 2 (critical stream condition at anticipated discharge) | 765 cfs | 13.5 mgd | BOD 1,966 lb/d<br>TP 23 lb/d<br>$NH_3$ 896 lb/d<br>ON 158 lb/d<br>$NO_3$ 1,020 lb/d |
| Scenario 3 (average summer stream flow at full discharge) | 2014 cfs | 20 mgd | BOD 2,919 lb/d<br>TP 167 lb/d<br>$NH_3$ 1328 lb/d<br>ON 235 lb/d<br>$NO_3$ 1,406 lb/d |
| Scenario 4 (average summer stream flow at anticipated discharge) | 2014 cfs | 13.5mgd | BOD 1,966 lb/d<br>TP 23 lb/d<br>$NH_3$ 896 lb/d<br>ON 158 lb/d<br>$NO_3$ 1,020 lb/d |

[1]Upstream river flow at OUA-2, sum of Ouachita and Saline river flows.

Tables 3.2 and 3.3 provide a summary of the QUAL2K output data for chlorophyll-a, dissolved oxygen, total phosphorus, and total nitrogen from stations OUA-2 and OUA-3, respectively. Tables 3.2 and 3.3 include the output data from QUAL2K models using critical, and average flow conditions with and without the input from the proposed Ouachita Joint Pipeline.

Table 3.2. QUAL2K results at OUA-2

| Model | Chlorophyll-a (µg/L) | Dissolved Oxygen (µg/L) | Total Phosphorus (µg/L) | Total Nitrogen (µg/L) |
|---|---|---|---|---|
| **Critical Stream Conditions, Baseline (no discharge)** | 8.9 | 6.2 | 78.3 | 560 |
| Critical Stream Conditions, Full Permitted Discharge (Scenario 1) | 13.9 | 6.2 | 92.0 | 1135 |
| **Critical Stream Conditions, Baseline for Anticipated Discharge** | 8.2 | 6.2 | 59.3 | 570 |
| Critical Stream Conditions, Anticipated Discharge Loads (Scenario 2) | 8.1 | 5.9 | 59.3 | 981 |
| **Average Summer Flow Conditions, Baseline (no discharge)** | 5.1 | 5.8 | 64.7 | 597 |
| Average Summer Flow Conditions, Full Permitted Discharge (Scenario 3) | 5.4 | 5.5 | 70.2 | 837 |
| **Average Stream Conditions, Baseline for Anticipated Discharge** | 4.4 | 5.9 | 57.4 | 594 |
| Average Summer Flow Conditions, Anticipated Discharge Loads (Scenario 4) | 4.4 | 5.7 | 57.4 | 765 |

Table 3.3. QUAL2K results at OUA-3

| Model | Chlorophyll-a (µg/L) | Dissolved Oxygen (µg/L) | Total Phosphorus (µg/L) | Total Nitrogen (µg/L) |
|---|---|---|---|---|
| **Critical Stream Conditions, Baseline (no discharge)** | 8.5 | 5.2 | 77.8 | 567 |
| Critical Stream Conditions, Full Permitted Discharge (Scenario 1) | 13.0 | 5.2 | 91.6 | 1091 |
| **Critical Stream Conditions, Baseline for Anticipated Discharge** | 7.7 | 5.1 | 59.0 | 558 |
| Critical Stream Conditions, Anticipated Discharge Loads (Scenario 2) | 7.7 | 5.0 | 59.1 | 950 |
| **Average Summer Flow Conditions, Baseline (no discharge)** | 5.7 | 5.4 | 64.6 | 594 |
| Average Summer Flow Conditions, Full Permitted Discharge (Scenario 3) | 6.2 | 5.2 | 70.2 | 830 |
| **Average Stream Conditions, Baseline for Anticipated Discharge** | 4.9 | 5.5 | 57.3 | 590 |
| Average Summer Flow Conditions, Anticipated Discharge Loads (Scenario 4) | 4.8 | 5.3 | 57.4 | 759 |

Results of the modeling indicate that little change in dissolved oxygen occurs as a result of the pipeline discharge (0.3 mg/L maximum oxygen decrease) under any model scenario. The oxygen sag under critical conditions (scenario 1) drops to 5.3 mg/L just downstream of Moro Bay. The oxygen in the river displays additional oxygen sag near the Felsenthal lock and Dam where under critical conditions (scenario 1) the oxygen drops to 5.2 mg/L before recovering.

Figures 3.10 to 3.13 show the results of the modeling from the point of discharge to approximately 118 km downstream for model scenario's 1, 2, 3 and 4 described previously.

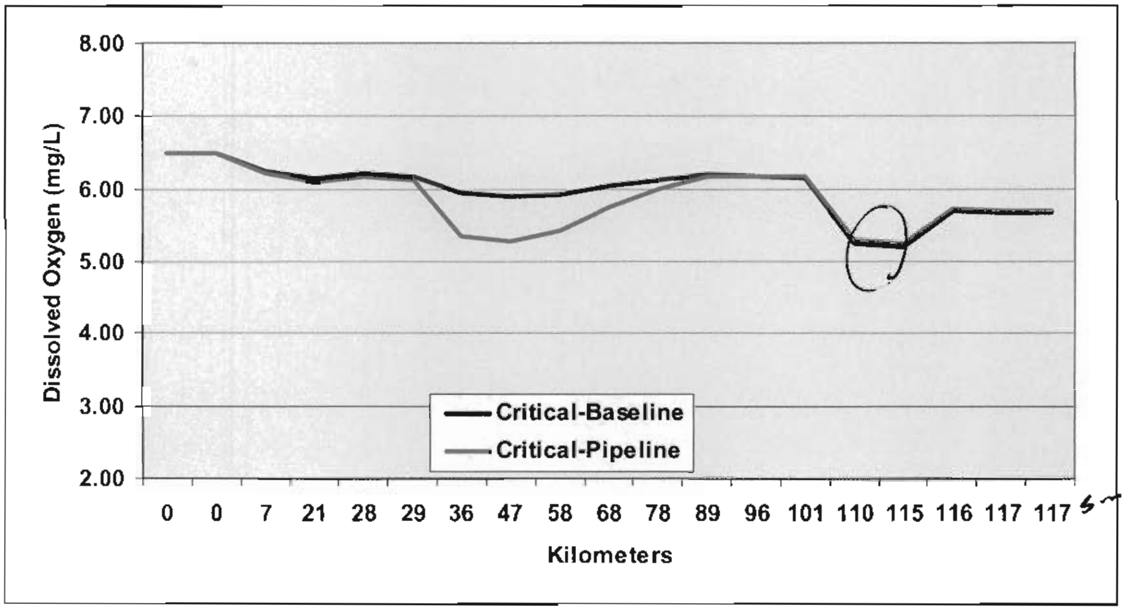


Figure 3.10 Dissolved oxygen predictions with and without the pipeline discharge under critical conditions and at full permitted discharge (Scenario 1).

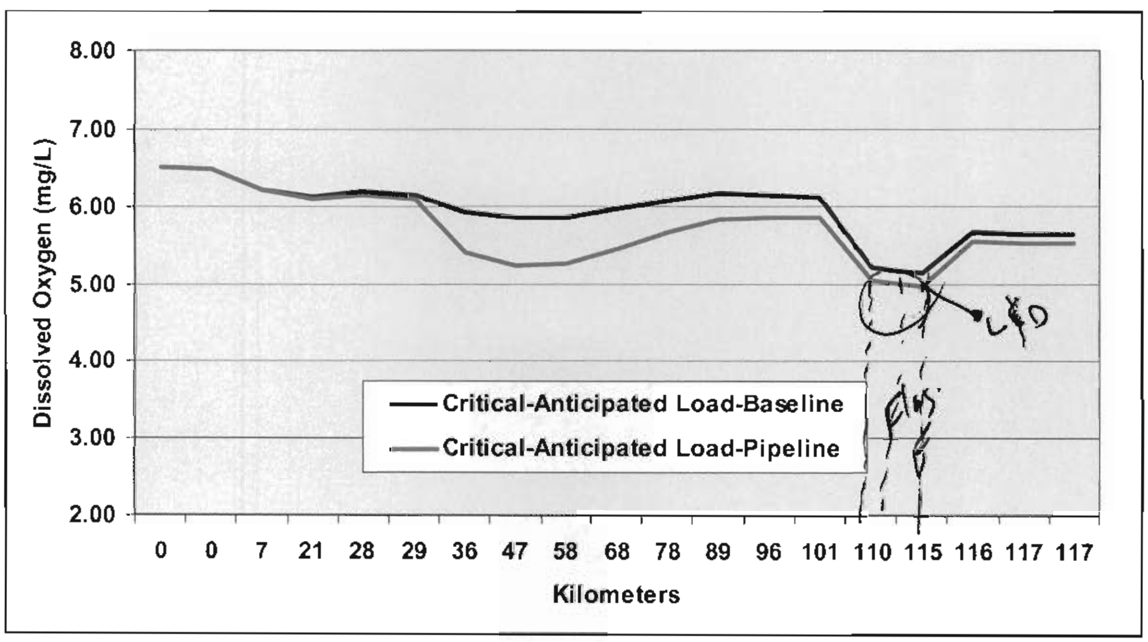


Figure 3.11. Dissolved oxygen predictions with and without the pipeline discharge under critical conditions and at the anticipated discharge loads (Scenario 2).

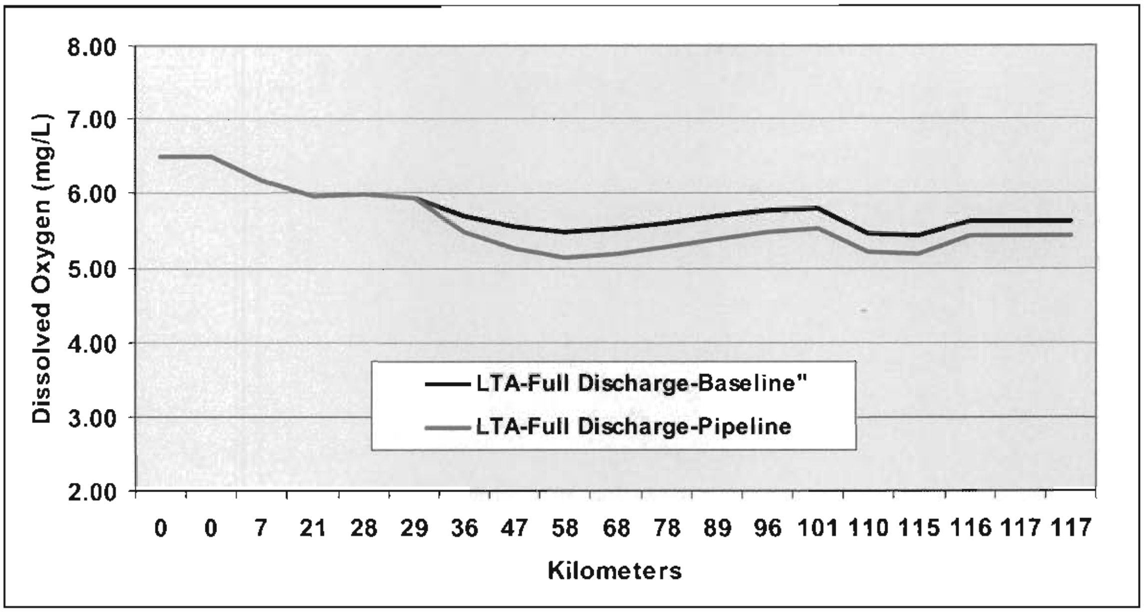


Figure 3.12. Dissolved oxygen predictions with and without the pipeline at full permitted discharge under average summer flow conditions (Scenario 3).

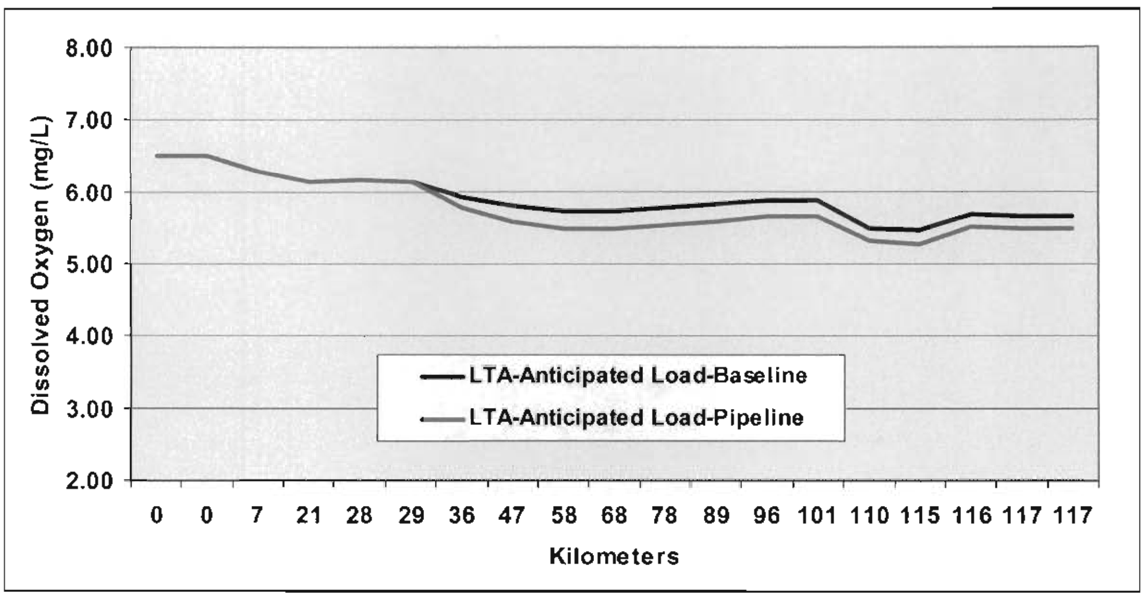


Figure 3.13. Dissolved oxygen predictions with and without the pipeline at anticipated discharge under average summer flow conditions (Scenario 4).

Discharge scenario 1 modeling for total phosphorus, projects an increase in instream phosphorus concentration from approximately 83 µg/L to 93 µg/L as a result of the discharge (Figure 3.14). Total phosphorus levels upstream of Coffee Creek, near the Arkansas and Louisiana state line, remain higher than baseline projections at approximately 92 µg/L, but inorganic phosphorus levels (that portion of phosphorus that is biologically available for phytoplankton growth) are well below background levels by OUA-2.5, half way between highway 82 and Felsenthal Lock and Dam.

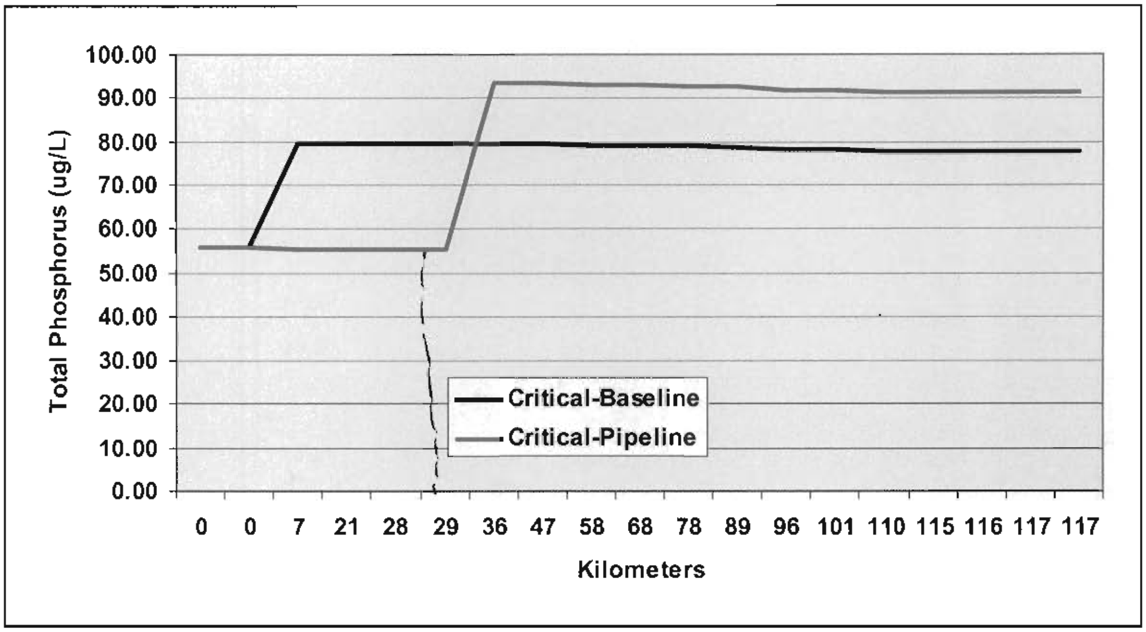


Figure 3.14. Total phosphorus predictions with and without the pipeline discharge under critical stream conditions and at full permitted discharge loads (Scenario 1).

Discharge scenario 2 modeling for total phosphorus projects no significant increase in instream phosphorus concentration as a result of the discharge (Figure 3.15).

