Implementation of Hybrid Wetland Treatment Technology in the Northern Everglades Watershed

Task 30 Deliverable: Final Report

Chapter I: Technical Report

Sites 1-3, 5-7

Prepared for:

Florida Department of Agriculture and Consumer Service (FDACS)

&

South Florida Water Management District (SFWMD)

Contract #020210

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August 18, 2014

Revised August 27, 2014

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List of Abbreviations

Alum - aluminum sulfate

BAT – Best Available Technology

cfs - cubic feet per second

C:N – carbon to nitrogen ratio

DO – dissolved oxygen

DOP – dissolved organic phosphorus

ET - evapotranspiration

FAV – floating aquatic vegetation

(F)DEP – (Florida) Department of Environmental Protection

(F)DOT – (Florida) Department of Transportation

HRT – hydraulic retention time

HWTT – Hybrid Wetland Treatment Technology

LR – limerock

Mgal – million gallons

N - nitrogen

NO_x – nitrate + nitrite nitrogen as N

NPP – Net Primary Productivity

P - phosphorus

PP – particulate phosphorus

PAC - polyaluminum chloride

SAV – submerged aquatic vegetation

SRP – soluble reactive phosphorus

TAl – total aluminum

TKN – total Kjeldahl nitrogen

TN – total nitrogen = TKN + NO_x-N

TON – total organic nitrogen = TKN – ammonia-N

TP – total phosphorus

VC – vegetated compartment

Introduction

The reduction of phosphorus (P) loads to Lake Okeechobee from the watershed represents a formidable challenge. In order to meet the lake's P load reduction targets, hundreds of tons of P inputs must be curtailed each year. Water managers propose to accomplish this reduction by deploying a combination of Best Management Practices, "Edge of Field" treatment systems, and "Regional" treatment systems. A review (SWET, 2001) of Dairy "Best Available Treatment Technologies" (BAT) concluded that chemical treatment is likely to play a key role in reducing P inputs to the lake.

Because the operating (i.e., chemical) costs for removing a significant fraction of the inflow P load to the lake will be quite high, it is extremely important to identify and implement techniques for increasing the efficiency of chemical use. The Hybrid Wetland Treatment Technology (HWTT) concept was developed with the intent of harnessing and integrating the strengths of both wetland and chemical treatment technologies. The goal of HWTT systems is to provide the effectiveness and reliability of chemical treatment systems for P removal; to utilize the wetland vegetation to the maximum extent possible to minimize chemical amendment use; to eliminate the need for off-site disposal of residual floc materials; and to facilitate the removal of nitrogen (N) species.

HWTT systems are comprised of vegetated zones (primarily with floating and/or submerged macrophytes) and non-vegetated zones that utilize internal floc recycling as well as the drying of floc material with subsequent re-introduction into the treatment train. Chemical coagulants are added to the front-end of the system, which is equipped with one or more deep zones to capture and store the resulting chemical flocs. A fundamental concept of the HWTT is that the floc material resulting from coagulant addition remains at least temporarily viable and can be "re-used" for additional P removal. Both passive and active re-use of floc material can be practiced in a HWTT. Passive re-use refers to the accumulation of viable flocs on plant roots and stems that are situated near the front-end and mid-regions of the system. Active re-use refers to the periodic re-suspension of settled floc. Re-use is achieved by exposing existing viable flocs within the system, in either an active or passive manner, to "untreated parcels" of water. Coagulants typically are dosed to

the front end of the HWTT only intermittently, such that untreated parcels of water pass through into the HWTT system at selected time intervals. The HWTT includes intellectual property represented by several US Patents.

Overview of Project Activities

This report describes the water treatment performance of six HWTT systems in the northern Lake Okeechobee watershed during the 2013-2014 project period. Three of the HWTT facilities were constructed in 2008: of these, two systems are being utilized to treat tributaries (Nubbin Slough and Mosquito Creek) to Lake Okeechobee, and the third, which drains to the Indian River Lagoon, treats citrus (Ideal Grove) runoff (Watershed Technologies, 2008). In 2009, two additional HWTT systems were designed and constructed in the Lemkin Creek watershed and are being utilized to treat tributary waters from Wolff Ditch and Lemkin Creek/FDOT Ditch sub-basins. Construction of Phase I of the Grassy Island HWTT facility was completed in mid-2011. Phase II construction was completed in June 2012, providing for a total of 20 cfs system capacity. Optimization of Phase II operations continued from July through October 2012. Phase III construction (pump station enhancements, and expansion of the western components to 15 cfs) spanned most of the 2012-13 project year, and was completed in June 2013. These enhancements allow for a maximum treatment capacity of 30 cfs.

As part of our HWTT system performance assessments, grab samples of inflow and outflow water were collected at each of the HWTT facilities, and continuous inflow data were obtained from on-site instrumentation. Near the end of this monitoring period, we initiated floc removal/tilling at a subset of facilities. Additionally, at the Wolff and Lemkin facilities, we performed monitoring downstream of the two HWTT systems to characterize effects of HWTT system discharges on water quality in a previously dry “Isolated Wetland” parcel.

Detailed Treatment Performance of the Operational HWTT Systems

Site 1: Nubbin Slough Tributary Treatment HWTT Facility

From July 2013 through June 2014, we continued operations of the 1.55-acre Nubbin Slough HWTT system located at Davie Dairy (Figure 1). This retrofitted system had been constructed early in 2008, utilizing some of the infrastructure that previously was deployed as part of the Dairy BAT project.



Figure 1. The Nubbin Slough HWTT system looking toward the north. The mixing chamber and inflow manifold are at the northeast corner of the pond, and the outflow riser is at the southwest corner (left foreground). The limerock bed is situated to the right of the pond.

Alkalinity levels in the Nubbin Slough waters are low, which necessitates either the use of buffer in conjunction with alum additions or the use of a polyaluminum chloride (PAC) compound. PAC compounds were utilized during operations of the Davie Dairy BAT

chemical treatment system, but they proved ineffective for P removal in that system. During 2008 and 2009, sodium aluminate was utilized in conjunction with alum during HWTT operations; however, the aluminate compound is expensive and difficult to store and deploy. Prior to the wet season of 2010, we therefore designed and deployed a limerock bed (Figure 2) to provide buffering prior to alum additions.



Figure 2. The limerock bed at the Nubbin Slough HWTT facility.

During the July 2013 – June 2014 reporting period the Nubbin Slough HWTT system received continuous dosing of aluminum sulfate (alum), with the exception of the period from mid-April through mid-June, during which the alum feed was intermittent (85% of operational time). The overall average effective dosing rate was 15.6 mg Al/L, with monthly averages ranging from 13.2 to 16.5 mg Al/L. During the period December 7-19 system operation was suspended (no flow) for maintenance of the limerock bed. Daily system flow status is provided in the Chapter II appendices.

Grab samples of inflow water were collected for chemical analyses from the HWTT diversion weir (system inflow) while system outflow samples were collected at the HWTT pond outflow structure. Samples were analyzed for total phosphorus (TP), alkalinity, pH, color, conductivity and turbidity on a weekly basis. Water samples were also analyzed for nitrate + nitrite N (NO_x-N) and TKN on a biweekly basis; total N (TN) was calculated as the sum of NO_x and TKN. Water chemistry data for the July 2013 – June 2014 monitoring period are presented in Figure 3 through Figure 10.

TP concentrations in the Nubbin HWTT inflow stream were most variable, and generally of greatest magnitude, during the wet seasons (Figure 3). Over the course of the monitoring period, inflow TP ranged from 416 to 1550 µg/L and averaged 768 µg/L (median = 690 µg/L). Outflow TP concentrations were consistently lower than inflow concentrations, but exhibited a relatively large degree of temporal variability, particularly during the wet season. Maximum TP levels at the outflow were observed during June - September 2013 and June 2014. Outflow TP concentration averaged 189 µg/L (median = 110 µg/L) and ranged from 31 to 897 µg/L.

Inflow alkalinity levels were relatively low, but highly variable, averaging 38 mg/L (as $CaCO_3$) and ranging from 17 to 64 mg/L during the monitoring period (Figure 4). Highest inflow alkalinity levels were measured during the 2013 wet season. Outflow alkalinity was highly variable and similar in magnitude to inflow alkalinity, ranging from 15 to 85 mg/L and averaging 40 mg/L over the course of the monitoring period. Inflow pH varied from 6.0 to 6.9, while outflow pH ranged from 6.0 to 7.1 during the monitoring period (Figure 5). The overall pH in the outflow stream was 6.6, slightly higher than pH in the inflow stream (6.4). Color in both inflow and outflow streams was higher and more variable during the wet season months than during the dry season (Figure 6). Mean color concentrations at the inflow and outflow were 336 and 203 PCU, respectively. Inflow color ranged widely, from 154 to 802 PCU, while outflow color ranged from 49 to 750 PCU. Conductivity exhibited high variability in both inflow and outflow streams, with generally higher levels observed during the dry season (Figure 7). Inflow conductivity averaged 350 µS/cm and ranged from 133 to 499 µS/cm, while outflow conductivity averaged 440 µS/cm and ranged from 250 to

556 µS/cm. Inflow turbidity averaged 2.5 NTU and ranged from 1.0 to 7.9 NTU (Figure 8). Outflow turbidity was frequently higher and more variable than inflow turbidity, primarily during the wet season. The overall range in outflow turbidity was 1.1 to 20.8 NTU, while the mean value was 7.0 NTU.

