Tres Palacios WPP: Appendix A-C

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August 9, 2016

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- Overview
  - Appendix A – Load Duration Curve Methodology
  - Appendix B – Calculations for Potential Loading and Load Reductions
  - Appendix C- Elements of Successful WPPs

Appendix A – Load Duration Methodology

- Load Duration Curve (LDC) analysis was used to determine load reductions required to meet water quality standards in Chapter 3

- The modified LDC analysis is described in Appendix A in order to account for tidal influences in the Tres Palacios.

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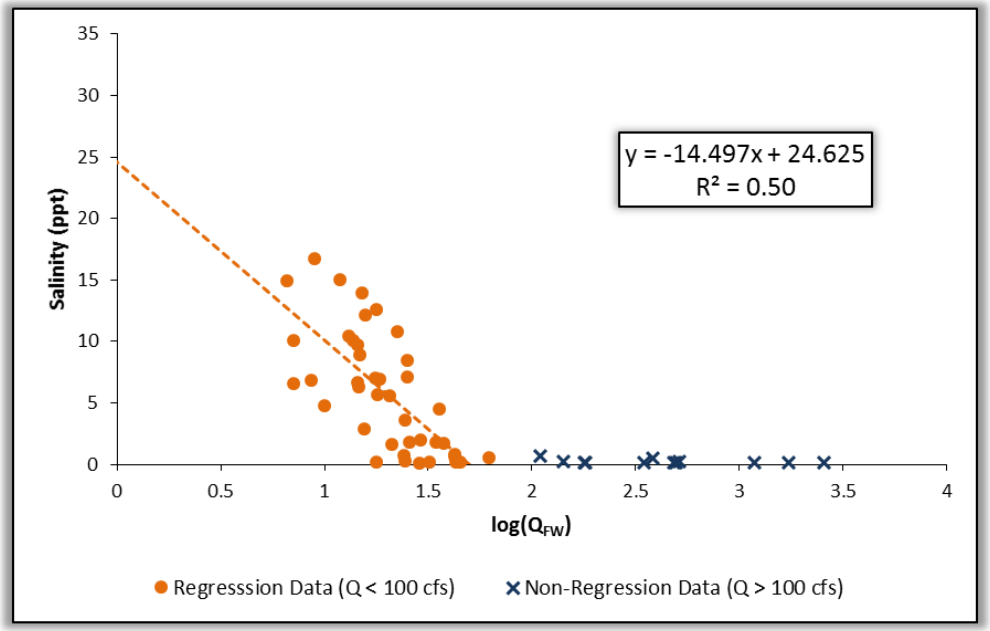
Appendix A – Load Duration Methodology

Modified LDC steps

1. Develop 15 yr-daily streamflow records at station12515
    1. Drainage-area ratio approach to estimate streamflows from records at an upstream gauge
    2. Account for discharges and diversions between the upstream gauge and station 12515
2. Use linear regressions and mass balance equations to determine the daily volume of seawater that mixes with freshwater