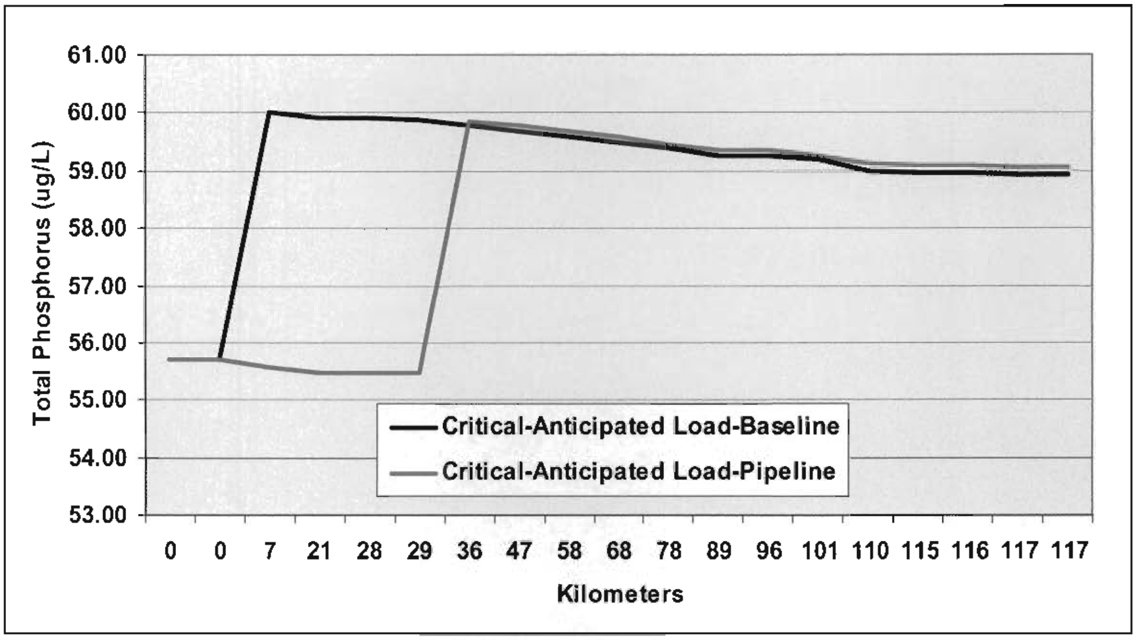


Figure 3.15. Total phosphorus predictions with and without the pipeline discharge under critical stream conditions and the anticipated discharge loads (Scenario 2).

The model projection for scenario 3, average summer stream flow conditions and full permitted discharge results in a slight increase in total phosphorus relative to baseline conditions as the model projects that the total instream phosphorus will be approximately 5 µg/L higher from approximately the 40 km point on the Ouachita River downstream to near the Arkansas and Louisiana state line (Figure 3.16).

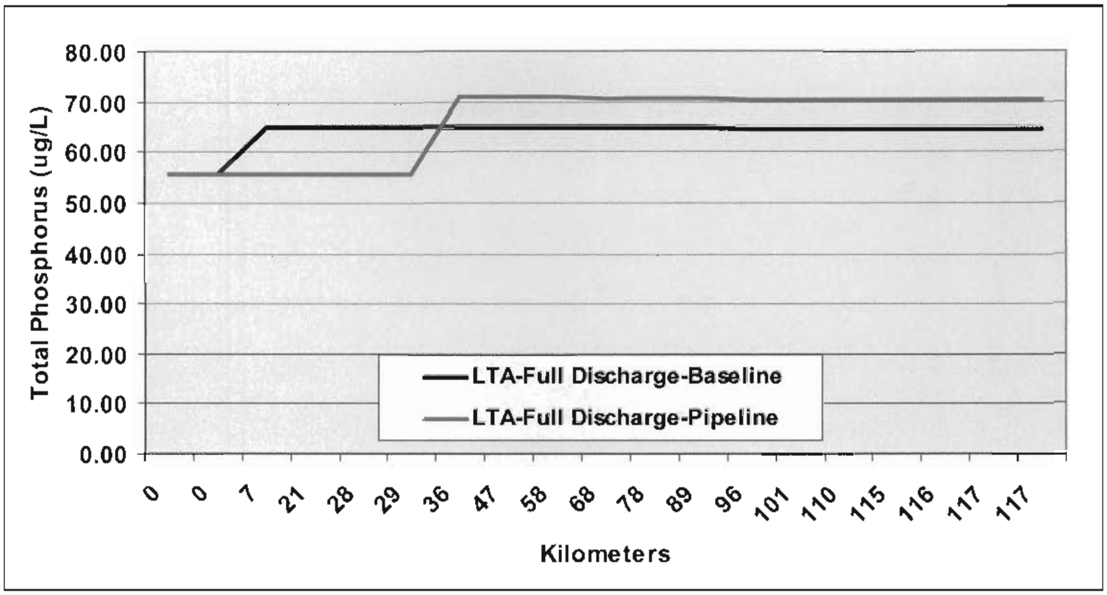


Figure 3.16. Total phosphorus predictions with and without the pipeline discharge under average summer flow conditions and full permitted discharge loads (Scenario 3).

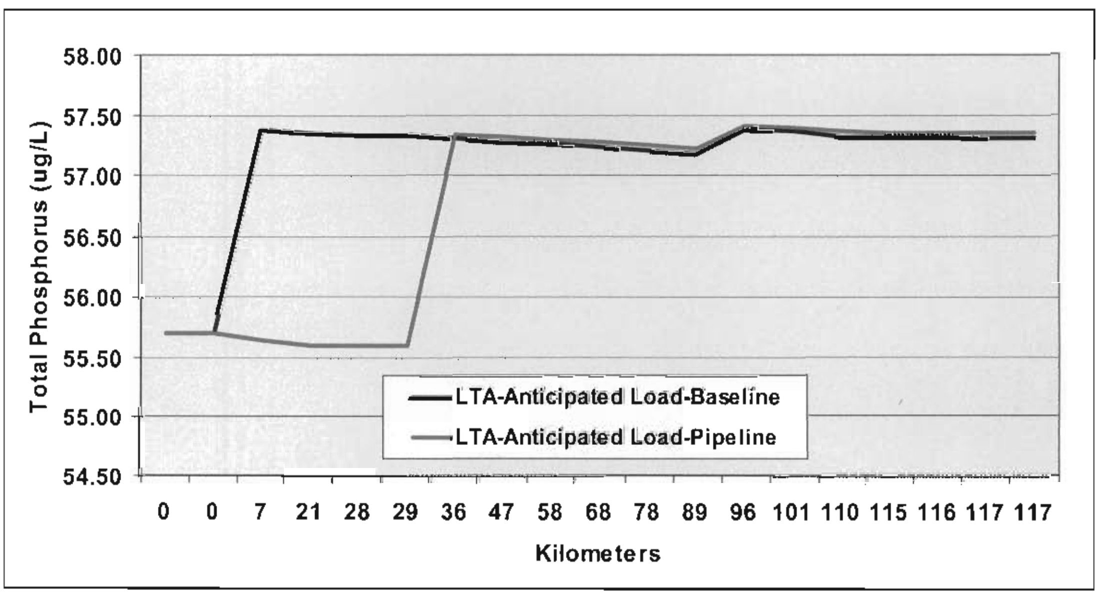


Figure 3.17. Total phosphorus predictions with and without the pipeline discharge under average summer flow conditions and anticipated discharge loads (Scenario 4).

Model projections for chlorophyll-a were similar to those described by the phosphorus projections, that is the largest increases were projected at critical stream flow and full discharge loads. Figure 3.18 shows the scenario 1 model results relative to baseline and projects an increase in chlorophyll-a under critical stream flow conditions and full discharge loads of no more than 5.3 μg/L in the downstream section of the Ouachita River. Figures 3.19 thru 3.21

show only slight increases (≤0.5 µg/L) to no increases in chlorophyll-a concentrations are projected under scenario 2, 3 and 4 conditions.

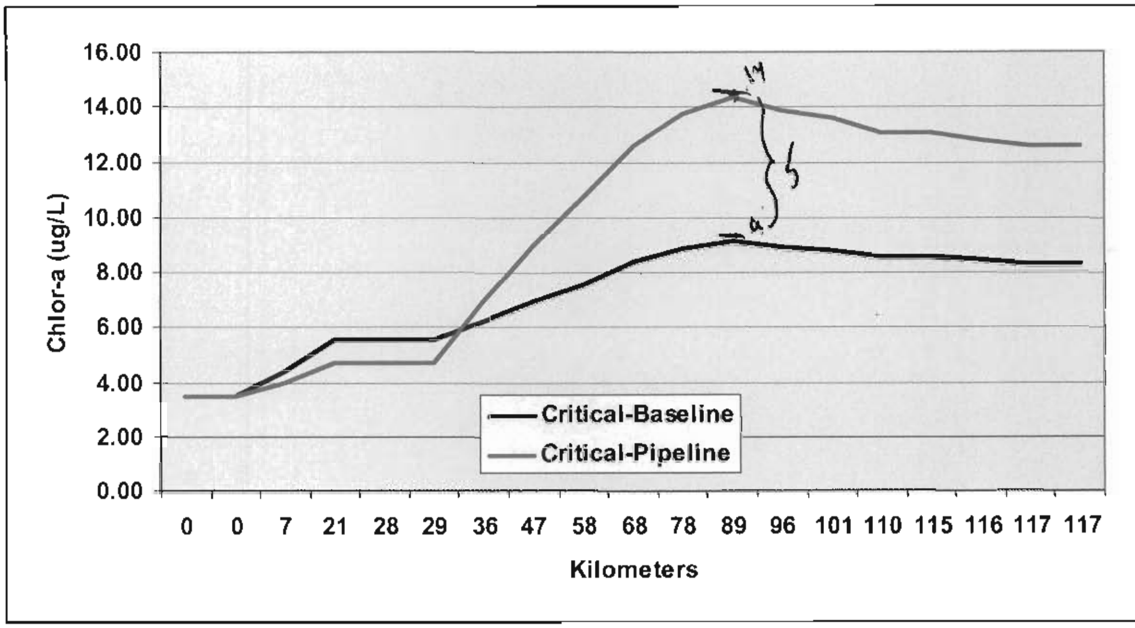


Figure 3.18. Chlorophyll-a predictions with and without the pipeline discharge under critical conditions and full permitted discharge loads (Scenario 1).

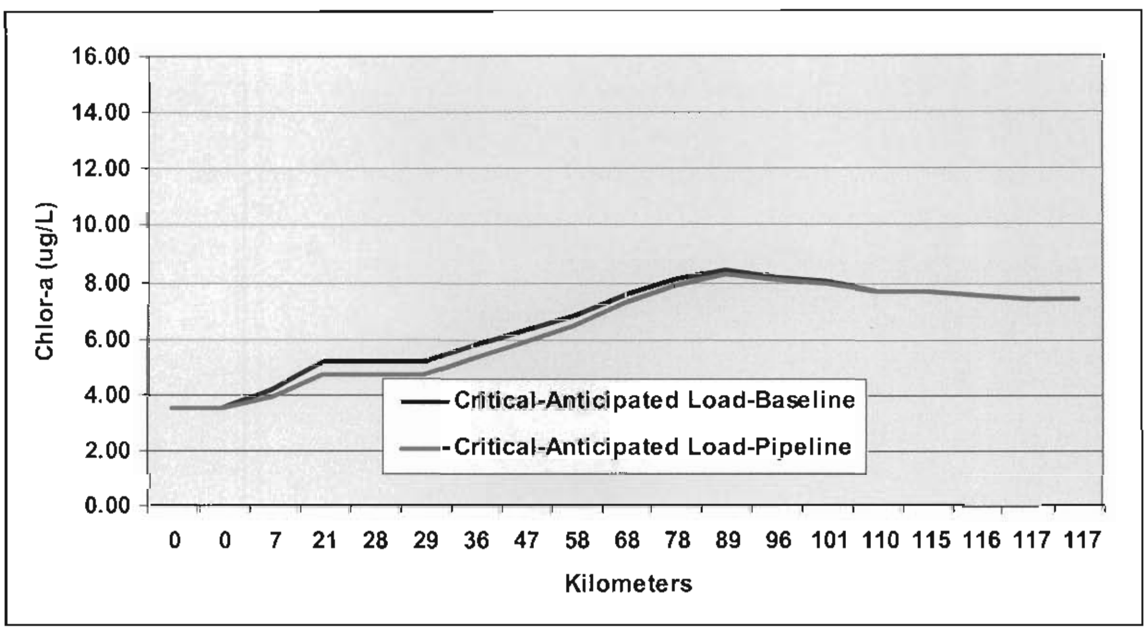


Figure 3.19 Chlorophyll-a predictions with and without the pipeline discharge under critical stream flow conditions and the anticipated discharge loads (Scenario 2).

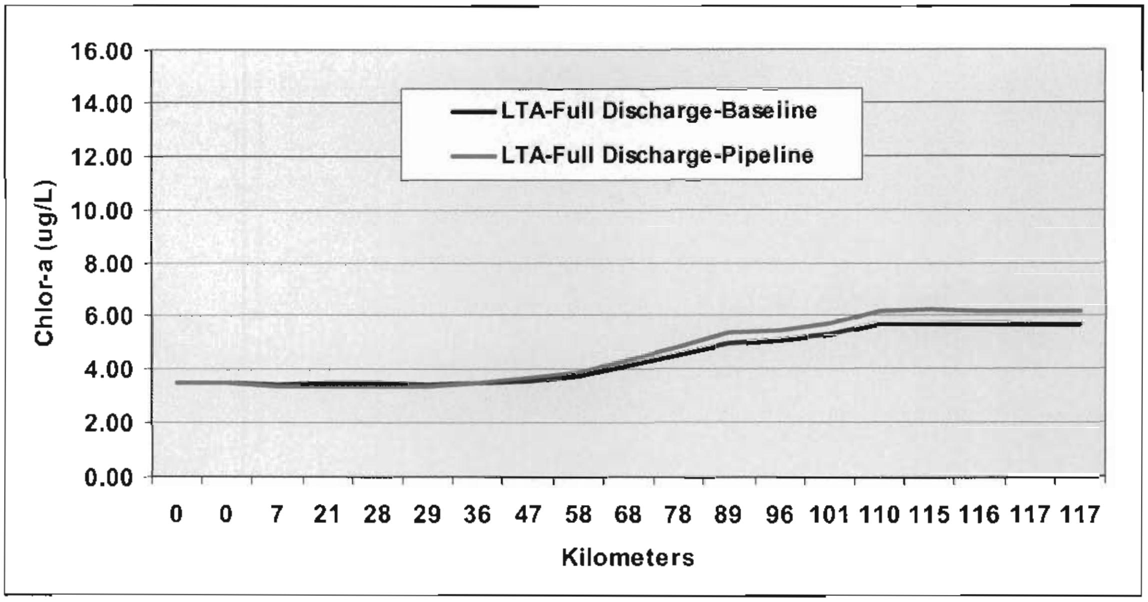


Figure 3.20. Chlorophyll-a predictions with and without the pipeline discharge under average summer flow conditions and full permitted discharge loads (Scenario 3).

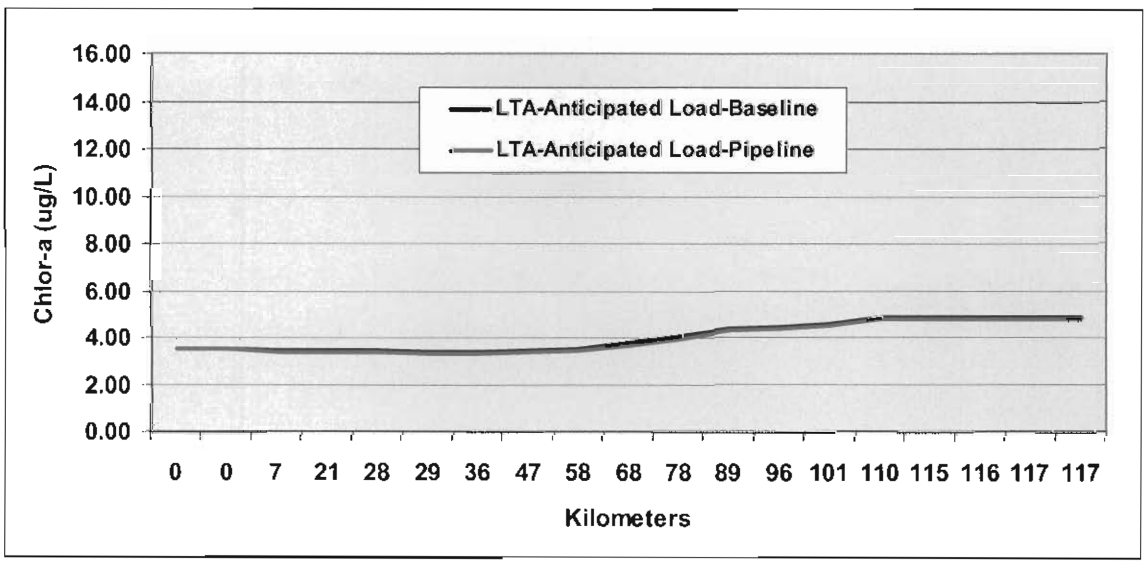


Figure 3.21. Chlorophyll-a predictions with and without the pipeline discharge under average summer flow conditions and anticipated discharge loads (Scenario 4).

The modeling projections for total nitrogen were different than for phosphorus or chlorophyll-a in that the critical stream conditions simulations using both permitted loads and anticipated loads resulted in similar downstream nitrogen results as shown in Figures 3.22 and 3.23. However, the nitrogen levels, as in the original modeling, do not cause an overall change in trophic status in the river (Section 3.2).

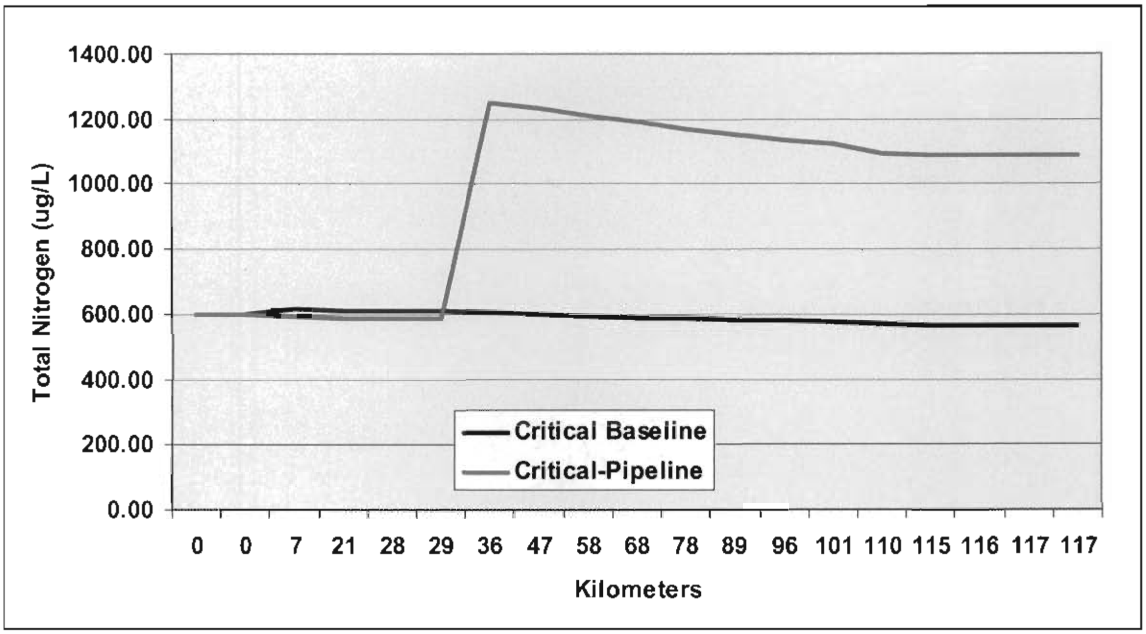


Figure 3.22. Total nitrogen predictions with and without the pipeline discharge under critical stream conditions and full permitted discharge load (Scenario 1).