TN concentrations in the inflow stream exhibited a minor overall decrease, with high short-term variability, during the monitoring period (Figure 9). Outflow TN concentrations showed no overall trend, but varied considerably among sampling events. Inflow TN ranged from 1.00 to 6.21 mg/L and averaged 3.19 mg/L, while outflow TN ranged from 0.81 to 4.59 mg/L and averaged 2.29 mg/L. Concentrations of NO_x were seasonally variable, with higher inflow and outflow levels measured during the dry season (Figure 10). On average, NO_x accounted for a relatively high proportion of TN in both inflow (26%) and outflow (38%) streams. Inflow NO_x concentrations averaged 0.830 mg N/L and ranged from ≤ 0.016 mg/L (MDL) to 3.00 mg N/L, while outflow NO_x concentration averaged 0.883 mg N/L and ranged from ≤ 0.016 to 2.60 mg N/L. While a net reduction in TN concentration was observed for the Nubbin Slough HWTT system during the monitoring period, the percentage removal rate was low compared to that of the Ideal Groves HWTT facility. As previously reported, the absence of a shallow vegetated zone in the Nubbin facility contributes to the poorer N removal performance at this site.

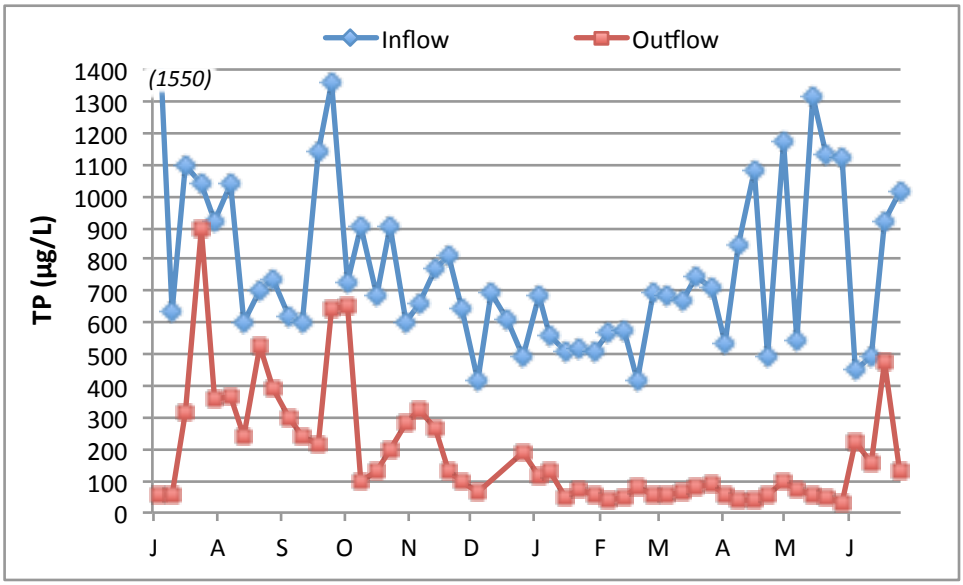


Figure 3. TP concentration in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

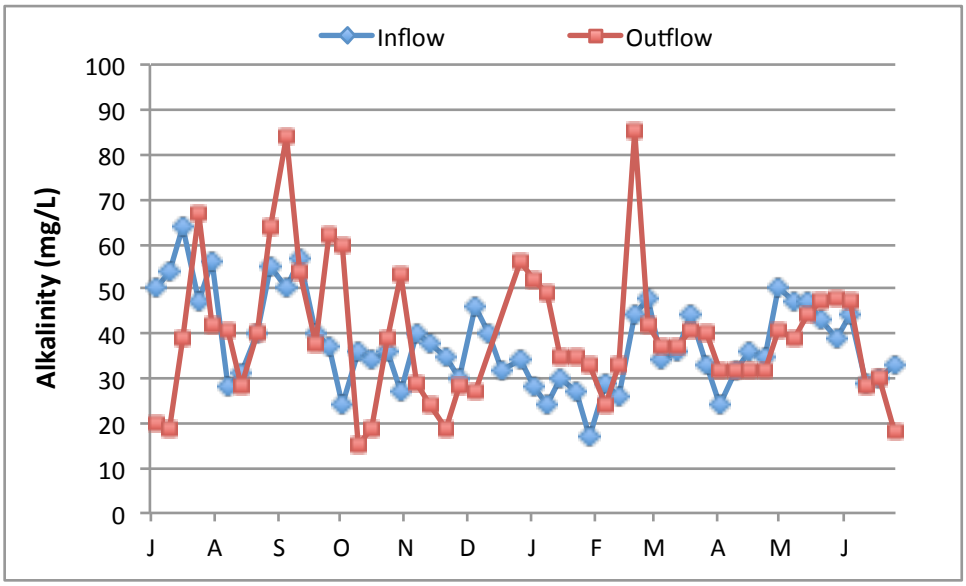


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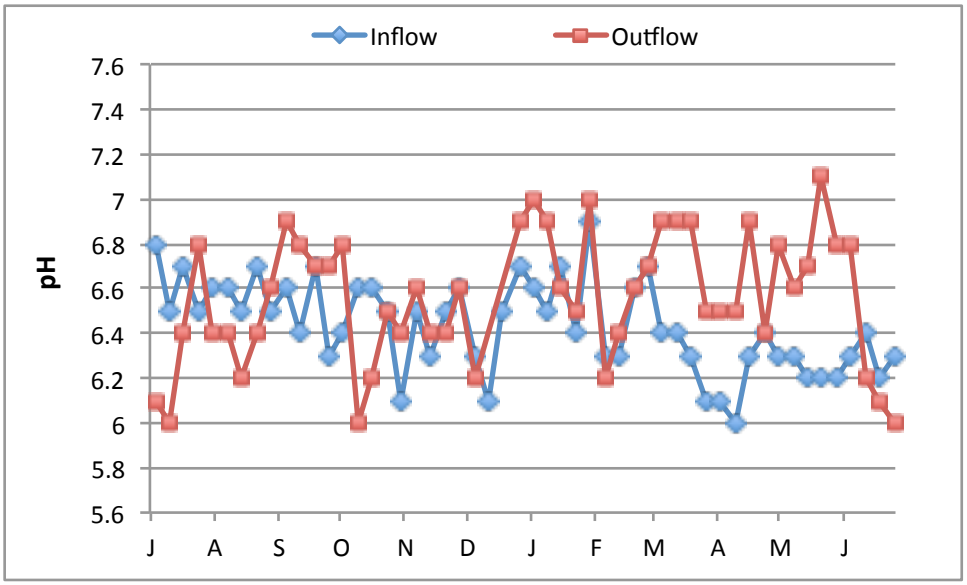