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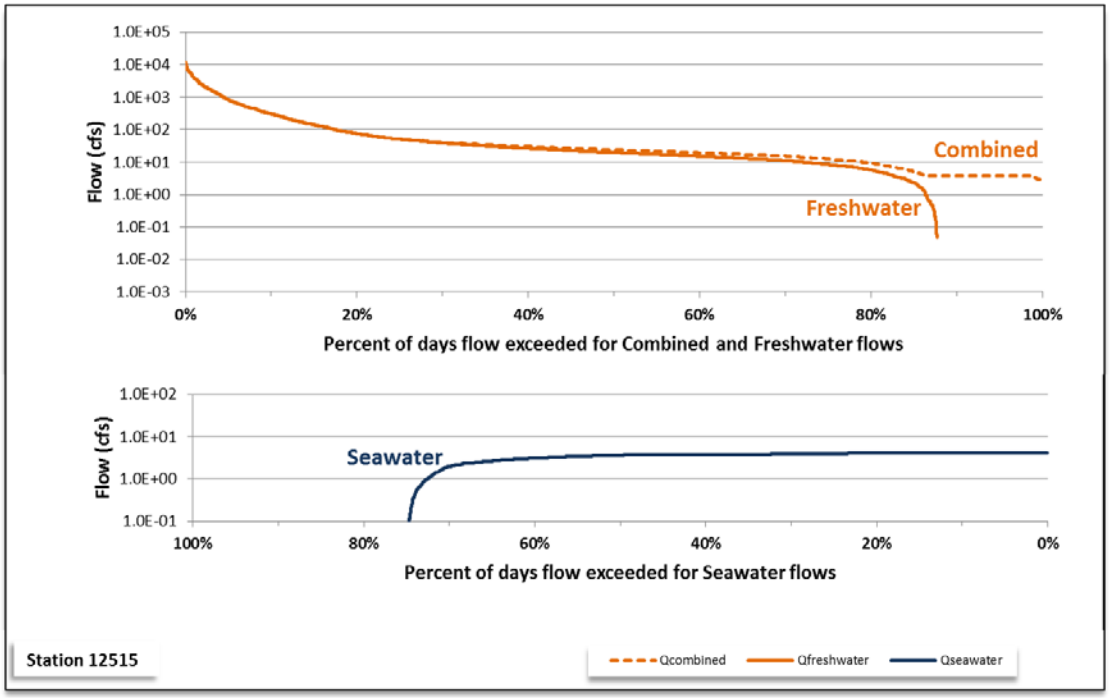
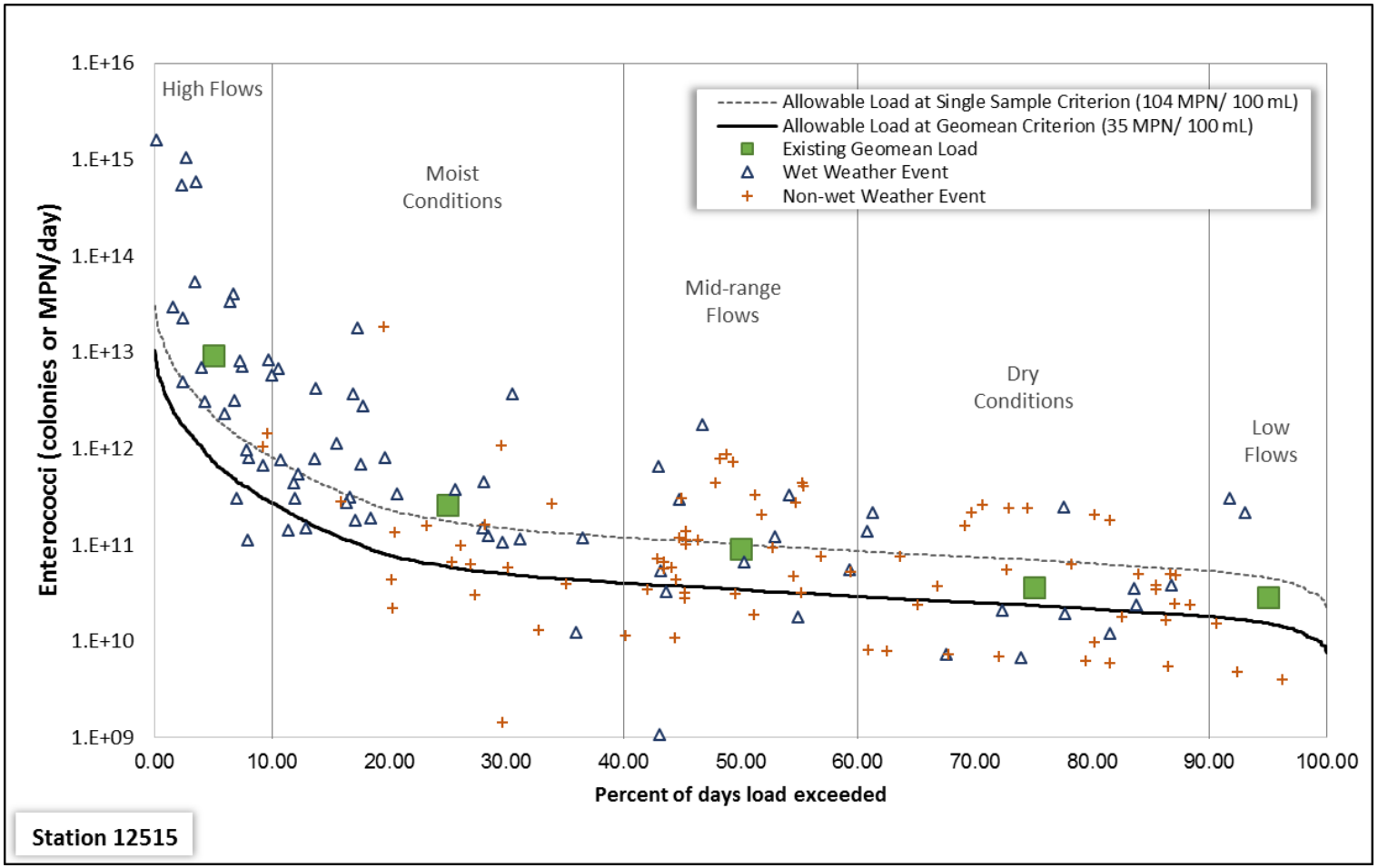
Appendix A – Load Duration Methodology

Modified LDC steps

3. Use the combined volumes to develop a Flow Duration Curve (FDC)



Appendix A – Load Duration Methodology



Appendix B – Loading and Load Reduction Calculations

- Chapter 3 estimates of pollutant source loads utilized a GIS analysis to calculate the amount of potential loading across the watershed