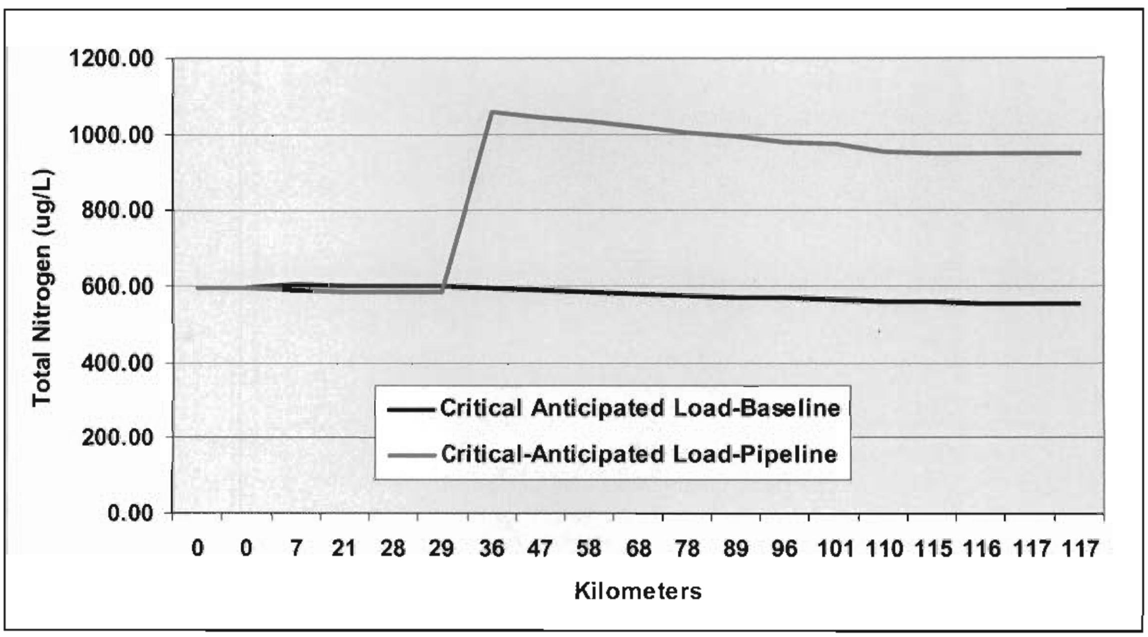


Figure 3.23 Total nitrogen predictions with and without the pipeline discharge under critical conditions and the anticipated discharge loads (Scenario 2).

The projections for average summer flow conditions (Scenario 3 and 4) shown in Figures 3.24 and 3.25 shows a smaller total nitrogen increase downstream.

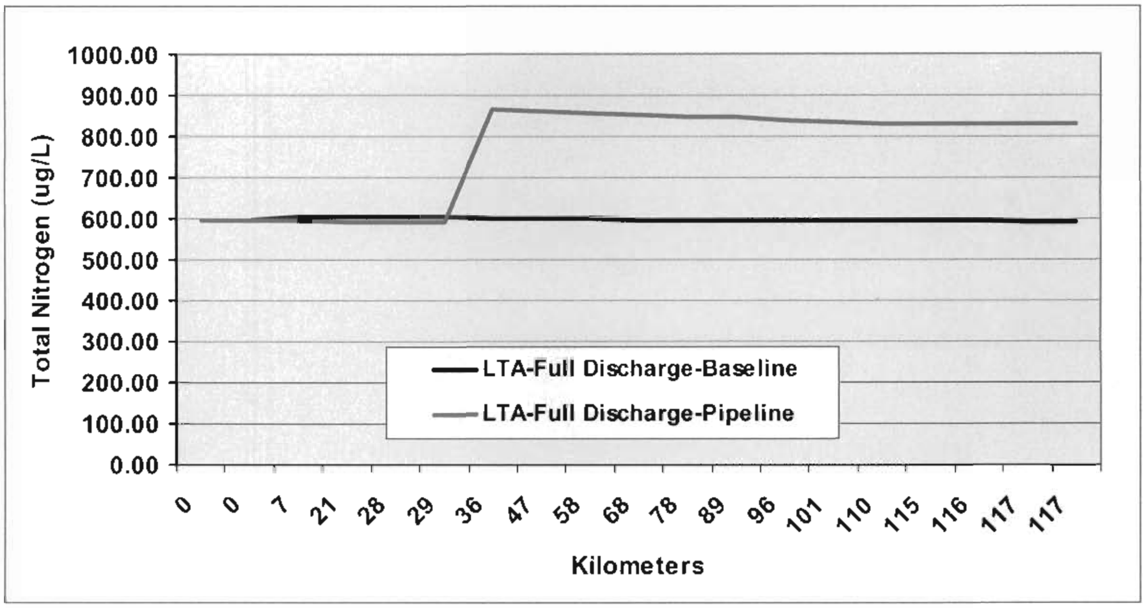


Figure 3.24. Total nitrogen predictions with and without the pipeline discharge under average summer flow conditions and full permitted discharge loads (Scenario 3).

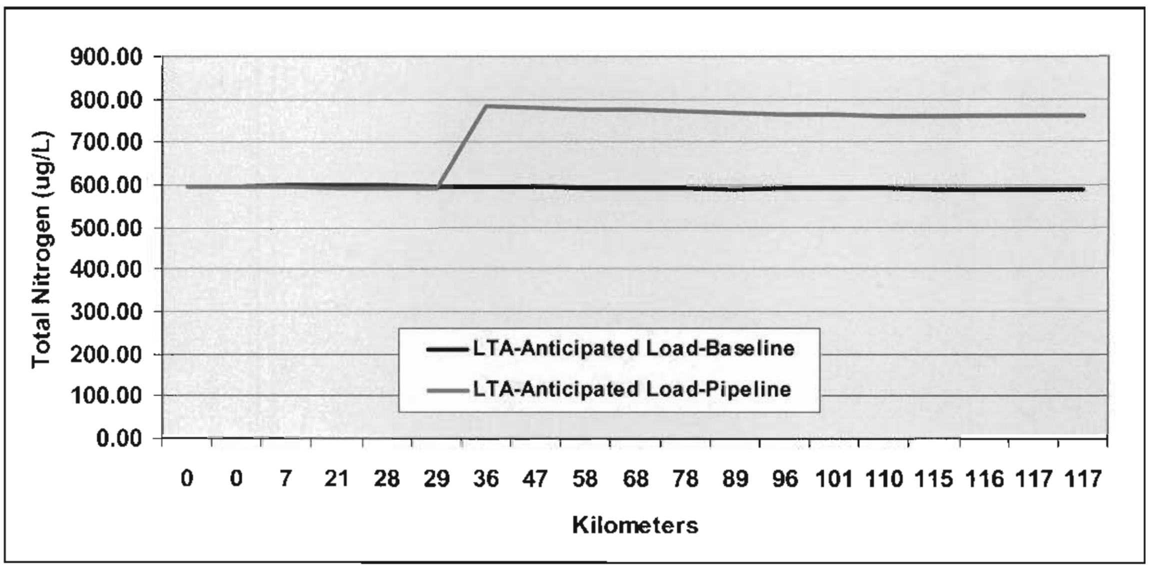


Figure 3.25. Total nitrogen predictions with and without the pipeline discharge under average summer flow conditions and anticipated discharge loads (Scenario 4).

Overall, the water quality predicted by the revised models are little different to that predicted by the models in the original study report.

## 3.2 Trophic State Indices

Carlson's trophic state indices were calculated from predicted model values for each of the three parameters (chlorophyll-a, total phosphorus and total nitrogen) at OUA-3, just upstream of Felsenthal Lock and Dam (Table 3.4).

Table 3.4. Summary of trophic state index scores calculated from QUAL2K revised model predictions.

| Model Scenario | Chlorophyll-a | Total Phosphorus | Total Nitrogen | Overall TSI |
|---|---|---|---|---|
| Critical Stream Conditions (Baseline) with No Pipeline Discharge | 51.6 | 66.9 | 46.3 | 54.9 |
| Critical Stream Conditions with Full Permitted Pipeline Discharge | 55.8 | 69.3 | 55.7 | 60.3 |
| Summer Average Flow Conditions (Baseline) with No Pipeline Discharge | 47.7 | 64.3 | 46.9 | 53.0 |
| Summer Average Flow Conditions with Full Permitted Pipeline Discharge | 48.5 | 65.5 | 51.8 | 55.2 |
| Critical Stream Conditions (Baseline) with No Pipeline Discharge | 50.6 | 62.9 | 46.0 | 53.2 |
| Critical Stream Conditions with Anticipated Discharge Loads from the Pipeline | 50.6 | 63.0 | 53.7 | 55.8 |
| Summer Average Flow Conditions (Baseline) with No Pipeline Discharge | 46.2 | 62.5 | 46.8 | 51.9 |
| Summer Average Flow Conditions with Anticipated Discharge Loads from the Pipeline | 46.0 | 62.6 | 50.5 | 53.0 |

Similar to the original model predictions the results from the trophic state analysis indicate that the model predicts an overall index increase of 5 points under critical worst case conditions as a result of the pipeline discharge. The trophic status of the river remains unchanged. However, as the nutrient load (coupled with critical low flow) this scenario portrays is a theoretical worst case condition that is unlikely to ever be attained, particularly in regards to phosphorus, the more realistic critical scenario (critical stream conditions with anticipated loads) predictions should be emphasized. Trophic state indices calculated from results of the "critical stream conditions with anticipated loads" scenario predictions return scores of 53.0 (baseline) to 55.2 (pipeline). All overall trophic state scores, with or without the pipeline, indicate that the river is eutrophic. Therefore, no change in trophic status of the Ouachita River is predicted to occur as a result of the pipeline discharge for any model scenario analyzed.

# Appendix A

| Reach for diel plot | 11 | | | | | One Option, Leave the Other Blank or Zero) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0550 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0550 |
| 2.000 | 1/2 way to Thatcher L&D (289.5) | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0550 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0550 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0500 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0500 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0690 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0690 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0690 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0480 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0480 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0480 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0340 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0340 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0400 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0400 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0440 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0440 |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.70 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.65 | 6.70 | 0.01 | 2.40 | 444.86 | 20.04 | 20.04 | 30.13 | 10.01 | 3.50 | 1.21 |
| 2.00 | 6.96 | 63.48 | 3.00 | 6.63 | 0.16 | 2.50 | 482.31 | 21.85 | 27.54 | 35.79 | 10.52 | 3.55 | 0.63 |
| 3.00 | 20.56 | 63.48 | 2.45 | 6.61 | 0.12 | 2.48 | 495.80 | 22.80 | 29.80 | 38.25 | 10.73 | 3.75 | 0.33 |
| 4.00 | 27.76 | 63.48 | 2.42 | 6.65 | 0.12 | 2.48 | 496.75 | 23.03 | 30.08 | 38.43 | 10.78 | 3.74 | 0.31 |
| 5.00 | 28.81 | 63.48 | 2.37 | 6.63 | 0.11 | 2.48 | 498.00 | 23.36 | 30.56 | 38.68 | 10.85 | 3.72 | 0.28 |
| 6.00 | 35.65 | 63.48 | 1.92 | 6.50 | 0.06 | 2.25 | 498.35 | 24.93 | 36.21 | 39.52 | 11.36 | 3.70 | 0.14 |
| 7.00 | 47.07 | 63.48 | 1.60 | 6.46 | 0.04 | 2.01 | 494.35 | 25.52 | 41.03 | 39.62 | 11.70 | 3.76 | 0.09 |
| 8.00 | 57.53 | 63.48 | 1.33 | 6.46 | 0.02 | 1.78 | 488.47 | 25.67 | 45.65 | 39.45 | 11.95 | 3.87 | 0.06 |
| 9.00 | 67.99 | 63.48 | 1.11 | 6.54 | 0.02 | 1.59 | 482.75 | 24.97 | 48.19 | 39.22 | 11.89 | 4.21 | 0.06 |
| 10.00 | 78.45 | 63.48 | 0.92 | 6.63 | 0.02 | 1.42 | 476.95 | 24.48 | 49.93 | 38.96 | 11.77 | 4.56 | 0.05 |
| 11.00 | 88.91 | 63.48 | 0.77 | 6.70 | 0.02 | 1.27 | 471.30 | 24.15 | 50.96 | 38.72 | 11.60 | 4.92 | 0.05 |
| 12.00 | 96.16 | 64.20 | 0.78 | 6.71 | 0.07 | 1.30 | 470.69 | 24.69 | 51.18 | 38.61 | 11.63 | 4.93 | 0.07 |
| 13.00 | 101.39 | 64.20 | 0.70 | 6.71 | 0.04 | 1.24 | 467.41 | 25.07 | 52.84 | 38.53 | 11.71 | 4.98 | 0.07 |
| 14.00 | 109.84 | 64.20 | 0.54 | 6.26 | 0.02 | 1.09 | 459.98 | 25.22 | 55.71 | 38.28 | 11.77 | 5.15 | 0.06 |
| 15.00 | 115.47 | 64.20 | 0.53 | 6.22 | 0.02 | 1.08 | 459.40 | 25.23 | 55.93 | 38.26 | 11.78 | 5.17 | 0.06 |
| 16.00 | 116.28 | 64.20 | 0.52 | 6.44 | 0.02 | 1.07 | 458.71 | 25.50 | 56.39 | 38.24 | 11.84 | 5.13 | 0.06 |
| 17.00 | 117.08 | 64.20 | 0.51 | 6.45 | 0.02 | 1.05 | 458.01 | 25.73 | 56.88 | 38.21 | 11.90 | 5.09 | 0.06 |
| | 117.48 | 64.20 | 0.51 | 6.45 | 0.02 | 1.05 | 458.01 | 25.73 | 56.88 | 38.21 | 11.90 | 5.09 | 0.06 |

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |

Critical base line

| Reach Label | Downstream Label | Downstream Distance | Hydraulics Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | Reaeration ka,20, /d | Reaeration formula |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Headwater | 0.00 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 0.00 | 0.000020 | 0.25 | O'Conn |
| 1.00 | OVR CRK (297.9) | 0.16 | 21.20 | 0.25 | 3.07 | 48.50 | 182.87 | 0.12 | 0.02 | 0.000020 | 0.25 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 21.51 | 10.76 | 3.10 | 48.50 | 184.66 | 0.12 | 1.37 | 0.000020 | 0.25 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 21.51 | 20.31 | 3.10 | 48.50 | 184.66 | 0.12 | 2.72 | 0.000020 | 0.25 | O'Conn |
| 4.00 | 280.50 | 28.16 | 21.51 | 8.28 | 3.99 | 48.50 | 250.74 | 0.09 | 2.83 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 21.51 | 2.02 | 3.99 | 48.50 | 250.74 | 0.09 | 3.00 | 0.000007 | 0.14 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 21.51 | 11.67 | 3.94 | 56.70 | 278.95 | 0.08 | 4.86 | 0.000011 | 0.14 | O'Conn |
| 7.00 | 265.50 | 52.30 | 21.51 | 10.75 | 3.94 | 56.70 | 278.95 | 0.08 | 6.43 | 0.000011 | 0.14 | O'Conn |
| 8.00 | 259.00 | 62.76 | 21.51 | 10.76 | 3.94 | 56.70 | 278.95 | 0.08 | 8.00 | 0.000011 | 0.14 | O'Conn |
| 9.00 | 252.50 | 73.22 | 21.51 | 10.76 | 3.63 | 56.70 | 253.42 | 0.08 | 9.43 | 0.000007 | 0.17 | O'Conn |
| 10.00 | 246.00 | 83.68 | 21.51 | 10.75 | 3.63 | 56.70 | 253.42 | 0.08 | 10.85 | 0.000007 | 0.17 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 21.51 | 15.54 | 3.63 | 56.70 | 253.42 | 0.08 | 12.28 | 0.000007 | 0.17 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 21.93 | 8.43 | 4.13 | 56.70 | 295.76 | 0.07 | 12.91 | 0.000003 | 0.13 | O'Conn |
| 13.00 | 233.00 | 104.61 | 21.93 | 8.35 | 4.13 | 56.70 | 295.76 | 0.07 | 13.91 | 0.000003 | 0.13 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 21.93 | 20.36 | 4.24 | 81.60 | 411.05 | 0.05 | 16.18 | 0.000002 | 0.10 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 21.93 | 10.97 | 4.24 | 81.60 | 411.05 | 0.05 | 16.36 | 0.000002 | 0.10 | O'Conn |
| 16.00 | 225.50 | 116.68 | 21.93 | 10.96 | 4.95 | 81.60 | 491.76 | 0.04 | 16.57 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 21.93 | 10.97 | 4.95 | 81.60 | 491.76 | 0.04 | 16.77 | 0.000001 | 0.08 | O'Conn |