Figure 5. pH in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

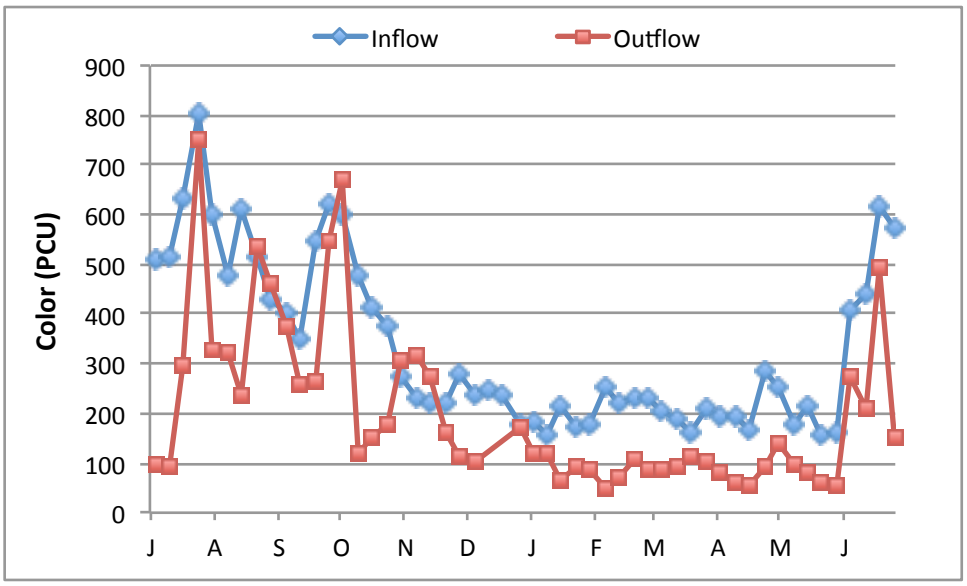


Figure 6. Color in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

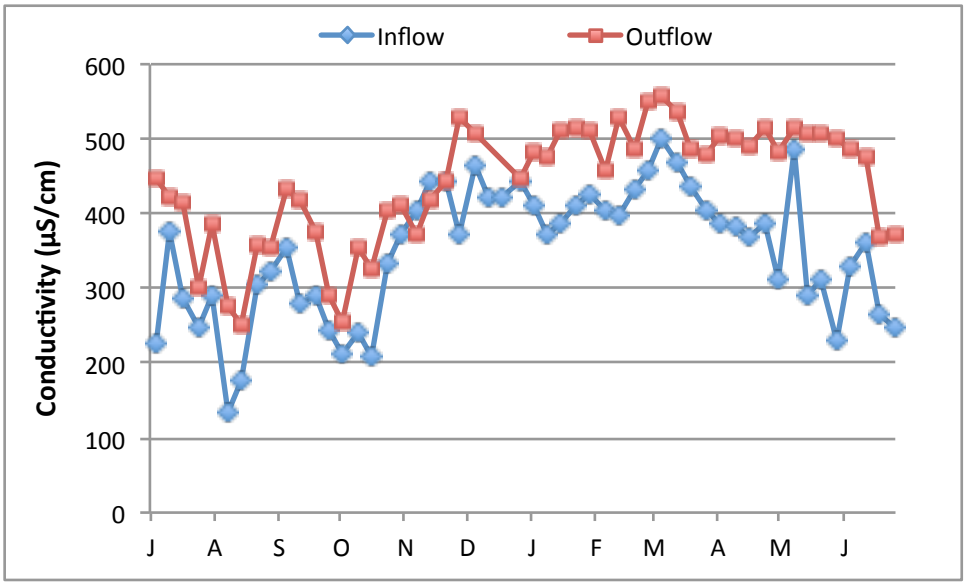


Figure 7. Conductivity in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

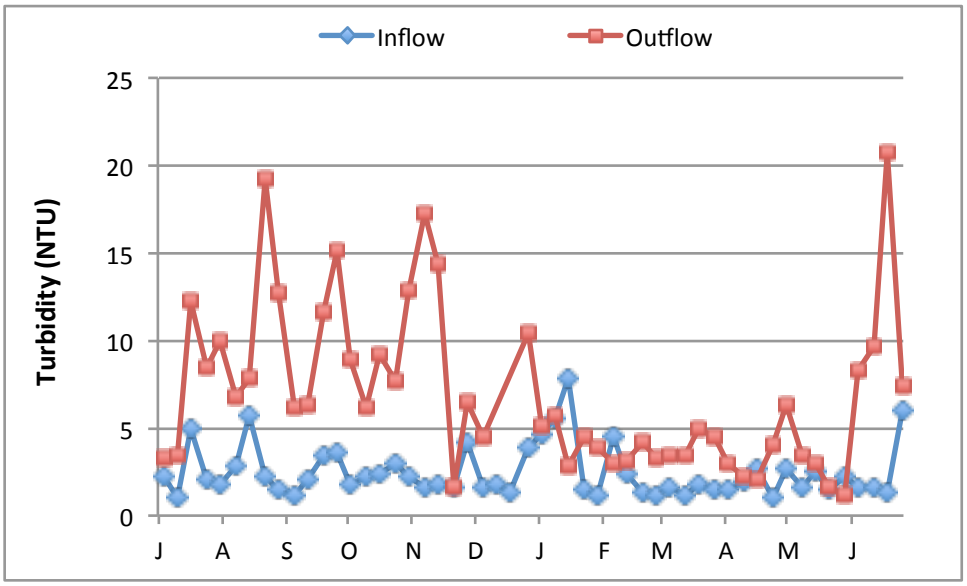


Figure 8. Turbidity in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

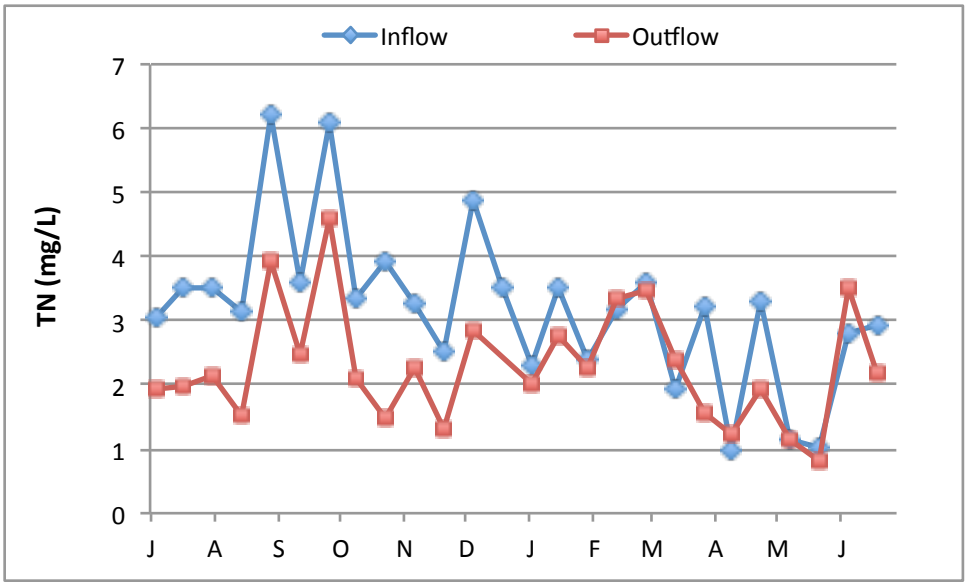


Figure 9. TN in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

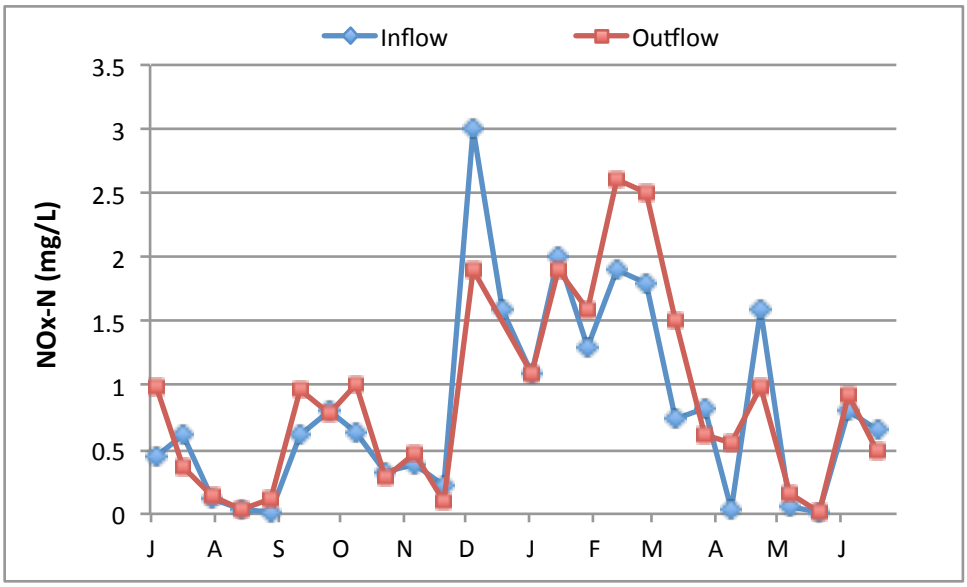


Figure 10. NO_x-N in the inflow and outflow streams at the Nubbin Slough HWTT system during the July 2013 – June 2014 monitoring period.

Monthly flow volumes treated in the Nubbin HWTT system reflect seasonal trends in flows and water levels in Nubbin Slough (Figure 11). Treated flow volume was considerably

higher during wet season months than during the dry season. Total monthly flow volumes during the monitoring period ranged from 3.5 million gallons (Mgal) in May 2014 to 45.8 Mgal in July 2013. Mean monthly flow volume was 19.6 Mgal, while total flow treated by the Nubbin Slough HWTT system during the period July 2013 through June 2014 was 235.7 Mgal.

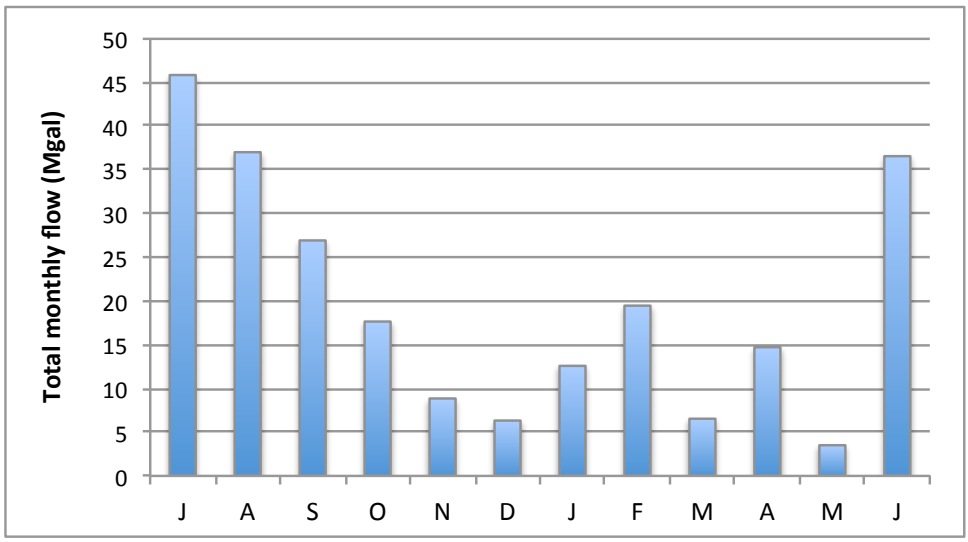


Figure 11. Total monthly flow treated by the Nubbin Slough HWTT system during the period July 2013 – June 2014.

Site 2: Ideal #2 Grove HWTT Facility

The Ideal #2 Grove HWTT site is situated within an irrigated citrus grove in western St. Lucie County. The small canal to the north of the treatment system ("North Canal") serves as a collector ditch for grove runoff and groundwater. Due to fertilizer usage in the grove, the water in the collection canals is nutrient-enriched. A large regional canal (the "Rim Ditch") immediately west of the grove site serves as a pumped supply of water to the canal that runs along the south side ("South Canal") of the treatment facility. This relatively large canal carries Rim Ditch water from west to east, and then a lateral canal flows about ½-mile north to a grove irrigation pump, which feeds water into drip irrigation emitters throughout the grove.