- Chapter 4 includes estimates of potential load reductions from different management measures

- Calculations are described in Appendix B

Appendix B – Loading Calculations

- Cattle Loadings

$$cfu = \#cattle \times \frac{8.55 \times 10^9 cfu\ fecal\ coliform}{Head \times day^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli}$$

- Horse Loadings

$$cfu = \#\ horses \times \frac{1.25\ AU}{horse} \times \frac{2.91 \times 10^8 cfu\ fecal\ coliform}{AU \times day^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli}$$

- Feral Hog Loadings

$$cfu = \#\ hogs \times \frac{0.125\ AU}{hog} \times \frac{1.21 \times 10^9 cfu\ fecal\ coliform}{AU \times day^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli}$$

- Deer Loadings

$$cfu = \#\ deer \times \frac{0.112\ AU}{deer} \times \frac{1.50 \times 10^{10} cfu\ fecal\ coliform}{AU \times day^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli}$$

Appendix B – Loading Calculations

- Household Pet Loadings

$$cfu = \#pets \times \frac{5.00 \times 10^9 cfu\ fecal\ coliform}{pet \times day^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli}$$

- OSSF

$$cfu = Number\ of\ OSSFs \times \frac{number\ of\ people}{household} \times \frac{70\ gal}{person \times day^{-1}} \times 0.15\ Failure\ rate \times \frac{1 \times 10^6\ cfu\ fecal\ coliform}{100\ ml} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli} \times 3578.4\ {}^{mL}/_{gal}$$

Appendix B – Loading Calculations

- Urban Stormwater

$$cfu = urban\ acerage \times \frac{5.60 \times 10^{9} cfu\ fecal\ coliform}{ha \times yr^{-1}} \times \frac{126\ cfu\ E.coli}{200\ fecal\ coliform} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli} \times 0.404686\ {}^{ha}/_{ac}$$

- WWTP

$$cfu = maximum\ permitted\ discharge\ ({}^{Gal}/_{day}) \times \frac{126\ cfu\ E.coli}{100\ ml} \times \frac{35\ cfu\ Enterococcus}{126\ cfu\ E.coli} \times 3785.2\ {}^{ml}/_{Gal}$$

Appendix B – Load Reduction Calculations

- Livestock Management Measures
  - The amount of load reduction from conservation plans depends on the specific BMP's implemented

	Effectiveness		
	Low	High	Median
Exclusionary Fencing	30%	94%	62%
Filter Strips	30%	100%	65%
Prescribed Grazing	42%	66%	54%
Stream Crossing	44%	52%	48%
Watering Facility	51%	94%	72.5%

Appendix B – Loading and Load Reduction Calculations

- Livestock Management Measures (page B-2)
  - Potential Load Reduction:
    - Implement 45 plans
    - Assume 213 farms and 13,000 head. (~61 head/farm)
    - 69% median effectiveness and 0.25 proximity factor
    - # of plans × average # of cattle/plan × loading rate × BMP effectiveness × proximity factor × conversion factors

Appendix B – Loading and Load Reduction Calculations

- Feral Hog Management (page B-4)
  - Reduce and maintain the population by 20% (~1000 hogs)
  - Population Reduction × loading rate × conversion factors

- Pet Waste Management (page B-6)
  - Deliver education and outreach efforts reaching at least 2,500 pet owners
  - # of pet owners × average number of owners willing to change behavior × loading rate × conversion factors

Appendix B – Loading and Load Reduction Calculations

- OSSF Management (page B-5)
  - Replace 30 OSSFs
  - # OSSFs replaced × loading rate × conversion factors
- Urban BMPs (page B-7)
  - Treat 25 acres
  - # of acres treated × urban loading rate × conversion factors × detention basin effectiveness
- WWTF Management (page B-7)
  - Divert 100% of El Campo effluent
  - Equivalent to the amount of effluent diverted

Appendix C – Elements of Successful WPPs

- WPPs must address the nine elements detailed in the USEPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* for implementation funding eligibility through Section 319 funds.

Appendix C – Elements of Successful WPPs

- ***A: Identification of Cases and Sources of Impairment***
  - Chapters 2, 3, and Appendix B
- ***B: Estimated Load Reductions***
  - Chapter 4 and Appendix B
- ***C: Proposed Management Measures***
  - Chapter 4
- ***D: Technical and Financial Assistance Needs***
  - Chapters 4 and 5

Appendix C – Elements of Successful WPPs

- ***E: Information, Education, and Public Participation Component***
  - Chapter 4
- ***F: Schedule***
  - Chapter 6
- ***G: Milestones***
  - Chapter 6
- ***H: Load Reduction Evaluation Criteria***
  - Chapter 6
- ***I: Monitoring Component***
  - Chapter 6

Questions?

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