| Reach Label | X(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.64 | 6.49 | 0.02 | 2.39 | 445.40 | 20.05 | 20.06 | 30.21 | 10.01 | 3.50 | 1.20 |
| 2.00 | 6.96 | 62.88 | 2.74 | 6.24 | 0.15 | 2.51 | 495.61 | 21.50 | 33.63 | 54.70 | 15.59 | 4.38 | 0.49 |
| 3.00 | 20.56 | 62.88 | 2.02 | 6.15 | 0.09 | 2.34 | 504.26 | 22.32 | 30.39 | 56.34 | 15.44 | 5.51 | 0.22 |
| 4.00 | 27.76 | 62.88 | 1.98 | 6.21 | 0.08 | 2.33 | 504.78 | 22.76 | 30.43 | 56.44 | 15.51 | 5.52 | 0.20 |
| 5.00 | 28.81 | 62.88 | 1.92 | 6.16 | 0.07 | 2.30 | 505.24 | 23.35 | 30.56 | 56.56 | 15.61 | 5.54 | 0.17 |
| 6.00 | 35.65 | 62.88 | 1.39 | 5.95 | 0.04 | 1.90 | 498.00 | 25.38 | 30.96 | 56.14 | 16.01 | 6.23 | 0.09 |
| 7.00 | 47.07 | 62.88 | 1.05 | 5.89 | 0.03 | 1.60 | 489.62 | 26.14 | 30.21 | 55.46 | 16.10 | 6.90 | 0.07 |
| 8.00 | 57.53 | 62.88 | 0.80 | 5.91 | 0.03 | 1.35 | 481.16 | 26.65 | 28.56 | 54.74 | 16.08 | 7.55 | 0.07 |
| 9.00 | 67.99 | 62.88 | 0.61 | 6.03 | 0.03 | 1.18 | 474.12 | 26.41 | 24.48 | 54.17 | 15.71 | 8.34 | 0.08 |
| 10.00 | 78.45 | 62.88 | 0.46 | 6.12 | 0.03 | 1.04 | 467.79 | 26.81 | 20.91 | 53.69 | 15.52 | 8.84 | 0.08 |
| 11.00 | 88.91 | 62.88 | 0.35 | 6.20 | 0.03 | 0.94 | 462.00 | 27.25 | 18.27 | 53.27 | 15.49 | 9.12 | 0.08 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0.99 | [illegible] | [illegible] | 18.82 | [illegible] | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 63.45 | 0.31 | 6.15 | 0.04 | 0.95 | 457.63 | 29.05 | 19.89 | 52.59 | 16.03 | 8.72 | 0.09 |
| 14.00 | 109.84 | 63.45 | 0.21 | 5.25 | 0.03 | 0.84 | 448.74 | 29.42 | 22.19 | 51.86 | 16.63 | 8.53 | 0.08 |
| [illegible] | [illegible] | [illegible] | 0.20 | [illegible] | 0.03 | [illegible] | [illegible] | [illegible] | [illegible] | 51.80 | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 63.46 | 0.20 | 5.69 | 0.03 | 0.82 | 447.22 | 30.02 | 23.07 | 51.73 | 16.85 | 8.38 | 0.08 |
| 17.00 | 117.08 | 63.46 | 0.19 | 5.67 | 0.03 | 0.82 | 446.38 | 30.43 | 23.83 | 51.66 | 17.02 | 8.25 | 0.08 |
| | 117.48 | 63.46 | 0.19 | 5.67 | 0.03 | 0.82 | 446.38 | 30.43 | 23.83 | 51.66 | 17.02 | 8.25 | 0.08 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 596.95 | 55.70 | 576.89 | 5.19 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 21.60 | 7.05 | 0.00 | 3.02 | 617.40 | 79.55 | 583.77 | 3.67 | 3.65 | 0.00 | 0.23 | 7.26 | 7.89 |
| 3.00 | 20.56 | 0.00 | 21.57 | 7.13 | 0.00 | 2.74 | 612.16 | 79.44 | 581.77 | 2.79 | 3.25 | 0.00 | 0.28 | 7.22 | 7.89 |
| 4.00 | 27.76 | 0.00 | 21.56 | 7.15 | 0.00 | 2.71 | 611.85 | 79.43 | 581.42 | 2.73 | 3.21 | 0.00 | 0.31 | 7.22 | 7.89 |
| 5.00 | 28.81 | 0.00 | 21.56 | 7.15 | 0.00 | 2.66 | 611.37 | 79.42 | 580.81 | 2.64 | 3.15 | 0.00 | 0.31 | 7.22 | 7.89 |
| 6.00 | 35.65 | 0.00 | 21.49 | 7.17 | 0.00 | 2.23 | 605.93 | 79.31 | 574.96 | 2.11 | 2.71 | 0.00 | 0.36 | 7.19 | 7.89 |
| 7.00 | 47.07 | 0.00 | 21.44 | 7.21 | 0.00 | 1.93 | 601.08 | 79.21 | 570.87 | 1.82 | 2.45 | 0.00 | 0.41 | 7.17 | 7.89 |
| 8.00 | 57.53 | 0.00 | 21.39 | 7.26 | 0.00 | 1.71 | 595.95 | 79.10 | 567.39 | 1.63 | 2.27 | 0.00 | 0.47 | 7.16 | 7.89 |
| 9.00 | 67.99 | 0.00 | 21.35 | 7.33 | 0.00 | 1.57 | 590.52 | 78.98 | 566.04 | 1.52 | 2.18 | 0.00 | 0.55 | 7.15 | 7.89 |
| 10.00 | 78.45 | 0.00 | 21.31 | 7.41 | 0.00 | 1.46 | 584.89 | 78.85 | 563.98 | 1.42 | 2.11 | 0.00 | 0.67 | 7.14 | 7.89 |
| 11.00 | 88.91 | 0.00 | 21.27 | 7.48 | 0.00 | 1.37 | 579.14 | 78.70 | 560.87 | 1.34 | 2.04 | 0.00 | 0.80 | 7.13 | 7.89 |
| ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~78.32~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ |
| 13.00 | 101.39 | 0.00 | 22.72 | 7.45 | 0.00 | 1.37 | 575.66 | 78.22 | 555.77 | 1.27 | 2.02 | 0.00 | 0.79 | 7.13 | 7.92 |
| 14.00 | 109.84 | 0.00 | 22.62 | 7.49 | 0.00 | 1.25 | 567.64 | 77.83 | 545.45 | 1.15 | 1.88 | 0.00 | 0.89 | 7.13 | 7.92 |
| ~~[illegible]~~ | ~~[illegible]~~ | ~~0.00~~ | ~~[illegible]~~ | ~~7.49~~ | ~~0.00~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~0.00~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~7.92~~ |
| 16.00 | 116.28 | 0.00 | 22.60 | 7.56 | 0.00 | 1.22 | 566.41 | 77.77 | 543.34 | 1.12 | 1.84 | 0.00 | 1.05 | 7.12 | 7.92 |
| 17.00 | 117.08 | 0.00 | 22.59 | 7.55 | 0.00 | 1.21 | 565.80 | 77.73 | 541.96 | 1.10 | 1.82 | 0.00 | 1.06 | 7.12 | 7.92 |
| | 117.48 | 0.00 | 22.59 | 7.55 | 0.00 | 1.21 | 565.80 | 77.73 | 541.96 | 1.10 | 1.82 | 0.00 | 1.06 | 7.12 | 7.92 |

Critical-pipeline-trap

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |

| Reach | Downstream | Downstream | Hydraulics | | | | | | | | Reaeration | Reaeration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | Label | Distance | Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | ka,20, /d | formula |
| | Headwater | 0.00 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 0.00 | 0.000020 | 0.25 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 21.20 | 0.25 | 3.07 | 48.50 | 182.87 | 0.12 | 0.02 | 0.000020 | 0.25 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 1.37 | 0.000020 | 0.25 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 21.20 | 20.02 | 3.07 | 48.50 | 182.87 | 0.12 | 2.73 | 0.000020 | 0.25 | O'Conn |
| 4.00 | 280.50 | 28.16 | 21.20 | 8.16 | 3.96 | 48.50 | 248.26 | 0.09 | 2.84 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 21.20 | 1.99 | 3.96 | 48.50 | 248.26 | 0.09 | 3.01 | 0.000007 | 0.15 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 22.08 | 11.97 | 3.99 | 56.70 | 283.90 | 0.08 | 4.86 | 0.000011 | 0.14 | O'Conn |
| 7.00 | 265.50 | 52.30 | 22.08 | 11.04 | 3.99 | 56.70 | 283.90 | 0.08 | 6.42 | 0.000011 | 0.14 | O'Conn |
| 8.00 | 259.00 | 62.76 | 22.08 | 11.04 | 3.99 | 56.70 | 283.90 | 0.08 | 7.97 | 0.000011 | 0.14 | O'Conn |
| 9.00 | 252.50 | 73.22 | 22.08 | 11.04 | 3.69 | 56.70 | 257.89 | 0.09 | 9.39 | 0.000007 | 0.16 | O'Conn |
| 10.00 | 246.00 | 83.68 | 22.08 | 11.03 | 3.69 | 56.70 | 257.89 | 0.09 | 10.80 | 0.000007 | 0.16 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 22.08 | 15.95 | 3.69 | 56.70 | 257.89 | 0.09 | 12.22 | 0.000007 | 0.16 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 22.50 | 8.65 | 4.19 | 56.70 | 300.93 | 0.07 | 12.84 | 0.000003 | 0.13 | O'Conn |
| 13.00 | 233.00 | 104.61 | 22.50 | 8.57 | 4.19 | 56.70 | 300.93 | 0.07 | 13.84 | 0.000003 | 0.13 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 22.50 | 20.89 | 4.31 | 81.60 | 418.07 | 0.05 | 16.09 | 0.000002 | 0.10 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 22.50 | 11.25 | 4.31 | 81.60 | 418.07 | 0.05 | 16.26 | 0.000002 | 0.10 | O'Conn |
| 16.00 | 225.50 | 116.68 | 22.50 | 11.24 | 5.02 | 81.60 | 500.24 | 0.04 | 16.47 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 22.50 | 11.25 | 5.02 | 81.60 | 500.24 | 0.04 | 16.67 | 0.000001 | 0.07 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.64 | 6.49 | 0.02 | 2.39 | 445.40 | 20.05 | 20.06 | 30.21 | 10.01 | 3.50 | 1.20 |
| 2.00 | 6.96 | 63.80 | 2.68 | 6.21 | 0.14 | 2.45 | 483.91 | 22.02 | 22.79 | 36.52 | 10.36 | 3.94 | 0.47 |
| 3.00 | 20.56 | 63.80 | 1.97 | 6.09 | 0.08 | 2.29 | 491.81 | 22.81 | 23.48 | 38.57 | 10.16 | 4.69 | 0.20 |
| 4.00 | 27.76 | 63.80 | 1.93 | 6.15 | 0.08 | 2.27 | 492.27 | 23.18 | 23.77 | 38.71 | 10.21 | 4.69 | 0.19 |
| 5.00 | 28.81 | 63.80 | 1.87 | 6.11 | 0.07 | 2.24 | 492.63 | 23.68 | 24.27 | 38.88 | 10.28 | 4.69 | 0.16 |
| 6.00 | 35.65 | 114.16 | 1.43 | 5.34 | 0.04 | 2.33 | 523.48 | 179.42 | 490.73 | 67.74 | 17.69 | 6.96 | 0.11 |
| 7.00 | 47.07 | 114.16 | 1.09 | 5.28 | 0.04 | 1.95 | 516.77 | 101.33 | 541.63 | 66.99 | 16.45 | 8.99 | 0.09 |
| 8.00 | 57.53 | 114.16 | 0.83 | 5.43 | 0.04 | 1.65 | 510.91 | 59.03 | 555.75 | 66.35 | 15.13 | 10.76 | 0.10 |
| 9.00 | 67.99 | 114.16 | 0.63 | 5.73 | 0.04 | 1.45 | 507.19 | 38.43 | 545.88 | 65.99 | 13.39 | 12.57 | 0.11 |
| 10.00 | 78.45 | 114.16 | 0.48 | 5.99 | 0.04 | 1.31 | 504.88 | 31.00 | 526.69 | 65.82 | 12.12 | 13.72 | 0.12 |
| 11.00 | 88.91 | 114.16 | 0.37 | 6.18 | 0.05 | 1.21 | 503.54 | 29.16 | 505.44 | 65.77 | 11.26 | 14.35 | 0.13 |
| [illegible] | [illegible] | 113.74 | 0.38 | 6.17 | 0.06 | 1.25 | 503.88 | [illegible] | [illegible] | 65.27 | 11.40 | [illegible] | [illegible] |
| 13.00 | 101.39 | 113.74 | 0.32 | 6.16 | 0.05 | 1.21 | 503.25 | 31.05 | 481.56 | 65.30 | 11.67 | 13.60 | 0.13 |
| 14.00 | 109.84 | 113.62 | 0.22 | 5.31 | 0.05 | 1.10 | 500.12 | 31.31 | 459.16 | 65.07 | 12.19 | 13.08 | 0.12 |
| [illegible] | [illegible] | [illegible] | 0.22 | [illegible] | [illegible] | 1.09 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 113.60 | 0.21 | 5.72 | 0.04 | 1.08 | 499.56 | 32.22 | 456.45 | 65.03 | 12.47 | 12.79 | 0.12 |
| 17.00 | 117.08 | 113.59 | 0.20 | 5.70 | 0.04 | 1.07 | 499.22 | 32.87 | 455.62 | 65.00 | 12.71 | 12.57 | 0.12 |
| | 117.48 | 113.59 | 0.20 | 5.70 | 0.04 | 1.07 | 499.22 | 32.87 | 455.62 | 65.00 | 12.71 | 12.57 | 0.12 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 596.95 | 55.70 | 576.89 | 5.19 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.45 | 7.06 | 0.00 | 2.94 | 591.32 | 55.57 | 568.53 | 3.55 | 3.53 | 0.00 | 0.23 | 7.26 | 7.87 |
| 3.00 | 20.56 | 0.00 | 20.40 | 7.12 | 0.00 | 2.64 | 586.65 | 55.47 | 563.17 | 2.64 | 3.10 | 0.00 | 0.28 | 7.22 | 7.87 |
| 4.00 | 27.76 | 0.00 | 20.39 | 7.15 | 0.00 | 2.61 | 586.38 | 55.47 | 562.60 | 2.58 | 3.06 | 0.00 | 0.31 | 7.22 | 7.87 |
| 5.00 | 28.81 | 0.00 | 20.39 | 7.14 | 0.00 | 2.57 | 585.95 | 55.46 | 561.68 | 2.50 | 2.99 | 0.00 | 0.31 | 7.21 | 7.87 |
| 6.00 | 35.65 | 0.00 | 22.42 | 7.08 | 0.00 | 2.70 | 1251.70 | 93.49 | 760.97 | 2.23 | 3.24 | 0.00 | 2.09 | 7.19 | 7.90 |
| 7.00 | 47.07 | 0.00 | 21.88 | 7.09 | 0.00 | 2.38 | 1231.23 | 93.37 | 689.59 | 2.08 | 3.05 | 0.00 | 1.21 | 7.17 | 7.89 |
| 8.00 | 57.53 | 0.00 | 21.60 | 7.14 | 0.00 | 2.16 | 1210.28 | 93.22 | 654.52 | 2.01 | 2.95 | 0.00 | 0.80 | 7.16 | 7.89 |
| 9.00 | 67.99 | 0.00 | 21.48 | 7.25 | 0.00 | 2.04 | 1190.00 | 93.05 | 644.11 | 2.00 | 2.96 | 0.00 | 0.65 | 7.15 | 7.89 |
| 10.00 | 78.45 | 0.00 | 21.44 | 7.36 | 0.00 | 1.95 | 1170.13 | 92.87 | 643.44 | 1.98 | 2.96 | 0.00 | 0.68 | 7.14 | 7.88 |
| 11.00 | 88.91 | 0.00 | 21.43 | 7.48 | 0.00 | 1.88 | 1150.74 | 92.68 | 645.30 | 1.93 | 2.94 | 0.00 | 0.84 | 7.13 | 7.88 |
| 12.00 | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 1.91 | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 22.87 | 7.47 | 0.00 | 1.86 | 1123.38 | 91.91 | 641.82 | 1.82 | 2.87 | 0.00 | 0.87 | 7.13 | 7.91 |
| 14.00 | 109.84 | 0.00 | 22.82 | 7.53 | 0.00 | 1.72 | 1093.70 | 91.58 | 634.54 | 1.66 | 2.69 | 0.00 | 1.02 | 7.13 | 7.91 |
| [illegible] | [illegible] | [illegible] | 22.81 | [illegible] | 0.00 | [illegible] | [illegible] | 91.55 | 633.98 | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 0.00 | 22.81 | 7.59 | 0.00 | 1.69 | 1089.20 | 91.53 | 632.75 | 1.61 | 2.64 | 0.00 | 1.20 | 7.13 | 7.91 |
| 17.00 | 117.08 | 0.00 | 22.80 | 7.58 | 0.00 | 1.67 | 1087.01 | 91.50 | 631.40 | 1.58 | 2.60 | 0.00 | 1.21 | 7.13 | 7.91 |
| | 117.48 | 0.00 | 22.80 | 7.58 | 0.00 | 1.67 | 1087.01 | 91.50 | 631.40 | 1.58 | 2.60 | 0.00 | 1.21 | 7.13 | 7.91 |