The Ideal Grove HWTT system consists of a 0.7-acre pond, equipped with both shallow and deep zones, that was initially divided into equal size parallel flow paths with a flexible boom and barrier (Figure 12). This configuration facilitated the comparative demonstration of different components of HWTT including amendment types and doses, as well as various operational schemes (e.g. different hydraulic loading rates, intermittent dosing, etc.) during the first two years of operation. The shallow zone is stocked with floating macrophytes, in this case water hyacinth (*Eichhornia crassipes*) (Figure 13 and Figure 14). The deep zones contain several species of submerged aquatic vegetation (SAV), including some that were stocked (e.g., *Najas guadalupensis*) and others (*Hydrilla verticillata*) that colonized from the adjacent inflow farm canal.



Figure 12. Aerial photo of the Ideal Grove HWTT facility.



Figure 13. The outflow region of the Ideal Grove HWTT facility.



Figure 14. Attachment of coagulant flocs to the roots of the floating plants in the shallow zone of the Ideal Grove HWTT system.

The two treatment flow paths in the Ideal HWTT system have been operated as a single (combined) flow path, beginning in April 2010. During the July 2013 – June 2014 reporting period, the combined system received intermittent (50% of operational time) dosing of alum, with the exception of brief periods (ca. 2 weeks duration) of continuous dosing during July, September and October 2013. The mean effective alum dose for the monitoring period was 15 mg Al/L, while monthly average effective dose ranged from 11 to 22 mg Al/L. Daily system flow status is provided in the Chapter II appendices.

Grab samples of water were collected for routine monitoring, from the pond inflow (pumped from the North Canal), and from the outflow of the northern (A) flow path. Samples were analyzed for total phosphorus (TP), alkalinity, pH, color, conductivity and turbidity on a weekly basis. Water samples were also analyzed for nitrate + nitrite N (NO_x-N) and TKN on a biweekly basis; total N (TN) was calculated as the sum of NO_x and TKN. Water chemistry data for the July 2013 – June 2014 monitoring period are presented in Figure 15 through Figure 22.

As observed in previous years, TP concentration in the Ideal HWTT inflow stream exhibited a high level of variability (CV = 73%) during the course of the monitoring period (Figure 15). Highest levels of inflow TP were observed during September 2013, although a short-duration spike in TP concentration was also observed during late February 2014. Inflow TP concentrations ranged from 184 to 2570 µg/L, and averaged 753 µg/L. Outflow TP concentrations were typically low for this site during most of the monitoring period, although occasional increases occurred during July – September 2013, coinciding with atypically high inflow TP levels. During that period of excessive P loading, presumably in the form of particulate and dissolved organic matter, outflow TP concentrations averaged 81 µg/L and ranged from 14 – 202 µg/L, whereas for the remainder of the monitoring period (October 2013 through June 2014) mean outflow TP concentration was only 20 µg/L. The overall range for outflow TP was 13 to 202 µg/L, while the mean was 35 µg/L.

Inflow alkalinity generally varied inversely with the rate of precipitation in the vicinity of the Ideal HWTT system (Figure 16). Alkalinity concentrations ranged from 103 to 249

mg/L and averaged 171 mg/L in the inflow stream. Outflow alkalinity exhibited wide fluctuations during the 2013 wet season and subsequently increased during most of the dry season, maintaining levels near or above 75 mg/L from December through the end of the monitoring period. Outflow alkalinity ranged from 36 to 153 mg/L overall, and averaged 102 mg/L. Inflow pH was relatively stable and slightly basic during the majority of the monitoring period, but decreased somewhat during the last two months of the period (Figure 17). The overall range of inflow pH was relatively narrow (6.6 – 7.7), with a mean value of 7.1. Outflow pH levels were generally slightly lower than inflow pH, during the greater part of the monitoring period. Mean outflow pH was 7.0, and the range was 6.5 to 7.4. Color in the inflow stream exhibited highest variability and concentrations during the wet season months of 2013 and 2014 (Figure 18). Inflow color ranged widely, from 126 to 580 PCU, and averaged 287 PCU. Color in the outflow stream was consistently lower than inflow color levels, with concentrations less than 150 PCU observed during the final 9 months of the monitoring period (October 2013 – June 2014). Outflow color levels ranged from 40 to 287 PCU and averaged 89 PCU. Conductivity in both the inflow and outflow streams decreased during the early portion of the monitoring period, then steadily increased during the dry season before decreasing during May and June (Figure 19). Inflow conductivity ranged from 420 to 2090 µS/cm and averaged 1178 µS/cm, while outflow conductivity ranged from 559 to 1920 µS/cm and averaged 1180 µS/cm. Inflow turbidity was highly variable throughout the monitoring period, while outflow turbidity was consistently lower and less variable than inflow turbidity (Figure 20). Inflow turbidity averaged 8.5 NTU and ranged from 1.6 to 39.5 NTU. Outflow turbidity was generally less than 5 NTU, with an overall range of 0.5 – 5.8 NTU and mean value of 1.8 NTU.

Inflow TN concentrations reflected a weak seasonal trend, with the highest concentrations measured during the 2013 wet season (Figure 21). Outflow TN concentrations were also elevated during this time, relative to the remainder of the monitoring period, when levels were consistently near or below 1 mg/L. The mean inflow TN concentration during the monitoring period was 2.81 mg/L, while the range was 1.61 to 6.00 mg/L. Outflow TN averaged 1.20 mg/L and ranged from 0.79 to 2.21 mg/L. Inflow and outflow NO_x concentrations were relatively low during the monitoring period, with the exception of

high inflow NO_x measured during the initial sampling event, which contributed to the high inflow TN concentration on the same date (Figure 22). Inflow NO_x concentrations ranged from <0.016 to 2.70 mg N/L and averaged 0.142 mg N/L. Outflow NO_x concentrations ranged from <0.016 to 0.044 mg N/L and averaged 0.010 mg N/L.

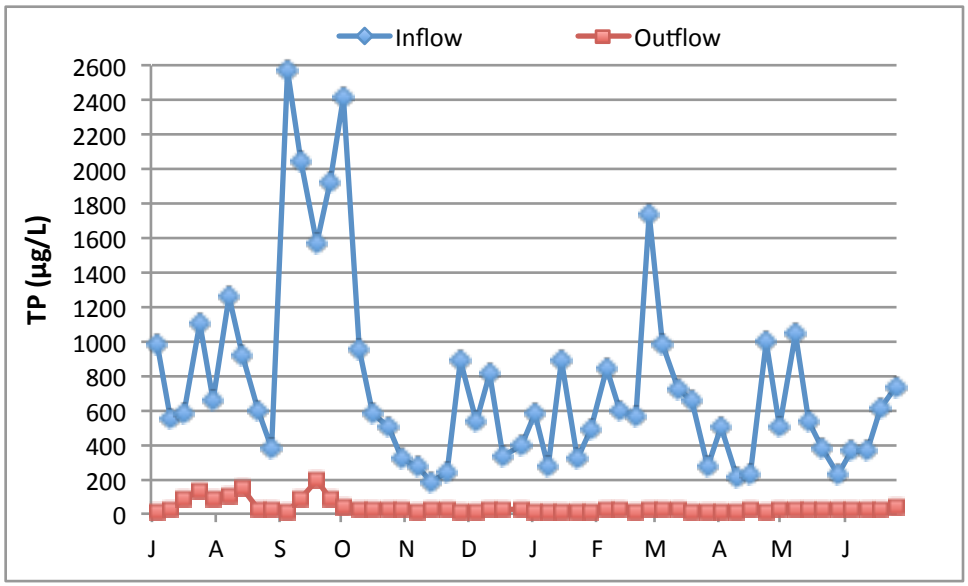


Figure 15. TP concentration in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