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |

| Reach Label | Downstream Label | Downstream Distance | Hydraulics Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | Reaeration ka,20, /d | Reaeration formula |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Headwater | 0.00 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.00 | 0.000020 | 0.23 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 54.37 | 0.64 | 4.00 | 48.50 | 251.92 | 0.22 | 0.01 | 0.000020 | 0.23 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.74 | 0.000020 | 0.23 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 54.37 | 51.33 | 4.00 | 48.50 | 251.92 | 0.22 | 1.47 | 0.000020 | 0.23 | O'Conn |
| 4.00 | 280.50 | 28.16 | 54.37 | 20.92 | 5.01 | 48.50 | 333.08 | 0.16 | 1.52 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 54.37 | 5.12 | 5.01 | 48.50 | 333.08 | 0.16 | 1.62 | 0.000007 | 0.14 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 54.96 | 29.81 | 4.63 | 56.70 | 339.26 | 0.16 | 2.50 | 0.000011 | 0.16 | O'Conn |
| 7.00 | 265.50 | 52.30 | 54.96 | 27.48 | 4.63 | 56.70 | 339.26 | 0.16 | 3.25 | 0.000011 | 0.16 | O'Conn |
| 8.00 | 259.00 | 62.76 | 54.96 | 27.48 | 4.63 | 56.70 | 339.26 | 0.16 | 4.00 | 0.000011 | 0.16 | O'Conn |
| 9.00 | 252.50 | 73.22 | 54.96 | 27.48 | 4.14 | 56.70 | 296.06 | 0.19 | 4.65 | 0.000007 | 0.20 | O'Conn |
| 10.00 | 246.00 | 83.68 | 54.96 | 27.47 | 4.14 | 56.70 | 296.06 | 0.19 | 5.30 | 0.000007 | 0.20 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 54.96 | 39.70 | 4.14 | 56.70 | 296.06 | 0.19 | 5.95 | 0.000007 | 0.20 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 57.62 | 22.16 | 4.35 | 56.70 | 314.56 | 0.18 | 6.21 | 0.000003 | 0.19 | O'Conn |
| 13.00 | 233.00 | 104.61 | 57.62 | 21.95 | 4.35 | 56.70 | 314.56 | 0.18 | 6.61 | 0.000003 | 0.19 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 57.62 | 53.50 | 4.43 | 81.60 | 431.80 | 0.13 | 7.52 | 0.000002 | 0.15 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 57.62 | 28.83 | 4.43 | 81.60 | 431.80 | 0.13 | 7.59 | 0.000002 | 0.15 | O'Conn |
| 16.00 | 225.50 | 116.68 | 57.62 | 28.79 | 5.15 | 81.60 | 516.20 | 0.11 | 7.67 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 57.62 | 28.81 | 5.15 | 81.60 | 516.20 | 0.11 | 7.76 | 0.000001 | 0.11 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.65 | 6.50 | 0.01 | 2.40 | 444.76 | 20.05 | 20.04 | 30.11 | 10.01 | 3.50 | 1.21 |
| 2.00 | 6.96 | 63.80 | 3.20 | 6.28 | 0.17 | 2.50 | 476.57 | 22.41 | 23.56 | 35.05 | 10.59 | 3.37 | 0.66 |
| 3.00 | 20.56 | 63.80 | 2.81 | 6.13 | 0.14 | 2.53 | 490.70 | 23.86 | 27.21 | 37.53 | 11.01 | 3.37 | 0.37 |
| 4.00 | 27.76 | 63.80 | 2.79 | 6.16 | 0.14 | 2.53 | 491.70 | 24.07 | 27.56 | 37.71 | 11.07 | 3.35 | 0.35 |
| 5.00 | 28.81 | 63.80 | 2.75 | 6.13 | 0.13 | 2.53 | 493.07 | 24.39 | 28.15 | 37.96 | 11.15 | 3.32 | 0.32 |
| 6.00 | 35.65 | 77.42 | 2.41 | 5.76 | 0.08 | 2.54 | 505.55 | 84.38 | 155.84 | 40.25 | 12.04 | 3.30 | 0.18 |
| 7.00 | 47.07 | 77.42 | 2.14 | 5.58 | 0.05 | 2.35 | 503.51 | 68.46 | 175.83 | 40.48 | 12.42 | 3.34 | 0.11 |
| 8.00 | 57.53 | 77.42 | 1.90 | 5.47 | 0.03 | 2.15 | 499.27 | 56.54 | 191.36 | 40.41 | 12.74 | 3.42 | 0.07 |
| 9.00 | 67.99 | 77.42 | 1.69 | 5.48 | 0.02 | 1.97 | 494.70 | 47.75 | 201.56 | 40.21 | 12.82 | 3.68 | 0.06 |
| 10.00 | 78.45 | 77.42 | 1.50 | 5.52 | 0.02 | 1.81 | 489.74 | 41.03 | 209.26 | 39.96 | 12.85 | 3.96 | 0.05 |
| 11.00 | 88.91 | 77.42 | 1.34 | 5.58 | 0.02 | 1.65 | 484.65 | 35.94 | 214.90 | 39.69 | 12.82 | 4.26 | 0.04 |
| [redacted] | | | | | | | | | | | | | |
| 13.00 | 101.39 | 78.11 | 1.28 | 5.66 | 0.07 | 1.70 | 482.94 | 32.19 | 210.56 | 39.45 | 12.76 | 4.48 | 0.07 |
| 14.00 | 109.84 | 78.11 | 1.10 | 5.30 | 0.03 | 1.55 | 476.98 | 29.43 | 214.23 | 39.22 | 12.82 | 4.75 | 0.06 |
| [redacted] | | | | | | | | | | | | | |
| 16.00 | 116.28 | 78.11 | 1.07 | 5.50 | 0.03 | 1.52 | 475.96 | 29.17 | 214.94 | 39.18 | 12.86 | 4.76 | 0.06 |
| 17.00 | 117.08 | 78.11 | 1.05 | 5.49 | 0.03 | 1.51 | 475.39 | 29.12 | 215.39 | 39.15 | 12.91 | 4.75 | 0.05 |
| | 117.48 | 78.11 | 1.05 | 5.49 | 0.03 | 1.51 | 475.39 | 29.12 | 215.39 | 39.15 | 12.91 | 4.75 | 0.05 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.00 | 55.70 | 576.96 | 5.21 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.47 | 7.02 | 0.00 | 3.07 | 594.56 | 55.64 | 571.00 | 4.20 | 3.74 | 0.00 | 0.22 | 7.28 | 7.87 |
| 3.00 | 20.56 | 0.00 | 20.43 | 7.04 | 0.00 | 2.95 | 592.62 | 55.60 | 565.41 | 3.52 | 3.43 | 0.00 | 0.24 | 7.26 | 7.87 |
| 4.00 | 27.76 | 0.00 | 20.43 | 7.05 | 0.00 | 2.94 | 592.50 | 55.60 | 564.94 | 3.47 | 3.40 | 0.00 | 0.25 | 7.26 | 7.87 |
| 5.00 | 28.81 | 0.00 | 20.42 | 7.05 | 0.00 | 2.92 | 592.33 | 55.60 | 564.18 | 3.40 | 3.36 | 0.00 | 0.26 | 7.26 | 7.87 |
| 6.00 | 35.65 | 0.00 | 21.04 | 7.04 | 0.00 | 2.82 | 782.19 | 57.34 | 626.35 | 2.91 | 3.16 | 0.00 | 0.86 | 7.24 | 7.88 |
| 7.00 | 47.07 | 0.00 | 20.88 | 7.02 | 0.00 | 2.58 | 779.61 | 57.32 | 603.78 | 2.58 | 2.88 | 0.00 | 0.69 | 7.22 | 7.88 |
| 8.00 | 57.53 | 0.00 | 20.75 | 7.02 | 0.00 | 2.35 | 777.03 | 57.30 | 585.67 | 2.32 | 2.63 | 0.00 | 0.57 | 7.21 | 7.87 |
| 9.00 | 67.99 | 0.00 | 20.66 | 7.04 | 0.00 | 2.17 | 774.53 | 57.27 | 572.97 | 2.12 | 2.45 | 0.00 | 0.50 | 7.20 | 7.87 |
| 10.00 | 78.45 | 0.00 | 20.58 | 7.06 | 0.00 | 2.00 | 771.99 | 57.25 | 562.73 | 1.95 | 2.30 | 0.00 | 0.46 | 7.19 | 7.87 |
| 11.00 | 88.91 | 0.00 | 20.51 | 7.09 | 0.00 | 1.85 | 769.39 | 57.22 | 554.49 | 1.81 | 2.17 | 0.00 | 0.43 | 7.18 | 7.87 |
| [redacted] | | | | | | | | | | | | | | | |
| 13.00 | 101.39 | 0.00 | 24.13 | 7.10 | 0.00 | 1.98 | 763.04 | 57.40 | 552.48 | 1.80 | 2.33 | 0.00 | 0.39 | 7.18 | 7.94 |
| 14.00 | 109.84 | 0.00 | 24.07 | 7.12 | 0.00 | 1.79 | 758.95 | 57.36 | 544.72 | 1.63 | 2.15 | 0.00 | 0.38 | 7.17 | 7.94 |
| [redacted] | | | | | | | | | | | | | | | |
| 16.00 | 116.28 | 0.00 | 24.06 | 7.17 | 0.00 | 1.76 | 758.32 | 57.35 | 543.37 | 1.60 | 2.12 | 0.00 | 0.42 | 7.17 | 7.94 |
| 17.00 | 117.08 | 0.00 | 24.05 | 7.17 | 0.00 | 1.74 | 758.00 | 57.35 | 542.61 | 1.58 | 2.10 | 0.00 | 0.42 | 7.17 | 7.94 |
| | 117.48 | 0.00 | 24.05 | 7.17 | 0.00 | 1.74 | 758.00 | 57.35 | 542.61 | 1.58 | 2.10 | 0.00 | 0.42 | 7.17 | 7.94 |

LTA - Aug Phos - Trap

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |

| Reach | Downstream | Downstream | Hydraulics | | | | | | | | Reaeration | Reaeration |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Label | Label | Distance | Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | ka,20, /d | formula |
| | Headwater | 0.00 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.00 | 0.000020 | 0.23 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 54.37 | 0.64 | 4.00 | 48.50 | 251.92 | 0.22 | 0.01 | 0.000020 | 0.23 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 54.54 | 27.27 | 4.01 | 48.50 | 252.46 | 0.22 | 0.74 | 0.000020 | 0.23 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 54.54 | 51.49 | 4.01 | 48.50 | 252.46 | 0.22 | 1.47 | 0.000020 | 0.23 | O'Conn |
| 4.00 | 280.50 | 28.16 | 54.54 | 20.99 | 5.02 | 48.50 | 333.80 | 0.16 | 1.52 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 54.54 | 5.13 | 5.02 | 48.50 | 333.80 | 0.16 | 1.61 | 0.000007 | 0.14 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 54.54 | 29.58 | 4.61 | 56.70 | 337.48 | 0.16 | 2.50 | 0.000011 | 0.16 | O'Conn |
| 7.00 | 265.50 | 52.30 | 54.54 | 27.27 | 4.61 | 56.70 | 337.48 | 0.16 | 3.25 | 0.000011 | 0.16 | O'Conn |
| 8.00 | 259.00 | 62.76 | 54.54 | 27.27 | 4.61 | 56.70 | 337.48 | 0.16 | 4.00 | 0.000011 | 0.16 | O'Conn |
| 9.00 | 252.50 | 73.22 | 54.54 | 27.27 | 4.12 | 56.70 | 294.52 | 0.19 | 4.65 | 0.000007 | 0.20 | O'Conn |
| 10.00 | 246.00 | 83.68 | 54.54 | 27.26 | 4.12 | 56.70 | 294.52 | 0.19 | 5.31 | 0.000007 | 0.20 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 54.54 | 39.40 | 4.12 | 56.70 | 294.52 | 0.19 | 5.96 | 0.000007 | 0.20 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 57.20 | 22.00 | 4.33 | 56.70 | 313.00 | 0.18 | 6.22 | 0.000003 | 0.19 | O'Conn |
| 13.00 | 233.00 | 104.61 | 57.20 | 21.79 | 4.33 | 56.70 | 313.00 | 0.18 | 6.62 | 0.000003 | 0.19 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 57.20 | 53.11 | 4.41 | 81.60 | 429.70 | 0.13 | 7.53 | 0.000002 | 0.15 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 57.20 | 28.62 | 4.41 | 81.60 | 429.70 | 0.13 | 7.60 | 0.000002 | 0.15 | O'Conn |
| 16.00 | 225.50 | 116.68 | 57.20 | 28.58 | 5.13 | 81.60 | 513.66 | 0.11 | 7.69 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 57.20 | 28.60 | 5.13 | 81.60 | 513.66 | 0.11 | 7.77 | 0.000001 | 0.11 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.65 | 6.50 | 0.01 | 2.40 | 444.76 | 20.05 | 20.04 | 30.11 | 10.01 | 3.50 | 1.21 |
| 2.00 | 6.96 | 63.60 | 3.22 | 6.29 | 0.17 | 2.51 | 479.03 | 22.35 | 26.38 | 36.37 | 10.94 | 3.41 | 0.67 |
| 3.00 | 20.56 | 63.60 | 2.82 | 6.13 | 0.14 | 2.54 | 493.23 | 23.77 | 29.78 | 38.84 | 11.35 | 3.44 | 0.37 |
| 4.00 | 27.76 | 63.60 | 2.80 | 6.16 | 0.14 | 2.54 | 494.24 | 23.99 | 30.12 | 39.02 | 11.40 | 3.42 | 0.35 |
| 5.00 | 28.81 | 63.60 | 2.76 | 6.13 | 0.13 | 2.54 | 495.61 | 24.31 | 30.68 | 39.28 | 11.48 | 3.39 | 0.32 |
| 6.00 | 35.65 | 63.60 | 2.40 | 5.92 | 0.08 | 2.41 | 498.07 | 25.58 | 35.99 | 40.22 | 12.00 | 3.38 | 0.17 |
| 7.00 | 47.07 | 63.60 | 2.14 | 5.80 | 0.05 | 2.24 | 496.03 | 26.17 | 40.52 | 40.44 | 12.37 | 3.42 | 0.11 |
| 8.00 | 57.53 | 63.60 | 1.90 | 5.72 | 0.03 | 2.05 | 491.86 | 26.43 | 44.97 | 40.36 | 12.68 | 3.51 | 0.07 |
| 9.00 | 67.99 | 63.60 | 1.68 | 5.73 | 0.02 | 1.88 | 487.38 | 25.93 | 47.87 | 40.16 | 12.75 | 3.77 | 0.06 |
| 10.00 | 78.45 | 63.60 | 1.50 | 5.77 | 0.02 | 1.72 | 482.54 | 25.51 | 50.26 | 39.92 | 12.76 | 4.05 | 0.05 |
| 11.00 | 88.91 | 63.60 | 1.33 | 5.81 | 0.02 | 1.57 | 477.58 | 25.16 | 52.14 | 39.65 | 12.73 | 4.36 | 0.05 |
| [redacted] | | | | | | | | | | | | | |
| 13.00 | 101.39 | 64.93 | 1.28 | 5.87 | 0.07 | 1.64 | 476.35 | 25.41 | 52.76 | 39.42 | 12.66 | 4.57 | 0.07 |
| 14.00 | 109.84 | 64.93 | 1.09 | 5.49 | 0.03 | 1.50 | 470.58 | 25.54 | 55.16 | 39.19 | 12.71 | 4.84 | 0.06 |
| [redacted] | | | | | | | | | | | | | |
| 16.00 | 116.28 | 64.93 | 1.06 | 5.67 | 0.03 | 1.47 | 469.59 | 25.73 | 55.68 | 39.15 | 12.75 | 4.85 | 0.06 |
| 17.00 | 117.08 | 64.93 | 1.05 | 5.66 | 0.03 | 1.46 | 469.04 | 25.90 | 56.04 | 39.13 | 12.79 | 4.84 | 0.06 |
| | 117.48 | 64.93 | 1.05 | 5.66 | 0.03 | 1.46 | 469.04 | 25.90 | 56.04 | 39.13 | 12.79 | 4.84 | 0.06 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.00 | 55.70 | 576.96 | 5.21 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.72 | 7.02 | 0.00 | 3.08 | 600.26 | 57.38 | 573.88 | 4.22 | 3.76 | 0.00 | 0.21 | 7.28 | 7.87 |
| 3.00 | 20.56 | 0.00 | 20.68 | 7.04 | 0.00 | 2.97 | 598.28 | 57.34 | 568.50 | 3.54 | 3.45 | 0.00 | 0.24 | 7.26 | 7.87 |
| 4.00 | 27.76 | 0.00 | 20.68 | 7.05 | 0.00 | 2.96 | 598.16 | 57.34 | 568.04 | 3.49 | 3.42 | 0.00 | 0.25 | 7.26 | 7.87 |
| 5.00 | 28.81 | 0.00 | 20.67 | 7.05 | 0.00 | 2.94 | 597.99 | 57.34 | 567.30 | 3.42 | 3.38 | 0.00 | 0.26 | 7.26 | 7.87 |
| 6.00 | 35.65 | 0.00 | 20.62 | 7.05 | 0.00 | 2.69 | 596.29 | 57.31 | 560.29 | 2.91 | 3.03 | 0.00 | 0.27 | 7.24 | 7.87 |
| 7.00 | 47.07 | 0.00 | 20.58 | 7.05 | 0.00 | 2.46 | 594.95 | 57.28 | 554.43 | 2.58 | 2.77 | 0.00 | 0.28 | 7.22 | 7.87 |
| 8.00 | 57.53 | 0.00 | 20.53 | 7.06 | 0.00 | 2.25 | 593.64 | 57.26 | 548.67 | 2.32 | 2.53 | 0.00 | 0.29 | 7.21 | 7.87 |
| 9.00 | 67.99 | 0.00 | 20.50 | 7.08 | 0.00 | 2.08 | 592.32 | 57.23 | 544.45 | 2.12 | 2.37 | 0.00 | 0.30 | 7.20 | 7.87 |
| 10.00 | 78.45 | 0.00 | 20.46 | 7.11 | 0.00 | 1.92 | 590.95 | 57.21 | 540.69 | 1.95 | 2.23 | 0.00 | 0.32 | 7.19 | 7.87 |
| 11.00 | 88.91 | 0.00 | 20.43 | 7.14 | 0.00 | 1.78 | 589.50 | 57.18 | 537.36 | 1.81 | 2.11 | 0.00 | 0.33 | 7.18 | 7.87 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 24.09 | 7.14 | 0.00 | 1.92 | 592.61 | 57.36 | 539.85 | 1.81 | 2.28 | 0.00 | 0.34 | 7.18 | 7.94 |
| 14.00 | 109.84 | 0.00 | 24.05 | 7.16 | 0.00 | 1.75 | 590.32 | 57.32 | 535.17 | 1.63 | 2.11 | 0.00 | 0.36 | 7.17 | 7.94 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 0.00 | 24.04 | 7.21 | 0.00 | 1.72 | 589.97 | 57.31 | 534.29 | 1.60 | 2.08 | 0.00 | 0.40 | 7.17 | 7.94 |
| 17.00 | 117.08 | 0.00 | 24.04 | 7.21 | 0.00 | 1.70 | 589.79 | 57.31 | 533.76 | 1.59 | 2.06 | 0.00 | 0.41 | 7.17 | 7.94 |
| | 117.48 | 0.00 | 24.04 | 7.21 | 0.00 | 1.70 | 589.79 | 57.31 | 533.76 | 1.59 | 2.06 | 0.00 | 0.41 | 7.17 | 7.94 |