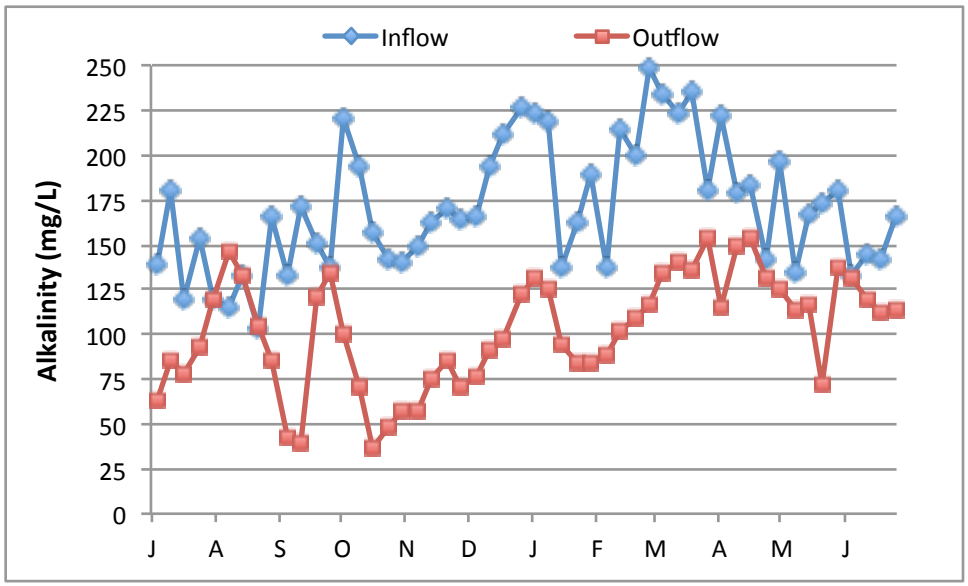


Figure 16. Alkalinity in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

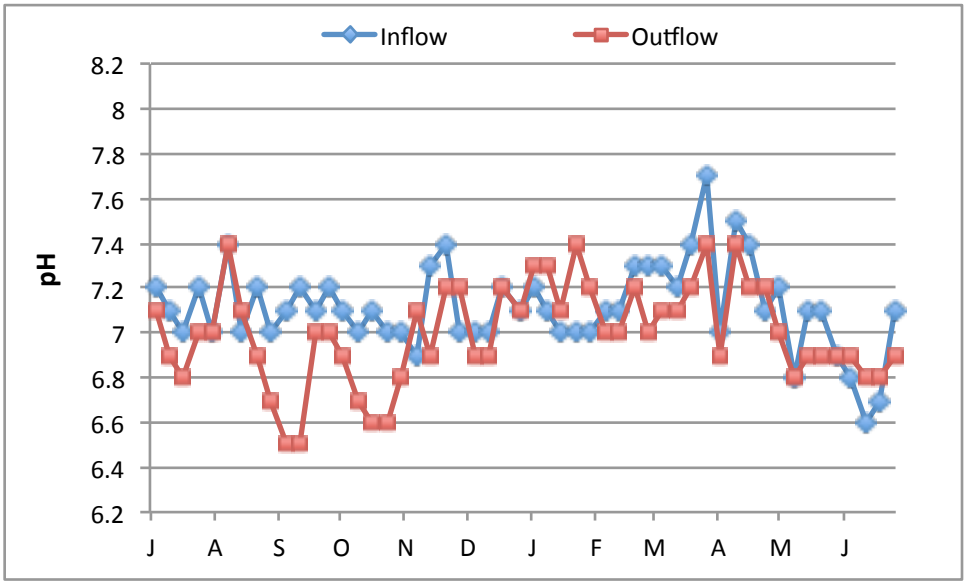


Figure 17. pH in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

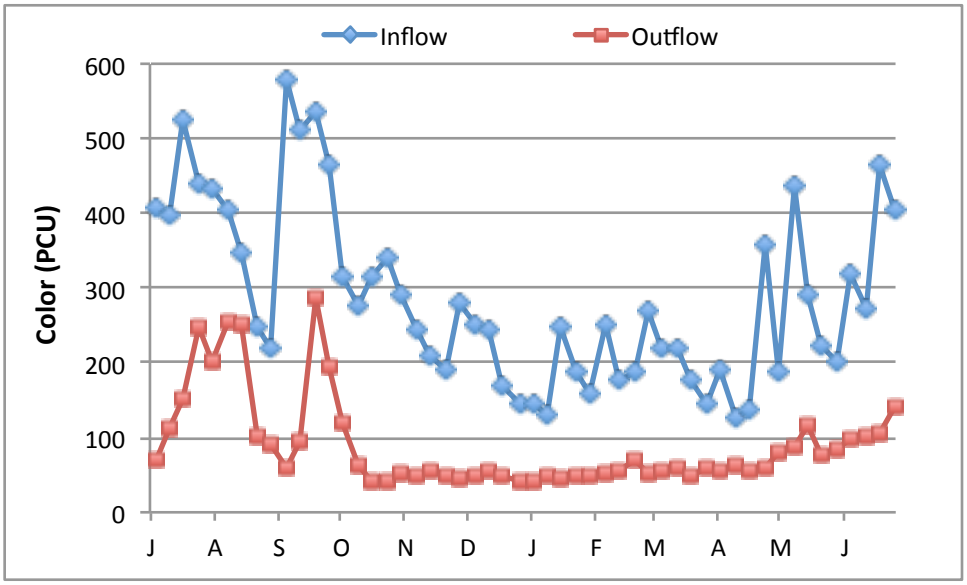


Figure 18. Color in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

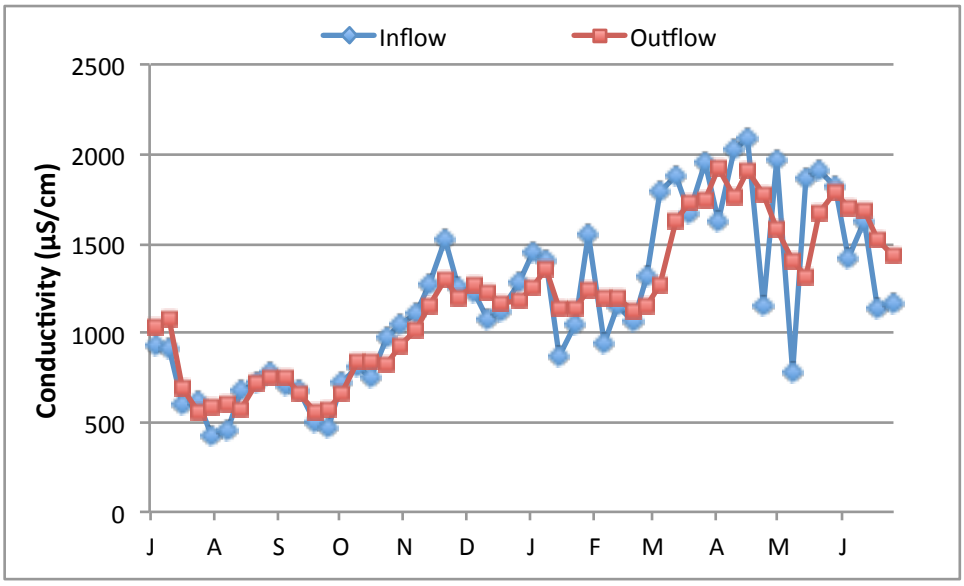


Figure 19. Conductivity in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

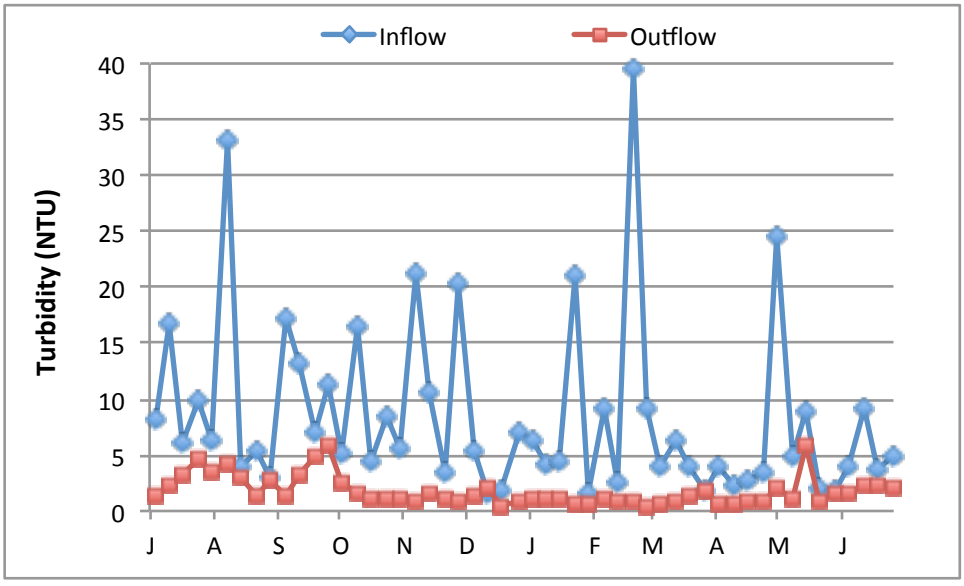


Figure 20. Turbidity in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

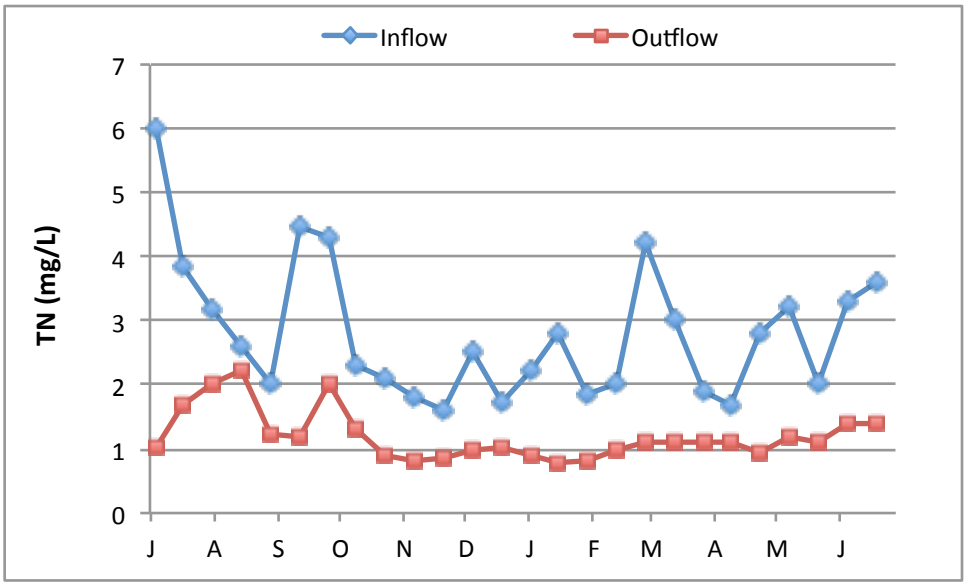


Figure 21. TN in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

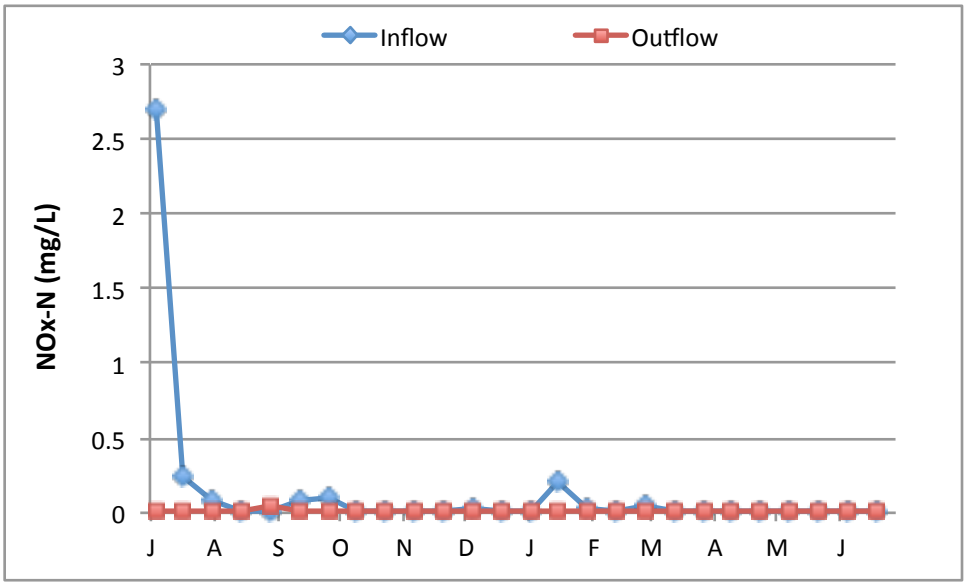


Figure 22. NO_x-N in the inflow and outflow streams at the Ideal #2 Grove HWTT system during the July 2013 – June 2014 monitoring period.

Flow volume treated in the Ideal HWTT system was highest for the months of July-September 2013, while monthly volumes were lower and relatively consistent during the remainder of the reporting period (Figure 23). Monthly treated flow volumes ranged from 1.5 Mgal in February 2014 to 3.7 Mgal in September 2013. Mean monthly flow volume was 2.2 Mgal, while total flow treated during the period July 2013 through June 2014 was 26.9 Mgal.

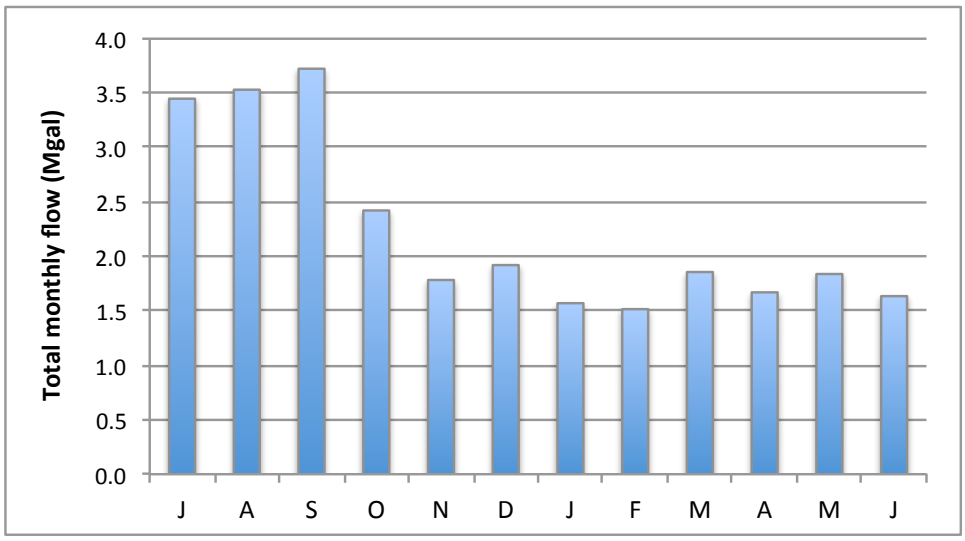


Figure 23. Total monthly flow treated by the Ideal #2 Grove HWTT system during the period July 2013 – June 2014.

Site 3: Mosquito Creek Tributary Treatment HWTT Facility

In 2008, a HWTT facility was constructed on Larson Dairy property, adjacent to Mosquito Creek. The facility consists of one large (1.3 acre) HWTT system and one small (0.44 acre) system (Figure 24). A limerock (LR) bed was added to the system in 2010 for buffering of Mosquito Creek waters prior to introduction to the large HWTT system (Figure 25).



Figure 24. Aerial photo of the large (left) and small (right) HWTT facilities at Mosquito Creek.

The large HWTT facility ("large pond") was operational during the July 2013 – June 2014 project assessment period, while the small system was kept off-line. System operation was suspended due to floc removal and vegetation tilling in the pond during the period April 8 – May 19; subsequently, low water levels in the creek delayed re-filling of the pond until the end of May.



Figure 25. Limerock bed at Mosquito Creek HWTT.

Alum was dosed to the large pond on a continuous feed basis during approximately 25% of the monitoring period, and on an intermittent (average of 85% of operational time) basis during the remainder of the period. Monthly averages of effective alum dose ranged from 8.4 to 13.8 mg Al/L, while the overall mean effective alum dose was 11.2 mg Al/L. In addition to alum, a polyaluminum chloride (PAC) compound was used as a supplemental coagulant during July and August 2013, at an average dose of 11.5 mg Al/L applied as a continuous feed. Daily system flow status is provided in the Chapter II appendices.

Grab samples of water were collected for routine monitoring at the system inflow (Mosquito Creek) and the large pond outflow. Samples were analyzed for total phosphorus (TP), alkalinity, pH, color, conductivity and turbidity on a weekly basis. Water samples were also analyzed for nitrate + nitrite N (NO_x-N) and TKN on a biweekly basis; total N (TN) was calculated as the sum of NO_x and TKN. During the period in which the system was

off-line, monitoring at the pond outflow was suspended, while routine collection of Mosquito Creek ("inflow") samples continued. Water chemistry data for the July 2013 – June 2014 monitoring period are presented in Figure 26 through Figure 33.