LTA-Pipeline-Trap

| Reach for diel plot | 11 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ne Option, Leave the Other Blank or Zero) | | | | | |
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning | |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n | |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 | |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 | |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 | |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 | |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 | |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 | |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 | |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 | |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 | |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 | |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 | |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 | |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 | |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 | |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 | |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 | |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 | |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 | |

| Reach | Downstream | Downstream | Hydraulics | | | | | | | | Reaeration | Reaeration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | Label | Distance | Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | ka,20, /d | formula |
| | Headwater | 0.00 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.00 | 0.000020 | 0.23 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 54.37 | 0.64 | 4.00 | 48.50 | 251.92 | 0.22 | 0.01 | 0.000020 | 0.23 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.74 | 0.000020 | 0.23 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 54.37 | 51.33 | 4.00 | 48.50 | 251.92 | 0.22 | 1.47 | 0.000020 | 0.23 | O'Conn |
| 4.00 | 280.50 | 28.16 | 54.37 | 20.92 | 5.01 | 48.50 | 333.08 | 0.16 | 1.52 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 54.37 | 5.12 | 5.01 | 48.50 | 333.08 | 0.16 | 1.62 | 0.000007 | 0.14 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 55.25 | 29.96 | 4.64 | 56.70 | 340.47 | 0.16 | 2.50 | 0.000011 | 0.16 | O'Conn |
| 7.00 | 265.50 | 52.30 | 55.25 | 27.62 | 4.64 | 56.70 | 340.47 | 0.16 | 3.25 | 0.000011 | 0.16 | O'Conn |
| 8.00 | 259.00 | 62.76 | 55.25 | 27.62 | 4.64 | 56.70 | 340.47 | 0.16 | 3.99 | 0.000011 | 0.16 | O'Conn |
| 9.00 | 252.50 | 73.22 | 55.25 | 27.62 | 4.15 | 56.70 | 297.10 | 0.19 | 4.64 | 0.000007 | 0.20 | O'Conn |
| 10.00 | 246.00 | 83.68 | 55.25 | 27.61 | 4.15 | 56.70 | 297.10 | 0.19 | 5.29 | 0.000007 | 0.20 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 55.25 | 39.91 | 4.15 | 56.70 | 297.10 | 0.19 | 5.95 | 0.000007 | 0.20 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 57.91 | 22.27 | 4.36 | 56.70 | 315.62 | 0.18 | 6.20 | 0.000003 | 0.18 | O'Conn |
| 13.00 | 233.00 | 104.61 | 57.91 | 22.06 | 4.36 | 56.70 | 315.62 | 0.18 | 6.60 | 0.000003 | 0.18 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 57.91 | 53.77 | 4.44 | 81.60 | 433.22 | 0.13 | 7.51 | 0.000002 | 0.15 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 57.91 | 28.97 | 4.44 | 81.60 | 433.22 | 0.13 | 7.58 | 0.000002 | 0.15 | O'Conn |
| 16.00 | 225.50 | 116.68 | 57.91 | 28.94 | 5.17 | 81.60 | 517.92 | 0.11 | 7.66 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 57.91 | 28.95 | 5.17 | 81.60 | 517.92 | 0.11 | 7.75 | 0.000001 | 0.11 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.65 | 6.49 | 0.01 | 2.39 | 444.76 | 20.05 | 20.04 | 30.11 | 10.01 | 3.50 | 1.21 |
| 2.00 | 6.96 | 63.80 | 3.20 | 6.18 | 0.17 | 2.37 | 476.57 | 22.42 | 23.55 | 35.05 | 10.59 | 3.37 | 0.66 |
| 3.00 | 20.56 | 63.80 | 2.81 | 5.95 | 0.14 | 2.29 | 490.70 | 23.88 | 27.17 | 37.53 | 11.01 | 3.37 | 0.37 |
| 4.00 | 27.76 | 63.80 | 2.79 | 5.98 | 0.14 | 2.28 | 491.70 | 24.09 | 27.53 | 37.71 | 11.07 | 3.35 | 0.35 |
| 5.00 | 28.81 | 63.80 | 2.75 | 5.94 | 0.13 | 2.27 | 493.07 | 24.41 | 28.11 | 37.96 | 11.15 | 3.32 | 0.32 |
| 6.00 | 35.65 | 83.92 | 2.42 | 5.47 | 0.08 | 2.24 | 510.41 | 112.48 | 202.27 | 50.54 | 15.01 | 3.47 | 0.18 |
| 7.00 | 47.07 | 83.92 | 2.15 | 5.25 | 0.05 | 1.98 | 508.52 | 88.58 | 228.24 | 50.62 | 15.38 | 3.66 | 0.11 |
| 8.00 | 57.53 | 83.92 | 1.91 | 5.14 | 0.03 | 1.73 | 504.46 | 70.63 | 247.58 | 50.41 | 15.69 | 3.90 | 0.08 |
| 9.00 | 67.99 | 83.92 | 1.70 | 5.19 | 0.03 | 1.52 | 500.11 | 57.45 | 259.66 | 50.10 | 15.67 | 4.34 | 0.06 |
| 10.00 | 78.45 | 83.92 | 1.51 | 5.27 | 0.02 | 1.34 | 495.44 | 47.33 | 268.05 | 49.75 | 15.58 | 4.82 | 0.05 |
| 11.00 | 88.91 | 83.92 | 1.34 | 5.39 | 0.02 | 1.18 | 490.73 | 39.68 | 273.36 | 49.39 | 15.41 | 5.34 | 0.05 |
| ~~12.00~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~1.09~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~1.26~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~48.72~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ |
| 13.00 | 101.39 | 84.31 | 1.29 | 5.51 | 0.07 | 1.24 | 489.16 | 34.05 | 265.49 | 48.64 | 15.11 | 5.68 | 0.08 |
| 14.00 | 109.84 | 84.31 | 1.10 | 5.21 | 0.04 | 1.09 | 483.97 | 30.10 | 266.65 | 48.33 | 15.00 | 6.16 | 0.07 |
| ~~[illegible]~~ | ~~[illegible]~~ | ~~84.31~~ | ~~1.09~~ | ~~[illegible]~~ | ~~0.03~~ | ~~1.08~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ |
| 16.00 | 116.28 | 84.31 | 1.07 | 5.43 | 0.03 | 1.06 | 483.09 | 29.73 | 266.96 | 48.28 | 15.03 | 6.19 | 0.07 |
| 17.00 | 117.08 | 84.31 | 1.06 | 5.42 | 0.03 | 1.05 | 482.59 | 29.65 | 267.21 | 48.25 | 15.06 | 6.19 | 0.07 |
| | 117.48 | 84.31 | 1.06 | 5.42 | 0.03 | 1.05 | 482.59 | 29.65 | 267.21 | 48.25 | 15.06 | 6.19 | 0.07 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.00 | 55.70 | 576.96 | 5.21 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.47 | 7.00 | 0.00 | 2.94 | 594.55 | 55.64 | 571.00 | 4.20 | 3.61 | 0.00 | 0.21 | 7.28 | 7.87 |
| 3.00 | 20.56 | 0.00 | 20.43 | 7.01 | 0.00 | 2.71 | 592.60 | 55.60 | 565.43 | 3.52 | 3.19 | 0.00 | 0.23 | 7.26 | 7.87 |
| 4.00 | 27.76 | 0.00 | 20.43 | 7.02 | 0.00 | 2.69 | 592.49 | 55.60 | 564.96 | 3.47 | 3.15 | 0.00 | 0.24 | 7.26 | 7.87 |
| 5.00 | 28.81 | 0.00 | 20.42 | 7.02 | 0.00 | 2.66 | 592.31 | 55.60 | 564.20 | 3.40 | 3.10 | 0.00 | 0.24 | 7.26 | 7.87 |
| 6.00 | 35.65 | 0.00 | 21.37 | 6.99 | 0.00 | 2.53 | 863.10 | 70.81 | 660.83 | 2.94 | 2.88 | 0.00 | 1.04 | 7.24 | 7.88 |
| 7.00 | 47.07 | 0.00 | 21.16 | 6.97 | 0.00 | 2.22 | 859.72 | 70.78 | 631.48 | 2.63 | 2.54 | 0.00 | 0.79 | 7.23 | 7.88 |
| 8.00 | 57.53 | 0.00 | 20.99 | 6.97 | 0.00 | 1.95 | 856.25 | 70.76 | 608.67 | 2.38 | 2.26 | 0.00 | 0.63 | 7.21 | 7.88 |
| 9.00 | 67.99 | 0.00 | 20.88 | 6.99 | 0.00 | 1.75 | 852.90 | 70.73 | 593.24 | 2.20 | 2.08 | 0.00 | 0.54 | 7.20 | 7.88 |
| 10.00 | 78.45 | 0.00 | 20.78 | 7.01 | 0.00 | 1.57 | 849.49 | 70.70 | 581.43 | 2.05 | 1.94 | 0.00 | 0.47 | 7.19 | 7.87 |
| 11.00 | 88.91 | 0.00 | 20.71 | 7.05 | 0.00 | 1.43 | 846.02 | 70.67 | 572.66 | 1.93 | 1.83 | 0.00 | 0.43 | 7.18 | 7.87 |
| [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | 2.02 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 24.29 | 7.07 | 0.00 | 1.57 | 835.36 | 70.22 | 569.87 | 1.94 | 2.01 | 0.00 | 0.39 | 7.18 | 7.94 |
| 14.00 | 109.84 | 0.00 | 24.24 | 7.10 | 0.00 | 1.40 | 830.02 | 70.17 | 563.37 | 1.79 | 1.86 | 0.00 | 0.37 | 7.18 | 7.94 |
| [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 0.00 | 24.23 | 7.15 | 0.00 | 1.37 | 829.20 | 70.16 | 562.23 | 1.76 | 1.83 | 0.00 | 0.41 | 7.17 | 7.94 |
| 17.00 | 117.08 | 0.00 | 24.22 | 7.15 | 0.00 | 1.35 | 828.78 | 70.16 | 561.57 | 1.75 | 1.81 | 0.00 | 0.41 | 7.17 | 7.94 |
| | 117.48 | 0.00 | 24.22 | 7.15 | 0.00 | 1.35 | 828.78 | 70.16 | 561.57 | 1.75 | 1.81 | 0.00 | 0.41 | 7.17 | 7.94 |

L1A-baseline-Trap

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0450 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0400 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0480 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0330 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0200 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0250 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0270 |

| Reach | Downstream | Downstream | Hydraulics | | | | | | | | Reaeration | Reaeration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | Label | Distance | Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | ka,20, /d | formula |
| | Headwater | 0.00 | 54.37 | 27.19 | 4.00 | 48.50 | 251.92 | 0.22 | 0.00 | 0.000020 | 0.23 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 54.37 | 0.64 | 4.00 | 48.50 | 251.92 | 0.22 | 0.01 | 0.000020 | 0.23 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 54.68 | 27.34 | 4.02 | 48.50 | 252.90 | 0.22 | 0.74 | 0.000020 | 0.23 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 54.68 | 51.62 | 4.02 | 48.50 | 252.90 | 0.22 | 1.46 | 0.000020 | 0.23 | O'Conn |
| 4.00 | 280.50 | 28.16 | 54.68 | 21.04 | 5.02 | 48.50 | 334.40 | 0.16 | 1.52 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 54.68 | 5.14 | 5.02 | 48.50 | 334.40 | 0.16 | 1.61 | 0.000007 | 0.14 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 54.68 | 29.66 | 4.61 | 56.70 | 338.08 | 0.16 | 2.50 | 0.000011 | 0.16 | O'Conn |
| 7.00 | 265.50 | 52.30 | 54.68 | 27.34 | 4.61 | 56.70 | 338.08 | 0.16 | 3.25 | 0.000011 | 0.16 | O'Conn |
| 8.00 | 259.00 | 62.76 | 54.68 | 27.34 | 4.61 | 56.70 | 338.08 | 0.16 | 4.00 | 0.000011 | 0.16 | O'Conn |
| 9.00 | 252.50 | 73.22 | 54.68 | 27.34 | 4.12 | 56.70 | 295.03 | 0.19 | 4.65 | 0.000007 | 0.20 | O'Conn |
| 10.00 | 246.00 | 83.68 | 54.68 | 27.33 | 4.12 | 56.70 | 295.03 | 0.19 | 5.30 | 0.000007 | 0.20 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 54.68 | 39.50 | 4.12 | 56.70 | 295.03 | 0.19 | 5.96 | 0.000007 | 0.20 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 57.34 | 22.05 | 4.34 | 56.70 | 313.52 | 0.18 | 6.21 | 0.000003 | 0.19 | O'Conn |
| 13.00 | 233.00 | 104.61 | 57.34 | 21.84 | 4.34 | 56.70 | 313.52 | 0.18 | 6.62 | 0.000003 | 0.19 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 57.34 | 53.24 | 4.41 | 81.60 | 430.40 | 0.13 | 7.53 | 0.000002 | 0.15 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 57.34 | 28.69 | 4.41 | 81.60 | 430.40 | 0.13 | 7.60 | 0.000002 | 0.15 | O'Conn |
| 16.00 | 225.50 | 116.68 | 57.34 | 28.65 | 5.14 | 81.60 | 514.51 | 0.11 | 7.68 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 57.34 | 28.67 | 5.14 | 81.60 | 514.51 | 0.11 | 7.76 | 0.000001 | 0.11 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.65 | 6.49 | 0.01 | 2.39 | 444.76 | 20.05 | 20.04 | 30.11 | 10.01 | 3.50 | 1.21 |
| 2.00 | 6.96 | 63.44 | 3.23 | 6.18 | 0.17 | 2.39 | 481.04 | 22.31 | 28.68 | 42.28 | 12.68 | 3.44 | 0.67 |
| 3.00 | 20.56 | 63.44 | 2.83 | 5.96 | 0.14 | 2.31 | 495.29 | 23.73 | 31.87 | 44.66 | 13.15 | 3.49 | 0.37 |
| 4.00 | 27.76 | 63.44 | 2.81 | 5.99 | 0.14 | 2.30 | 496.31 | 23.94 | 32.20 | 44.83 | 13.21 | 3.47 | 0.35 |
| 5.00 | 28.81 | 63.44 | 2.77 | 5.95 | 0.13 | 2.29 | 497.69 | 24.27 | 32.73 | 45.08 | 13.30 | 3.45 | 0.32 |
| 6.00 | 35.65 | 63.44 | 2.41 | 5.69 | 0.08 | 2.05 | 500.20 | 25.53 | 37.70 | 45.91 | 13.89 | 3.47 | 0.17 |
| 7.00 | 47.07 | 63.44 | 2.15 | 5.55 | 0.05 | 1.82 | 498.22 | 26.02 | 41.74 | 46.05 | 14.28 | 3.58 | 0.11 |
| 8.00 | 57.53 | 63.44 | 1.91 | 5.48 | 0.03 | 1.59 | 494.14 | 26.15 | 45.46 | 45.88 | 14.58 | 3.75 | 0.07 |
| 9.00 | 67.99 | 63.44 | 1.69 | 5.53 | 0.02 | 1.41 | 489.78 | 25.48 | 47.43 | 45.63 | 14.58 | 4.13 | 0.06 |
| 10.00 | 78.45 | 63.44 | 1.50 | 5.60 | 0.02 | 1.24 | 485.10 | 24.95 | 48.66 | 45.32 | 14.51 | 4.54 | 0.05 |
| 11.00 | 88.91 | 63.44 | 1.34 | 5.69 | 0.02 | 1.09 | 480.37 | 24.55 | 49.18 | 45.01 | 14.37 | 4.98 | 0.05 |
| ~~[illegible]~~ | ~~[illegible]~~ | ~~64.77~~ | ~~[illegible]~~ | ~~5.76~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~5.08~~ | ~~[illegible]~~ |
| 13.00 | 101.39 | 64.77 | 1.28 | 5.78 | 0.07 | 1.17 | 479.27 | 24.88 | 48.63 | 44.49 | 14.14 | 5.28 | 0.08 |
| 14.00 | 109.84 | 64.77 | 1.10 | 5.44 | 0.03 | 1.03 | 473.98 | 25.16 | 49.13 | 44.23 | 14.07 | 5.69 | 0.06 |
| ~~[illegible]~~ | ~~115.47~~ | ~~64.77~~ | ~~[illegible]~~ | ~~5.42~~ | ~~0.03~~ | ~~1.02~~ | ~~473.56~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ | ~~[illegible]~~ |
| 16.00 | 116.28 | 64.77 | 1.07 | 5.63 | 0.03 | 1.01 | 473.07 | 25.41 | 49.36 | 44.18 | 14.11 | 5.71 | 0.06 |
| 17.00 | 117.08 | 64.77 | 1.05 | 5.62 | 0.03 | 0.99 | 472.56 | 25.62 | 49.57 | 44.16 | 14.14 | 5.70 | 0.06 |
| | 117.48 | 64.77 | 1.05 | 5.62 | 0.03 | 0.99 | 472.56 | 25.62 | 49.57 | 44.16 | 14.14 | 5.70 | 0.06 |

| [illegible] | X(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.00 | 55.70 | 576.96 | 5.21 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.92 | 7.00 | 0.00 | 2.96 | 604.92 | 65.08 | 576.24 | 4.24 | 3.65 | 0.00 | 0.20 | 7.28 | 7.88 |
| 3.00 | 20.56 | 0.00 | 20.89 | 7.00 | 0.00 | 2.74 | 602.90 | 65.04 | 571.03 | 3.56 | 3.23 | 0.00 | 0.22 | 7.26 | 7.88 |
| 4.00 | 27.76 | 0.00 | 20.88 | 7.02 | 0.00 | 2.72 | 602.78 | 65.04 | 570.59 | 3.51 | 3.19 | 0.00 | 0.23 | 7.26 | 7.88 |
| 5.00 | 28.81 | 0.00 | 20.88 | 7.01 | 0.00 | 2.69 | 602.60 | 65.03 | 569.86 | 3.44 | 3.14 | 0.00 | 0.23 | 7.26 | 7.88 |
| 6.00 | 35.65 | 0.00 | 20.83 | 7.00 | 0.00 | 2.34 | 600.84 | 65.00 | 563.14 | 2.93 | 2.69 | 0.00 | 0.24 | 7.24 | 7.88 |
| 7.00 | 47.07 | 0.00 | 20.79 | 7.00 | 0.00 | 2.06 | 599.44 | 64.97 | 557.70 | 2.61 | 2.37 | 0.00 | 0.25 | 7.22 | 7.88 |
| 8.00 | 57.53 | 0.00 | 20.74 | 7.01 | 0.00 | 1.81 | 598.05 | 64.95 | 552.59 | 2.35 | 2.11 | 0.00 | 0.26 | 7.21 | 7.88 |
| 9.00 | 67.99 | 0.00 | 20.71 | 7.04 | 0.00 | 1.62 | 596.64 | 64.92 | 549.21 | 2.17 | 1.94 | 0.00 | 0.27 | 7.20 | 7.88 |
| 10.00 | 78.45 | 0.00 | 20.68 | 7.07 | 0.00 | 1.46 | 595.15 | 64.90 | 546.49 | 2.01 | 1.80 | 0.00 | 0.28 | 7.19 | 7.88 |
| 11.00 | 88.91 | 0.00 | 20.65 | 7.11 | 0.00 | 1.33 | 593.57 | 64.87 | 544.40 | 1.89 | 1.70 | 0.00 | 0.30 | 7.18 | 7.88 |
| [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 24.30 | 7.12 | 0.00 | 1.48 | 596.36 | 64.68 | 547.73 | 1.89 | 1.89 | 0.00 | 0.31 | 7.18 | 7.95 |
| 14.00 | 109.84 | 0.00 | 24.27 | 7.15 | 0.00 | 1.32 | 593.87 | 64.64 | 544.74 | 1.73 | 1.75 | 0.00 | 0.35 | 7.17 | 7.95 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 1.72 | 1.74 | 0.00 | [illegible] | [illegible] | 7.95 |
| 16.00 | 116.28 | 0.00 | 24.26 | 7.20 | 0.00 | 1.29 | 593.48 | 64.63 | 544.13 | 1.70 | 1.72 | 0.00 | 0.39 | 7.17 | 7.95 |
| 17.00 | 117.08 | 0.00 | 24.26 | 7.20 | 0.00 | 1.27 | 593.29 | 64.63 | 543.72 | 1.69 | 1.70 | 0.00 | 0.39 | 7.17 | 7.95 |
| | 117.48 | 0.00 | 24.26 | 7.20 | 0.00 | 1.27 | 593.29 | 64.63 | 543.72 | 1.69 | 1.70 | 0.00 | 0.39 | 7.17 | 7.95 |

| Reach for diel plot | 11 | | | | | | ne Option, Leave the Other Blank or Zero) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |

| Reach | Downstream | Downstream | Hydraulics | | | | | | | | Reaeration | Reaeration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label | Label | Distance | Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | ka,20, /d | formula |
| | Headwater | 0.00 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 0.00 | 0.000020 | 0.25 | O'Conn |
| 1.00 | )VR CRK (297.9) | 0.16 | 21.20 | 0.25 | 3.07 | 48.50 | 182.87 | 0.12 | 0.02 | 0.000020 | 0.25 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 1.37 | 0.000020 | 0.25 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 21.20 | 20.02 | 3.07 | 48.50 | 182.87 | 0.12 | 2.73 | 0.000020 | 0.25 | O'Conn |
| 4.00 | 280.50 | 28.16 | 21.20 | 8.16 | 3.96 | 48.50 | 248.26 | 0.09 | 2.84 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 21.20 | 1.99 | 3.96 | 48.50 | 248.26 | 0.09 | 3.01 | 0.000007 | 0.15 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 21.79 | 11.82 | 3.97 | 56.70 | 281.41 | 0.08 | 4.87 | 0.000011 | 0.14 | O'Conn |
| 7.00 | 265.50 | 52.30 | 21.79 | 10.89 | 3.97 | 56.70 | 281.41 | 0.08 | 6.43 | 0.000011 | 0.14 | O'Conn |
| 8.00 | 259.00 | 62.76 | 21.79 | 10.90 | 3.97 | 56.70 | 281.41 | 0.08 | 7.99 | 0.000011 | 0.14 | O'Conn |
| 9.00 | 252.50 | 73.22 | 21.79 | 10.90 | 3.66 | 56.70 | 255.65 | 0.09 | 9.41 | 0.000007 | 0.16 | O'Conn |
| 10.00 | 246.00 | 83.68 | 21.79 | 10.89 | 3.66 | 56.70 | 255.65 | 0.09 | 10.83 | 0.000007 | 0.16 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 21.79 | 15.74 | 3.66 | 56.70 | 255.65 | 0.09 | 12.26 | 0.000007 | 0.16 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 22.21 | 8.54 | 4.16 | 56.70 | 298.33 | 0.07 | 12.88 | 0.000003 | 0.13 | O'Conn |
| 13.00 | 233.00 | 104.61 | 22.21 | 8.46 | 4.16 | 56.70 | 298.33 | 0.07 | 13.88 | 0.000003 | 0.13 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 22.21 | 20.62 | 4.27 | 81.60 | 414.55 | 0.05 | 16.14 | 0.000002 | 0.10 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 22.21 | 11.11 | 4.27 | 81.60 | 414.55 | 0.05 | 16.32 | 0.000002 | 0.10 | O'Conn |
| 16.00 | 225.50 | 116.68 | 22.21 | 11.10 | 4.98 | 81.60 | 495.98 | 0.04 | 16.52 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 22.21 | 11.11 | 4.98 | 81.60 | 495.98 | 0.04 | 16.73 | 0.000001 | 0.07 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.64 | 6.49 | 0.02 | 2.39 | 445.40 | 20.05 | 20.06 | 30.21 | 10.01 | 3.50 | 1.20 |
| 2.00 | 6.96 | 63.80 | 2.68 | 6.21 | 0.14 | 2.45 | 483.91 | 22.02 | 22.79 | 36.52 | 10.36 | 3.94 | 0.47 |
| 3.00 | 20.56 | 63.80 | 1.97 | 6.09 | 0.08 | 2.29 | 491.81 | 22.81 | 23.48 | 38.57 | 10.16 | 4.69 | 0.20 |
| 4.00 | 27.76 | 63.80 | 1.93 | 6.15 | 0.08 | 2.27 | 492.27 | 23.18 | 23.77 | 38.71 | 10.21 | 4.69 | 0.19 |
| 5.00 | 28.81 | 63.80 | 1.87 | 6.11 | 0.07 | 2.24 | 492.63 | 23.68 | 24.27 | 38.88 | 10.28 | 4.69 | 0.16 |
| 6.00 | 35.65 | 98.22 | 1.40 | 5.39 | 0.04 | 2.17 | 509.96 | 133.56 | 370.00 | 42.36 | 11.24 | 5.31 | 0.09 |
| 7.00 | 47.07 | 98.22 | 1.07 | 5.23 | 0.03 | 1.80 | 500.44 | 82.40 | 414.43 | 42.07 | 11.08 | 5.92 | 0.07 |
| 8.00 | 57.53 | 98.22 | 0.81 | 5.26 | 0.02 | 1.49 | 490.52 | 53.86 | 435.09 | 41.71 | 10.81 | 6.52 | 0.06 |
| 9.00 | 67.99 | 98.22 | 0.62 | 5.46 | 0.02 | 1.27 | 482.10 | 38.48 | 439.54 | 41.43 | 10.15 | 7.32 | 0.07 |
| 10.00 | 78.45 | 98.22 | 0.47 | 5.66 | 0.03 | 1.10 | 474.46 | 31.14 | 436.80 | 41.23 | 9.60 | 7.91 | 0.07 |
| 11.00 | 88.91 | 98.22 | 0.36 | 5.83 | 0.03 | 0.97 | 467.52 | 28.02 | 430.82 | 41.11 | 9.17 | 8.32 | 0.08 |
| 12.00 | 96.16 | 98.10 | 0.37 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 41.05 | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 98.10 | 0.31 | 5.87 | 0.03 | 0.95 | 461.83 | 28.18 | 420.09 | 41.00 | 9.50 | 7.97 | 0.08 |
| 14.00 | 109.84 | 98.01 | 0.22 | 5.04 | 0.03 | 0.82 | 451.38 | 27.91 | 411.72 | 40.78 | 9.89 | 7.70 | 0.07 |
| 15.00 | [illegible] | [illegible] | [illegible] | [illegible] | 0.03 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 98.00 | 0.20 | 5.53 | 0.03 | 0.80 | 449.60 | 28.39 | 411.02 | 40.73 | 10.08 | 7.54 | 0.07 |
| 17.00 | 117.08 | 97.99 | 0.20 | 5.52 | 0.03 | 0.79 | 448.62 | 28.76 | 411.07 | 40.71 | 10.23 | 7.42 | 0.07 |
| | 117.48 | 97.99 | 0.20 | 5.52 | 0.03 | 0.79 | 448.62 | 28.76 | 411.07 | 40.71 | 10.23 | 7.42 | 0.07 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 596.95 | 55.70 | 576.89 | 5.19 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 20.45 | 7.06 | 0.00 | 2.94 | 591.32 | 55.57 | 568.53 | 3.55 | 3.53 | 0.00 | 0.23 | 7.26 | 7.87 |
| 3.00 | 20.56 | 0.00 | 20.40 | 7.12 | 0.00 | 2.64 | 586.65 | 55.47 | 563.17 | 2.64 | 3.10 | 0.00 | 0.28 | 7.22 | 7.87 |
| 4.00 | 27.76 | 0.00 | 20.39 | 7.15 | 0.00 | 2.61 | 586.38 | 55.47 | 562.60 | 2.58 | 3.06 | 0.00 | 0.31 | 7.22 | 7.87 |
| 5.00 | 28.81 | 0.00 | 20.39 | 7.14 | 0.00 | 2.57 | 585.95 | 55.46 | 561.68 | 2.50 | 2.99 | 0.00 | 0.31 | 7.21 | 7.87 |
| 6.00 | 35.65 | 0.00 | 21.73 | 7.08 | 0.00 | 2.46 | 1058.53 | 59.85 | 688.54 | 2.03 | 2.88 | 0.00 | 1.54 | 7.19 | 7.89 |
| 7.00 | 47.07 | 0.00 | 21.31 | 7.07 | 0.00 | 2.09 | 1044.90 | 59.77 | 630.46 | 1.73 | 2.54 | 0.00 | 0.94 | 7.17 | 7.88 |
| 8.00 | 57.53 | 0.00 | 21.06 | 7.09 | 0.00 | 1.80 | 1031.01 | 59.67 | 595.92 | 1.53 | 2.29 | 0.00 | 0.65 | 7.16 | 7.88 |
| 9.00 | 67.99 | 0.00 | 20.92 | 7.15 | 0.00 | 1.62 | 1017.65 | 59.57 | 578.11 | 1.42 | 2.16 | 0.00 | 0.54 | 7.15 | 7.88 |
| 10.00 | 78.45 | 0.00 | 20.84 | 7.23 | 0.00 | 1.47 | 1004.51 | 59.46 | 567.72 | 1.33 | 2.06 | 0.00 | 0.52 | 7.14 | 7.88 |
| 11.00 | 88.91 | 0.00 | 20.78 | 7.30 | 0.00 | 1.36 | 991.65 | 59.34 | 560.82 | 1.26 | 1.98 | 0.00 | 0.55 | 7.13 | 7.87 |
| 12.00 | [illegible] | 0.00 | 22.25 | 7.28 | 0.00 | [illegible] | [illegible] | 59.54 | 559.06 | 1.27 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 22.21 | 7.31 | 0.00 | 1.34 | 973.21 | 59.27 | 553.13 | 1.19 | 1.93 | 0.00 | 0.56 | 7.13 | 7.90 |
| 14.00 | 109.84 | 0.00 | 22.13 | 7.36 | 0.00 | 1.19 | 951.78 | 59.11 | 540.06 | 1.06 | 1.76 | 0.00 | 0.63 | 7.13 | 7.90 |
| [illegible] | [illegible] | 0.00 | 22.12 | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | 1.05 | 1.74 | 0.00 | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 0.00 | 22.12 | 7.44 | 0.00 | 1.16 | 948.56 | 59.08 | 537.54 | 1.03 | 1.72 | 0.00 | 0.77 | 7.13 | 7.90 |
| 17.00 | 117.08 | 0.00 | 22.11 | 7.44 | 0.00 | 1.14 | 947.02 | 59.07 | 535.95 | 1.01 | 1.69 | 0.00 | 0.77 | 7.13 | 7.90 |
| | 117.48 | 0.00 | 22.11 | 7.44 | 0.00 | 1.14 | 947.02 | 59.07 | 535.95 | 1.01 | 1.69 | 0.00 | 0.77 | 7.13 | 7.90 |

Avg. phos

| Reach for diel plot | 11 | | | | | | | ne Option, Leave the Other Blank or Zero) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reach | | | Downstream | Manning Formula | | | | | |
| Reach | Downstream | | length | Downstream | | location | Bot Width | Side | Side | Channel | Manning |
| Label | end of reach label | Number | (km) | Latitude | Longitude | (km) | m | Slope | Slope | Slope | n |
| | Headwater | 0 | | 33.23 | 92.65 | 0.00 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 1.000 | SMKOVR CRK (297.9) | 1 | 0.16 | 33.23 | 92.65 | 0.16 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 2.000 | 1/2 way to Thatcher L&D (289 | 2 | 13.60 | 33.23 | 92.65 | 13.76 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 3.000 | Thatcher L&D (281.0) | 3 | 13.60 | 33.23 | 92.65 | 27.36 | 48.50 | 3.60 | 3.60 | 0.0000199 | 0.0720 |
| 4.000 | 280.500 | 4 | 0.81 | 33.23 | 92.65 | 28.16 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 5.000 | Pipeline (279.7) | 5 | 1.29 | 33.23 | 92.65 | 29.45 | 48.50 | 3.60 | 3.60 | 0.000007 | 0.0670 |
| 6.000 | Moro Bay (272.0) | 6 | 12.39 | 33.23 | 92.65 | 41.84 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 7.000 | 265.500 | 7 | 10.46 | 33.23 | 92.65 | 52.30 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 8.000 | 259.000 | 8 | 10.46 | 33.23 | 92.65 | 62.76 | 56.70 | 3.60 | 3.60 | 0.0000105 | 0.0920 |
| 9.000 | 252.500 | 9 | 10.46 | 33.23 | 92.65 | 73.22 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 10.000 | 246.000 | 10 | 10.46 | 33.23 | 92.65 | 83.68 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 11.000 | Saline (239.5) | 11 | 10.47 | 33.23 | 92.65 | 94.15 | 56.70 | 3.60 | 3.60 | 0.0000074 | 0.0670 |
| 12.000 | HWY 82 (237.0) | 12 | 4.02 | 33.23 | 92.65 | 98.17 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 13.000 | 233.000 | 13 | 6.44 | 33.23 | 92.65 | 104.61 | 56.70 | 3.60 | 3.60 | 0.0000025 | 0.0480 |
| 14.000 | Felsenthal U/S (226.5) | 14 | 10.46 | 33.23 | 92.65 | 115.07 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 15.000 | Felsenthal L&D (226.0) | 15 | 0.81 | 33.23 | 92.65 | 115.87 | 81.60 | 3.60 | 3.60 | 0.0000019 | 0.0610 |
| 16.000 | 225.500 | 16 | 0.80 | 33.23 | 92.65 | 116.68 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |
| 17.000 | 225.000 | 17 | 0.80 | 33.23 | 92.65 | 117.48 | 81.60 | 3.60 | 3.60 | 0.0000013 | 0.0660 |

| Reach Label | Downstream Label | Downstream Distance | Hydraulics Q, m3/s | E', m3/s | H, m | B, m | Ac, m^2 | U, mps | trav time, d | Slope | Reaeration ka,20, /d | Reaeration formula |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Headwater | 0.00 | 21.20 | 10.60 | 3.07 | 48.50 | 182.87 | 0.12 | 0.00 | 0.000020 | 0.25 | O'Conn |
| 1.00 | DVR CRK (297.9) | 0.16 | 21.20 | 0.25 | 3.07 | 48.50 | 182.87 | 0.12 | 0.02 | 0.000020 | 0.25 | O'Conn |
| 2.00 | cher L&D (289.5) | 13.76 | 21.37 | 10.69 | 3.08 | 48.50 | 183.85 | 0.12 | 1.37 | 0.000020 | 0.25 | O'Conn |
| 3.00 | cher L&D (281.0) | 27.36 | 21.37 | 20.18 | 3.08 | 48.50 | 183.85 | 0.12 | 2.72 | 0.000020 | 0.25 | O'Conn |
| 4.00 | 280.50 | 28.16 | 21.37 | 8.22 | 3.97 | 48.50 | 249.62 | 0.09 | 2.83 | 0.000007 | 0.76 | Specified |
| 5.00 | Pipeline (279.7) | 29.45 | 21.37 | 2.01 | 3.97 | 48.50 | 249.62 | 0.09 | 3.01 | 0.000007 | 0.15 | O'Conn |
| 6.00 | Moro Bay (272.0) | 41.84 | 21.37 | 11.59 | 3.92 | 56.70 | 277.72 | 0.08 | 4.87 | 0.000011 | 0.14 | O'Conn |
| 7.00 | 265.50 | 52.30 | 21.37 | 10.68 | 3.92 | 56.70 | 277.72 | 0.08 | 6.44 | 0.000011 | 0.14 | O'Conn |
| 8.00 | 259.00 | 62.76 | 21.37 | 10.69 | 3.92 | 56.70 | 277.72 | 0.08 | 8.02 | 0.000011 | 0.14 | O'Conn |
| 9.00 | 252.50 | 73.22 | 21.37 | 10.69 | 3.62 | 56.70 | 252.31 | 0.08 | 9.45 | 0.000007 | 0.17 | O'Conn |
| 10.00 | 246.00 | 83.68 | 21.37 | 10.68 | 3.62 | 56.70 | 252.31 | 0.08 | 10.88 | 0.000007 | 0.17 | O'Conn |
| 11.00 | Saline (239.5) | 94.15 | 21.37 | 15.44 | 3.62 | 56.70 | 252.31 | 0.08 | 12.31 | 0.000007 | 0.17 | O'Conn |
| 12.00 | HWY 82 (237.0) | 98.17 | 21.79 | 8.38 | 4.12 | 56.70 | 294.48 | 0.07 | 12.94 | 0.000003 | 0.13 | O'Conn |
| 13.00 | 233.00 | 104.61 | 21.79 | 8.30 | 4.12 | 56.70 | 294.48 | 0.07 | 13.94 | 0.000003 | 0.13 | O'Conn |
| 14.00 | nthal U/S (226.5) | 115.07 | 21.79 | 20.23 | 4.23 | 81.60 | 409.31 | 0.05 | 16.22 | 0.000002 | 0.10 | O'Conn |
| 15.00 | thal L&D (226.0) | 115.87 | 21.79 | 10.90 | 4.23 | 81.60 | 409.31 | 0.05 | 16.39 | 0.000002 | 0.10 | O'Conn |
| 16.00 | 225.50 | 116.68 | 21.79 | 10.89 | 4.93 | 81.60 | 489.65 | 0.04 | 16.60 | 0.000001 | 1.33 | Specified |
| 17.00 | 225.00 | 117.48 | 21.79 | 10.90 | 4.93 | 81.60 | 489.65 | 0.04 | 16.81 | 0.000001 | 0.08 | O'Conn |