TP concentrations in the inflow stream were generally lower during the dry season months; nevertheless, the highest inflow TP concentrations were also measured during this period (Figure 26). The overall concentration range for inflow TP was 233 to 3210 µg/L, while concentrations averaged 653 µg/L during the monitoring period. Outflow TP concentrations exhibited a high level of short-term variability, ranging from 15 to 466 µg/L. Variability in outflow TP levels was likely enhanced by large fluctuations in TP and other parameters (e.g., alkalinity and color) in the inflow stream. The overall mean outflow TP concentration for the monitoring period was 137 µg/L, while the median outflow TP was 97 µg/L.

Alkalinity showed no obvious seasonal trend, but a high level short-term variability was measured in both the inflow and outflow streams (Figure 27). Inflow alkalinity spikes of 380 and 414 mg/L, well above the mean value of 97 mg/L, occurred during November 2013 and January 2014. The overall range for inflow alkalinity was 48 to 414 mg/L. Outflow alkalinity varied widely in response to high fluctuations in inflow water chemistry. Mean outflow alkalinity concentration was 40 mg/L, while the overall range was 15 to 175 mg/L. Inflow pH ranged from 6.4 to 7.5 and averaged 6.9 during the monitoring period (Figure 28). Outflow pH was somewhat more variable than inflow pH, ranging from 5.9 to 7.2. Mean pH in the outflow stream was 6.4. Color levels in the inflow stream suggested a seasonal trend, similar to that observed for inflow TP concentration (Figure 29). Spikes in color concentration during November and January coincided with the highest spikes in inflow TP. Outflow color levels varied in proportion to inflow color during the majority of the monitoring period. Inflow color ranged from 141 to 1034 PCU and averaged 398 PCU. Color in the outflow stream ranged from 43 to 760 PCU and averaged 177 PCU. Conductivity levels exhibited relatively minor short-term variability, with the exception of fluctuations associated with high inflow color concentrations (Figure 30). Mean inflow and outflow conductivity levels were both 503 µS/cm, respectively. Inflow conductivity ranged

from 202 to 1392 µS/cm and outflow conductivity ranged from 209 to 883 µS/cm. Inflow turbidity was characterized by low (ca. 2-5 NTU) baseline levels and periodic spikes in the 25-35 NTU range (Figure 31). The overall range of inflow turbidity was 1.2 to 35 NTU, while the mean value was 5.7 NTU. Outflow turbidity levels generally did not reflect inflow turbidity, with a few exceptions, e.g. during late August. Outflow turbidity ranged from 1.4 to 40.8 and averaged 8.5 NTU.

Inflow TN concentration was generally less than 5 mg/L during the monitoring period, but briefly rose to levels above 20 mg/L in November and January (Figure 32). The overall range for TN was 1.91 to 23.6 mg/L, and the mean for the monitoring period was 4.55 mg/L. The Mosquito HWTT system effectively removed TN during the monitoring period, although outflow concentrations ranged widely, from 0.82 to 5.50 mg/L. The mean outflow TN concentration over the course of the monitoring period was 2.38 mg/L. Concentrations of NO_x were similar in the inflow and outflow streams, with the exception of the large magnitude spike of inflow NO_x in late January (Figure 33). NO_x concentrations ranged from <0.016 to 8.00 mg N/L in the inflow stream and <0.016 to 2.40 mg N/L in the outflow stream. Mean inflow and outflow concentrations of NO_x were 0.911 and 0.719 mg N/L, respectively. As previously reported, the absence of a shallow SAV zone in the Mosquito Creek facility probably serves to limit N removal performance at this site.