| Reach Label | x(km) | cond (umhos) | ISS (mgD/L) | DO(mgO2/L) | CBODs (mgO2/L) | CBODf (mgO2/L) | No(ugN/L) | NH4(ugN/L) | NO3(ugN/L) | Po (ugP/L) | Inorg P (ugP/L) | Phyto (ugA/L) | Detritus (mgD/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 63.80 | 3.66 | 6.50 | 0.00 | 2.40 | 444.00 | 20.00 | 20.00 | 30.00 | 10.00 | 3.50 | 1.22 |
| 1.00 | 0.08 | 63.80 | 3.64 | 6.49 | 0.02 | 2.39 | 445.40 | 20.05 | 20.06 | 30.21 | 10.01 | 3.50 | 1.20 |
| 2.00 | 6.96 | 63.29 | 2.71 | 6.23 | 0.14 | 2.48 | 490.37 | 21.74 | 28.73 | 39.89 | 11.11 | 4.19 | 0.48 |
| 3.00 | 20.56 | 63.29 | 2.00 | 6.12 | 0.09 | 2.32 | 498.68 | 22.55 | 27.26 | 41.92 | 10.74 | 5.15 | 0.21 |
| 4.00 | 27.76 | 63.29 | 1.96 | 6.18 | 0.08 | 2.30 | 499.18 | 22.96 | 27.42 | 42.06 | 10.78 | 5.15 | 0.19 |
| 5.00 | 28.81 | 63.29 | 1.89 | 6.14 | 0.07 | 2.27 | 499.59 | 23.51 | 27.72 | 42.23 | 10.84 | 5.16 | 0.17 |
| 6.00 | 35.65 | 63.29 | 1.37 | 5.92 | 0.04 | 1.88 | 491.86 | 25.33 | 29.87 | 42.32 | 10.83 | 5.75 | 0.09 |
| 7.00 | 47.07 | 63.29 | 1.04 | 5.85 | 0.03 | 1.57 | 482.97 | 26.06 | 30.90 | 42.04 | 10.66 | 6.30 | 0.07 |
| 8.00 | 57.53 | 63.29 | 0.79 | 5.86 | 0.02 | 1.32 | 473.88 | 26.52 | 31.23 | 41.70 | 10.41 | 6.82 | 0.07 |
| 9.00 | 67.99 | 63.29 | 0.59 | 5.98 | 0.02 | 1.14 | 466.21 | 26.17 | 28.65 | 41.46 | 9.79 | 7.55 | 0.07 |
| 10.00 | 78.45 | 63.29 | 0.45 | 6.08 | 0.03 | 1.01 | 459.25 | 26.47 | 25.93 | 41.29 | 9.28 | 8.07 | 0.07 |
| 11.00 | 88.91 | 63.29 | 0.34 | 6.17 | 0.03 | 0.91 | 452.91 | 26.93 | 23.64 | 41.17 | 8.90 | 8.41 | 0.08 |
| [illegible] | 96.16 | [illegible] | 0.36 | [illegible] | 0.06 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 63.85 | 0.30 | 6.12 | 0.04 | 0.91 | 448.14 | 28.86 | 25.97 | 41.08 | 9.28 | 8.02 | 0.08 |
| 14.00 | 109.84 | 63.86 | 0.21 | 5.21 | 0.03 | 0.80 | 438.33 | 29.28 | 30.22 | 40.83 | 9.69 | 7.73 | 0.07 |
| [illegible] | 115.47 | 63.86 | 0.20 | [illegible] | 0.03 | 0.79 | [illegible] | 29.30 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 63.86 | 0.19 | 5.66 | 0.03 | 0.78 | 436.66 | 29.82 | 31.43 | 40.78 | 9.88 | 7.56 | 0.07 |
| 17.00 | 117.08 | 63.86 | 0.19 | 5.64 | 0.03 | 0.77 | 435.74 | 30.21 | 32.38 | 40.76 | 10.03 | 7.43 | 0.07 |
| | 117.48 | 63.86 | 0.19 | 5.64 | 0.03 | 0.77 | 435.74 | 30.21 | 32.38 | 40.76 | 10.03 | 7.43 | 0.07 |

| Reach Label | x(km) | Pathogen | Alk | pH | Bot Alg (gD/m2) | TOC | TN | TP | TKN | TSS (mgD/L) | CBODu | Bot Algae mgA/m2 | NH3 | DO sat | pHsat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.00 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 597.04 | 55.70 | 577.04 | 5.23 | 4.09 | 0.00 | 0.18 | 7.30 | 7.87 |
| 1.00 | 0.08 | 0.00 | 20.50 | 7.00 | 0.00 | 3.03 | 596.95 | 55.70 | 576.89 | 5.19 | 4.08 | 0.00 | 0.18 | 7.30 | 7.87 |
| 2.00 | 6.96 | 0.00 | 21.09 | 7.05 | 0.00 | 2.99 | 605.71 | 60.01 | 576.98 | 3.61 | 3.60 | 0.00 | 0.23 | 7.26 | 7.88 |
| 3.00 | 20.56 | 0.00 | 21.04 | 7.12 | 0.00 | 2.69 | 600.72 | 59.91 | 573.46 | 2.72 | 3.18 | 0.00 | 0.28 | 7.22 | 7.88 |
| 4.00 | 27.76 | 0.00 | 21.04 | 7.15 | 0.00 | 2.67 | 600.43 | 59.90 | 573.01 | 2.66 | 3.14 | 0.00 | 0.31 | 7.22 | 7.88 |
| 5.00 | 28.81 | 0.00 | 21.03 | 7.15 | 0.00 | 2.62 | 599.97 | 59.89 | 572.26 | 2.58 | 3.08 | 0.00 | 0.31 | 7.22 | 7.88 |
| 6.00 | 35.65 | 0.00 | 20.96 | 7.16 | 0.00 | 2.18 | 594.85 | 59.79 | 564.98 | 2.04 | 2.63 | 0.00 | 0.35 | 7.19 | 7.88 |
| 7.00 | 47.07 | 0.00 | 20.90 | 7.19 | 0.00 | 1.88 | 590.30 | 59.69 | 559.40 | 1.74 | 2.35 | 0.00 | 0.39 | 7.17 | 7.88 |
| 8.00 | 57.53 | 0.00 | 20.84 | 7.24 | 0.00 | 1.65 | 585.49 | 59.60 | 554.26 | 1.53 | 2.15 | 0.00 | 0.45 | 7.16 | 7.88 |
| 9.00 | 67.99 | 0.00 | 20.80 | 7.31 | 0.00 | 1.50 | 580.37 | 59.49 | 551.71 | 1.42 | 2.06 | 0.00 | 0.52 | 7.15 | 7.88 |
| 10.00 | 78.45 | 0.00 | 20.76 | 7.38 | 0.00 | 1.39 | 575.02 | 59.37 | 549.09 | 1.33 | 1.98 | 0.00 | 0.62 | 7.14 | 7.88 |
| 11.00 | 88.91 | 0.00 | 20.71 | 7.46 | 0.00 | 1.30 | 569.52 | 59.25 | 545.88 | 1.26 | 1.92 | 0.00 | 0.75 | 7.13 | 7.88 |
| [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | [illegible] |
| 13.00 | 101.39 | 0.00 | 22.18 | 7.42 | 0.00 | 1.30 | 566.47 | 59.17 | 540.51 | 1.18 | 1.89 | 0.00 | 0.75 | 7.13 | 7.91 |
| 14.00 | 109.84 | 0.00 | 22.08 | 7.46 | 0.00 | 1.17 | 558.79 | 58.98 | 528.57 | 1.05 | 1.74 | 0.00 | 0.82 | 7.13 | 7.91 |
| [illegible] | [illegible] | 0.00 | [illegible] | [illegible] | 0.00 | 1.16 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 16.00 | 116.28 | 0.00 | 22.06 | 7.53 | 0.00 | 1.14 | 557.62 | 58.95 | 526.19 | 1.02 | 1.70 | 0.00 | 0.98 | 7.12 | 7.91 |
| 17.00 | 117.08 | 0.00 | 22.05 | 7.52 | 0.00 | 1.13 | 557.04 | 58.94 | 524.66 | 1.00 | 1.68 | 0.00 | 0.98 | 7.12 | 7.91 |
| | 117.48 | 0.00 | 22.05 | 7.52 | 0.00 | 1.13 | 557.04 | 58.94 | 524.66 | 1.00 | 1.68 | 0.00 | 0.98 | 7.12 | 7.91 |

219 Brown Lane Bryant, AR 72022 (501) 847-7077 (501) 847-7943 fax

GBM^c

February 13, 2007

route to Mo



Mr. Martin Maner, P.E.
Chief, Water Division
Arkansas Department of Environmental Quality
8001 National Drive
P.O. Box 8913
Little Rock, AR 72219-8913

Re: Revised Modeling of Ouachita River and Proposed Joint Pipeline Discharge
GBM^c No. 3007-03-200

Dear Mr. Maner:

Attached please find two copies of the referenced report. As per the request of the ADEQ (letter from Mo Shafii dated December 5, 2006) the model developed for the Ouachita River and the Joint Pipeline discharge (final report dated June 1, 2006) was revised and each of the 4 model scenarios re-run. Revisions to the model focused on the re-segmenting of reaches 2 and 6, and on adjustment to reach channel geometry to provide more variation and to mimic the dimensions provided in the United States Army Corps of Engineers (USACE) HEC-RAS model. Detailed information concerning the revised channel geometry is provided in the attached report. Results of the revised modeling indicate that the dissolved oxygen standard is maintained under all modeled scenarios. Additionally, minimal to no variation (change) in key parameters (chlorophyll-a, nitrogen, phosphorus, dissolved oxygen, etc.) was observed between the original modeling and the revised modeling.

As discussed previously, the Louisiana Department of Environmental Quality (LDEQ) provided comment (on more than one occasion) that the river geometry in the Final Nutrient Study Report (GBMc, 2006) did not match up well to the USACE HEC data and that the river should be much deeper depths than used in the original modeling. We have contested this point and have stated that the geometry used in the original modeling, which was based on field data collected by GBMc & Associates, was in the range of that provided by the USACE HEC model and should be somewhat conservative. Re-analysis of the HEC data provided by the USACE supports the depths used in the original model and confirms that the river geometry the LDEQ has cited (letter dated August 14, 2006) is inaccurate. It is not clear how the LDEQ used the HEC-2 model to derive the channel dimensions cited in their comments. Table 1 below provides a comparison of channel dimensions from the LDEQ HEC-2 model, the original USACE HEC-RAS model (unaltered), the GBMc HEC-RAS modeling and the field data collected by GBMc. According to Mike Alexander a Hydraulic Engineer with the Vicksburg District USACE office, there should be no difference in the water surface elevations output from HEC-2 versus HEC-RAS if both models are run correctly and at similar flows.

Table 1. Comparison of USACE HEC-RAS data, LDEQ HEC-2 data and GBMc HEC-RAS data.

| Parameter | Average Cross Sectional Area (m) and (Range) | Average Depth[1] (m) and (Range) | Average Maximum Depth (m) and (Range) |
|---|---|---|---|
| HEC-2 1200 cfs (LDEQ) | 542 | 5.46 | 8.08 |
| HEC-RAS 1000 cfs (USACE) | 224 (63-753) | 2.86 (1.45-6.09) | 4.53 (2.56-9.38) |
| HEC-RAS 1200 cfs (GBMc) | 230 (69-756) | 2.93 (1.55-6.13) | 4.63 (2.74-9.45) |
| GBMc Field Data (~1100 cfs) | 328 (271-435) | 3.60 (2.90-4.27) | 5.23 (4.27-6.19) |

[1]Average depth is equal to cross sectional area divided by top width.

The HEC-RAS model run by GBMc at 1200 cfs flow predicts water surface elevations about 0.1 meters deeper than the unaltered HEC-RAS model prepared by the USACE for 1000 cfs flow. The LDEQ HEC-2 model run at the calibration flow of 1200 cfs predicts water surface elevations 2.6 meters (8.5 feet) deeper, on average, than the 1000 cfs USACE model. It is unreasonable to assume a flow increase of 200 cfs would equate to a level increase of 2.6 meters. The rating curve developed by the USGS for the Ouachita River gauge at Camden, AR cites an increase in stage of approximately 0.30 meters (1.0 foot) per 1000 cfs increase, which is 0.1 feet/100 cfs. Field data collected by GBMc does indicate that the river in its middle reaches may be slightly deeper than that predicted by the HEC-RAS model, but this slight difference in depth was accounted for in the original modeling report (GBMc, 2006) and in the revised modeling transmitted to the ADEQ today.

In addition, the river longitudinal slope and Manning's Coefficients suggested by the LDEQ in their December 12, 2006 e-mail results in QUAL2K predicted river geometry similar to that portrayed in the unrealistic LDEQ HEC-2 modeling and as such, produced incorrectly large cross sectional area (465 $m^2$) and excessive depths (overall average depth of 4.71 meters and trapezoidal depths averaging 5.85 meters). Therefore, the LDEQ recommended slopes and Manning's Coefficients were not used. Even considering these unreasonably large channel dimensions, preliminary modeling indicates that the dissolved oxygen standard would still be maintained in the river under critical conditions and full pipeline discharge loads.

If you have any questions, please do not hesitate to contact Vince Blubaugh or me at (501) 847-7077, on any issue arising from your review.

Respectfully submitted,
GBM[c] & ASSOCIATES

Greg Phillips
Senior Scientist

Attachment

cc: Mo Shaffii

⚠ This message was sent with high importance.
Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

**Shafii, Mo**

**From:** Cotter, Amy **Sent:** Fri 2/16/2007 4:21 PM
**To:** Shafii, Mo
**Cc:**
**Subject:** FW: Revised El Dorado Pipeline Nutrient Study
**Attachments:** Compilation of comments and responses.doc(82KB)

From LDEQ.

- Amy

-----Original Message-----
From: Marian Mergist [mailto:Marian.Mergist@LA.GOV]
Sent: Friday, February 16, 2007 3:30 PM
To: Cotter, Amy
Subject: FW: Revised El Dorado Pipeline Nutrient Study
Importance: High

-----Original Message-----
From: Marian Mergist On Behalf Of Mike McDaniel
Sent: Friday, February 16, 2007 3:24 PM
To: cotter@adeq.state.ar.us
Cc: Karen Gautreaux; Wilbert Jordan; Barbara Romanowsky; Dick Duerr; Marian Aguillard; Emelise Cormier; Dugan Sabins; Kirk Manuel; Max Forbes; barhamr@legis.state.la.us; larep015@legis.state.la.us; jeffersh@legis.state.la.us; terrellm@ag.state.la.us; minorc@ag.state.la.us; hosch.claudia@epa.gov; SeidemannR@ag.state.la.us; burrell.monica@epa.gov; rshenderson@agfc.state.ar.us; shafii@adeq.state.ar.us; sckuyeda@agfc.state.ar.us; marmstrong@agfc.state.ar.us; Steph Braden

Subject: Revised El Dorado Pipeline Nutrient Study
Importance: High

Good Afternoon,

LDEQ is in receipt of your email dated 02/15/2007 transmitting the Febuary 13, 2006 report of the revision of the GBMC model of the Ouachita River. Thank you for providing us with this information.

We understand that you need our comments by 02/20/2007 so as to have them prior to your meeting with the consultant. We are unable to perform an adequate review in such a short time period and are therefore unable, at this time, to withdraw our objections to the issuance of a permit for the proposed Pipeline. A compilation of our previous comments with the consultant's responses to some of those comments is attached. The appendix data tables as transmitted to us are not entirely readable and, in order to continue our review, we therefore request an electronic copy of each final QUAL2K modeling run.

We have made a cursory reading of the report and have the following initial observations:

* It appears that revisions to the June 1, 2006 version of the model still use the original version of QUAL2K, to which we objected in our comments of August 14, 2006.

O/C with <10 mi

* In addition, we notice that the model still maintains completely backmixed reach lengths of nearly 10 miles. We continue to object to this use of QUAL2K.

If you have any questions or need additional information we would be happy to discuss our comments with you by phone or by teleconference.

Mike D. McDaniel
Secretary
LA Dept of Environmental Quality
Tel: (225) 219-3953

**********************************************************************

-----Original Message-----
From: Cotter, Amy [mailto:COTTER@adeq.state.ar.us]
Sent: Thursday, February 15, 2007 3:05 PM
To: Shafii, Mo; Barbara Romanowsky; Claudia Hosch; Craig Uyeda; Dick Duerr; Marian Aguillard; Darin Mann; Marian Mergist; Tiffany Dickerson; Monica Burrell; Richard Henderson; Ryan Seidemann

Subject: Revised El Dorado Pipeline Nutrient Study

Hello all. ADEQ has received the attached revised report on the joint pipeline study. We are meeting with the consultants next Wednesday (Feb. 21). Please review and if you have comments let us know by Tuesday, Feb. 20. Thanks.

Amy Beck
Engineering Technical Projects and Assistance Engineer
ADEQ- Water Division
(501)682-0023