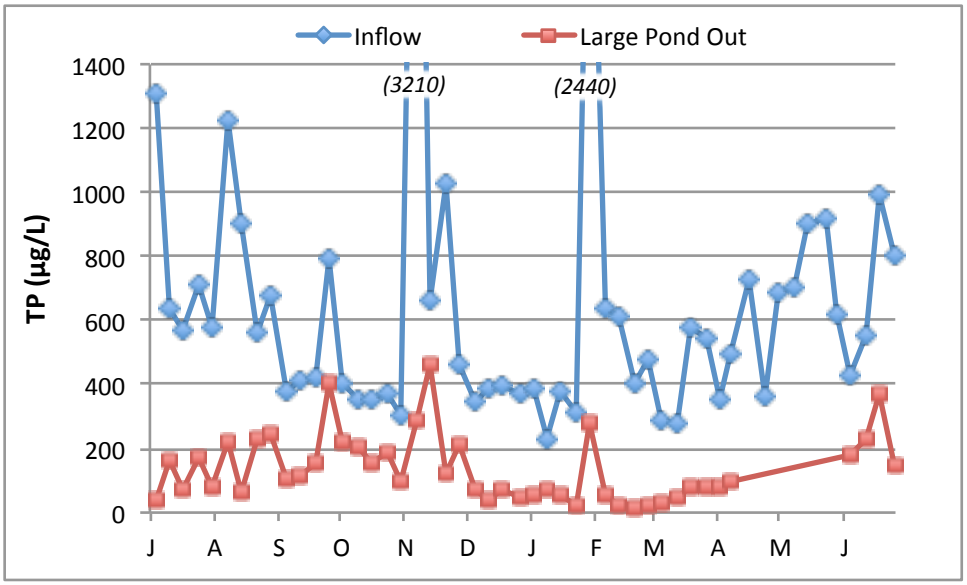


Figure 26. TP concentration in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

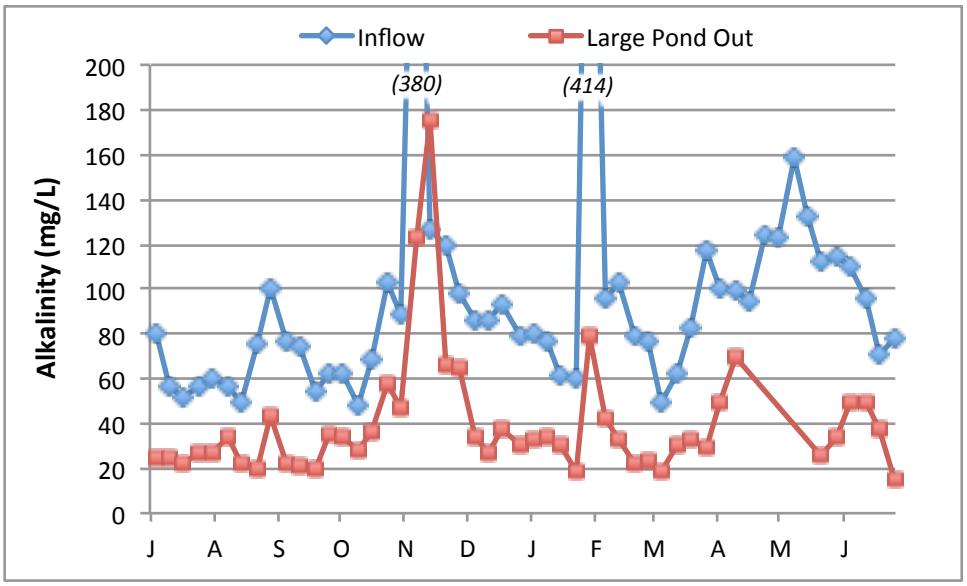


Figure 27. Alkalinity in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

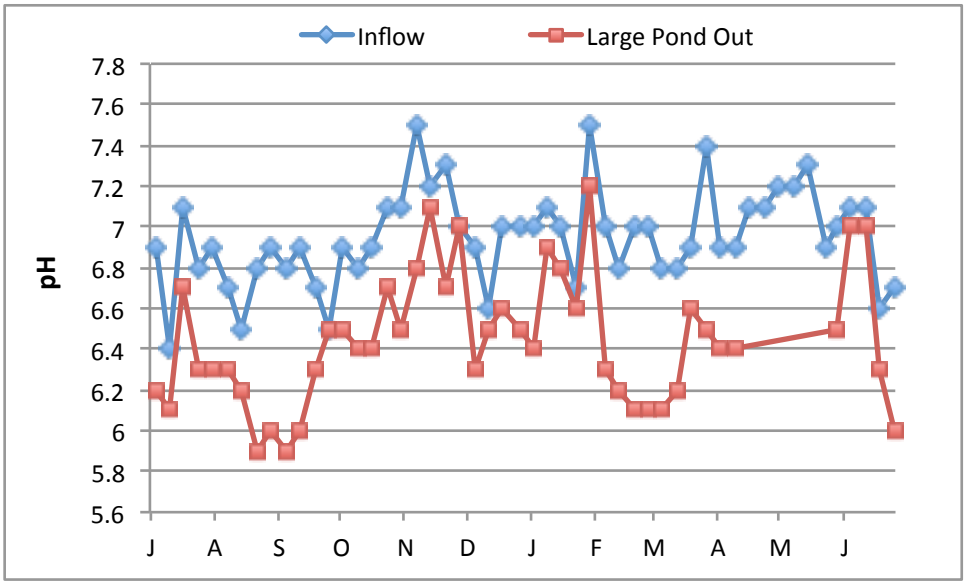


Figure 28. pH in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

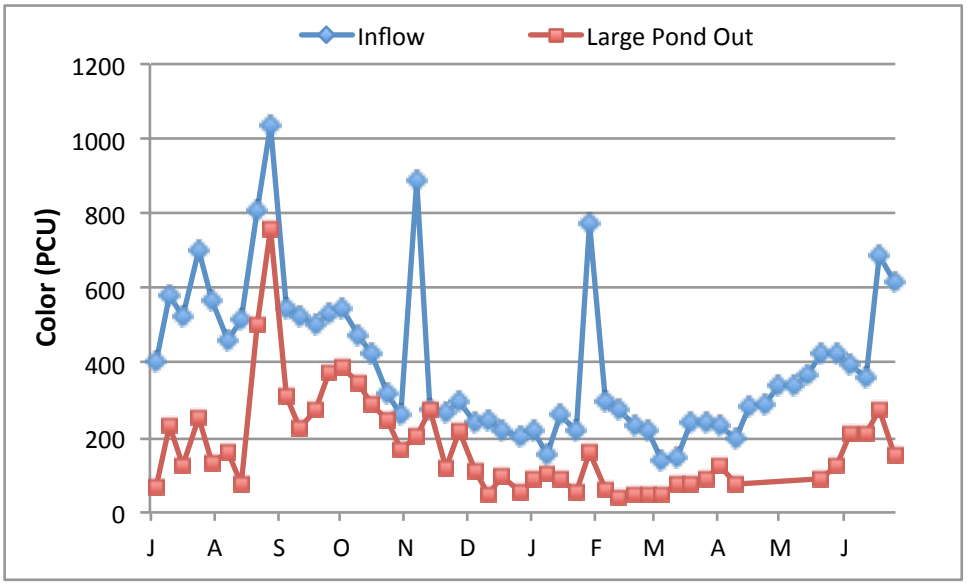


Figure 29. Color in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

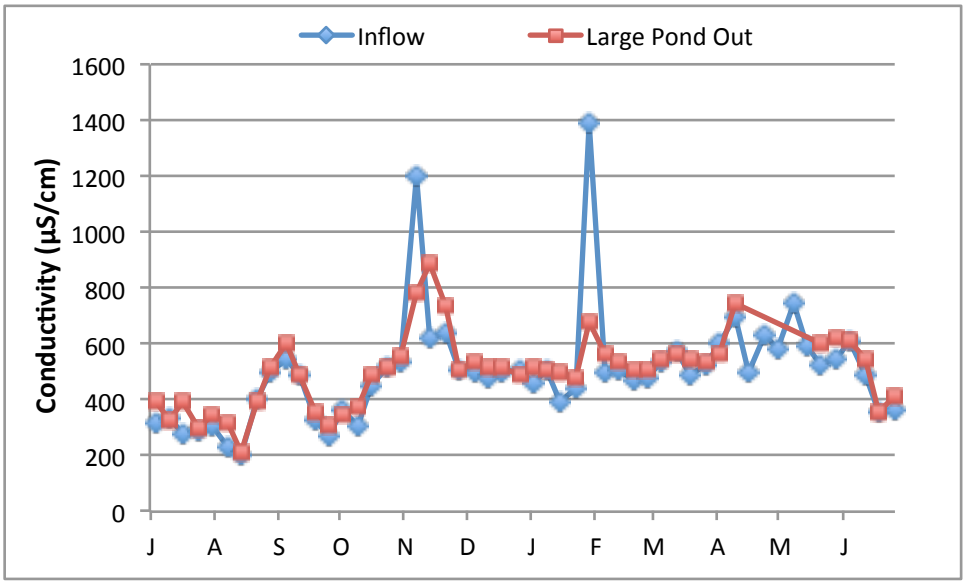


Figure 30. Conductivity in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

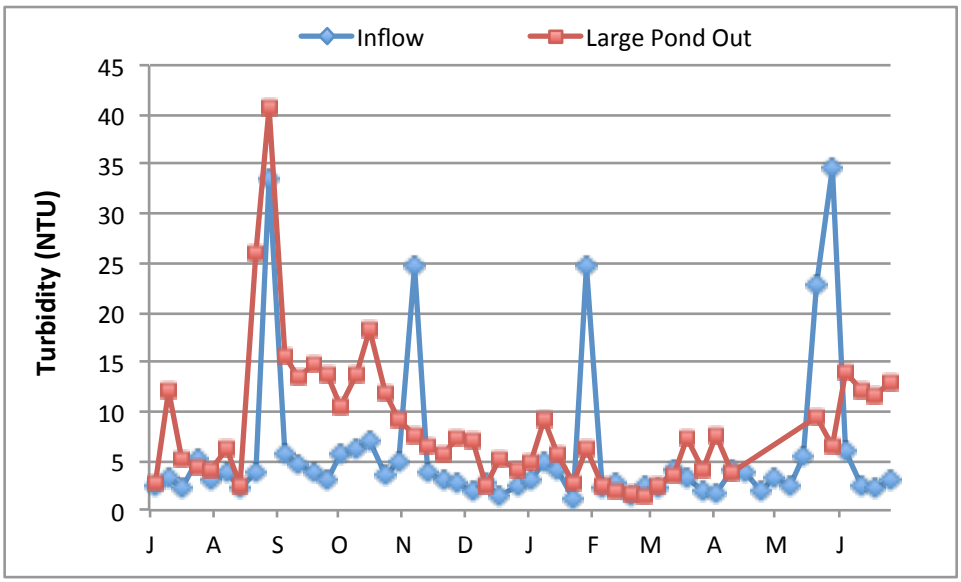


Figure 31. Turbidity in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

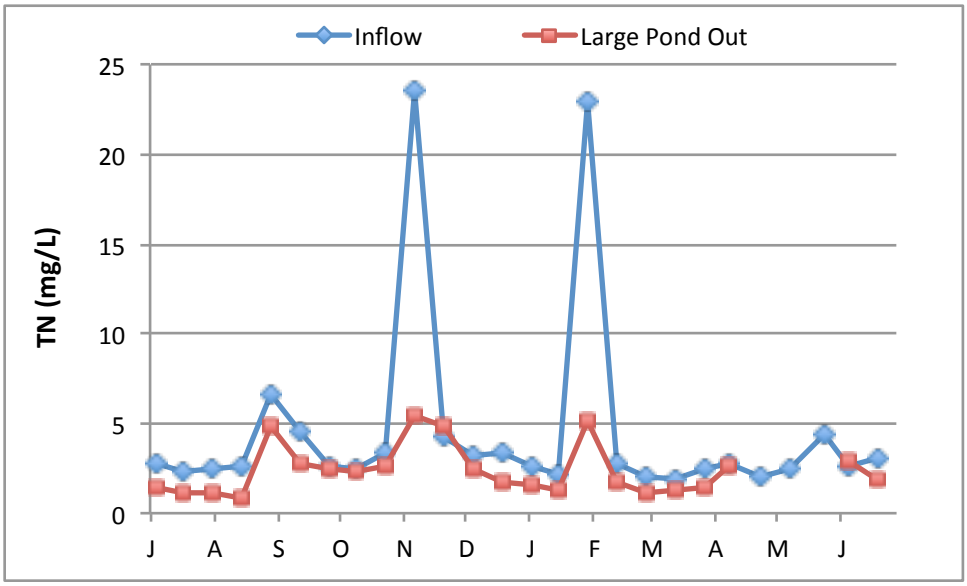


Figure 32. TN concentration in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

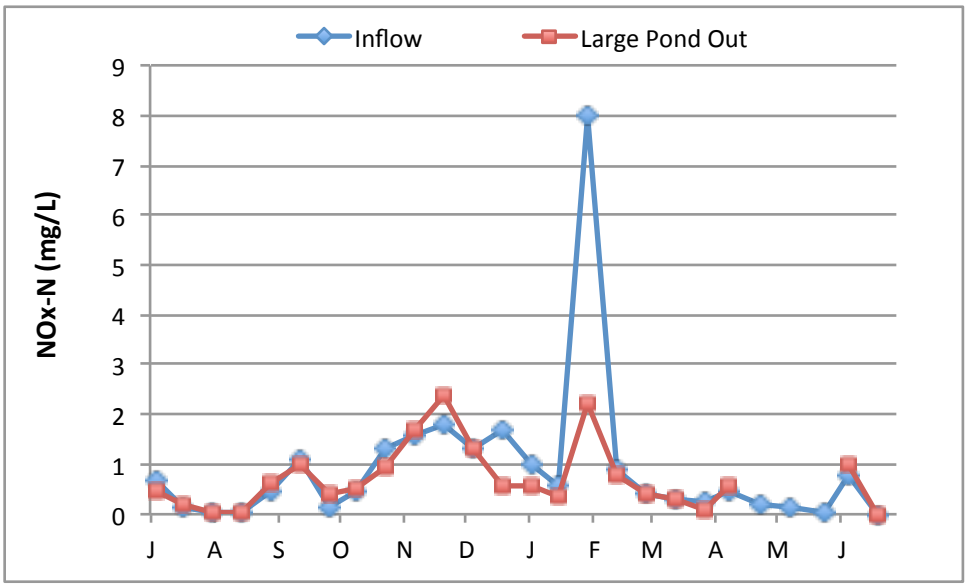


Figure 33. NO_x-N concentration in the inflow and large pond outflow streams at the Mosquito Creek Tributary Treatment HWTT system during the July 2013 – June 2014 monitoring period.

Monthly flow volume treated in the Mosquito Creek HWTT system was relatively variable, and largely dependent on the source water flow. Monthly volumes ranged from 0.49 Mgal

in May 2014 (which included extended system down-time, as discussed earlier) to 55.5 Mgal in August 2013 (Figure 34). Mean monthly flow volume was 27.6 Mgal, while total flow treated during the period from July 2013 through June 2014 was 331.2 Mgal.

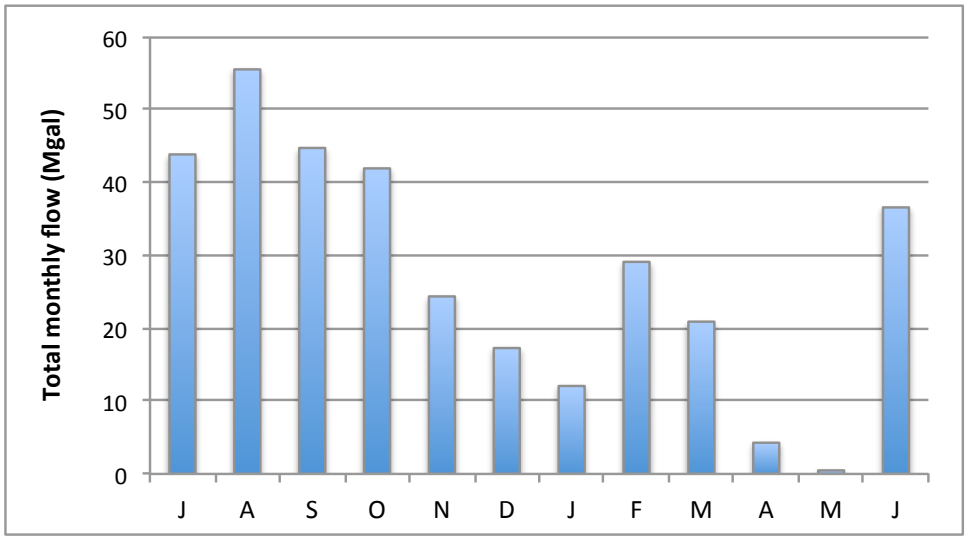


Figure 34. Total monthly flow treated by the Mosquito Creek Tributary Treatment HWTT system during the period July 2013 – June 2014.

Sites 5 and 6: Lemkin Creek and Wolff Ditch HWTT Facilities

During 2009, Watershed Technologies, LLC constructed and began operating two HWTT systems ("Lemkin and Wolff") on a District-owned parcel in Okeechobee County, Florida. The project parcel was operated as a shell rock pit for many years before being purchased by the District, and it consisted mainly of two ponds. The Site 5 HWTT facility treats water from the Lemkin Creek, and the Site 6 HWTT facility treats water from Wolff Ditch. The two HWTT systems each consist of an amendment dosing system, a deep settling region with active and passive floc recycle, and a back-end SAV/LR system. The Wolff HWTT system is the larger of the two facilities, with a 4.0 acre floc contact/settling pond and 1.0 acre SAV pond, and is designed to treat maximum flows of up to 20 cfs. The Lemkin system is comprised of a 2.0 acre contact/settling pond and a 0.4 acre SAV pond, with a 5 cfs

maximum treatment capacity. Treated water from the SAV ponds is discharged through culverts to the 27-acre South Pond. Overflow from the South Pond discharges to the restored Isolated Wetland to the south. Effluent from the Isolated Wetland discharges to Lemkin Creek over the existing concrete weir. The general layout for the facilities is shown in Figure 35.

The 65-acre 'isolated wetland' located downstream of the Lemkin/Wolff HWTT system's 27-acre south pond is the receiving water body of the Lemkin/Wolff HWTT system. The isolated wetland is a separate wetland restoration project (permit #EE-47-0254574-001). It is not managed for treatment under the HWTT permit nor is it managed by the HWTT operator. However, sampling results from upstream (required by the Lemkin HWTT permit) and downstream (as requested by SFWMD) monitoring sites show the isolated wetland provides additional treatment of the Lemkin/Wolff system effluent.

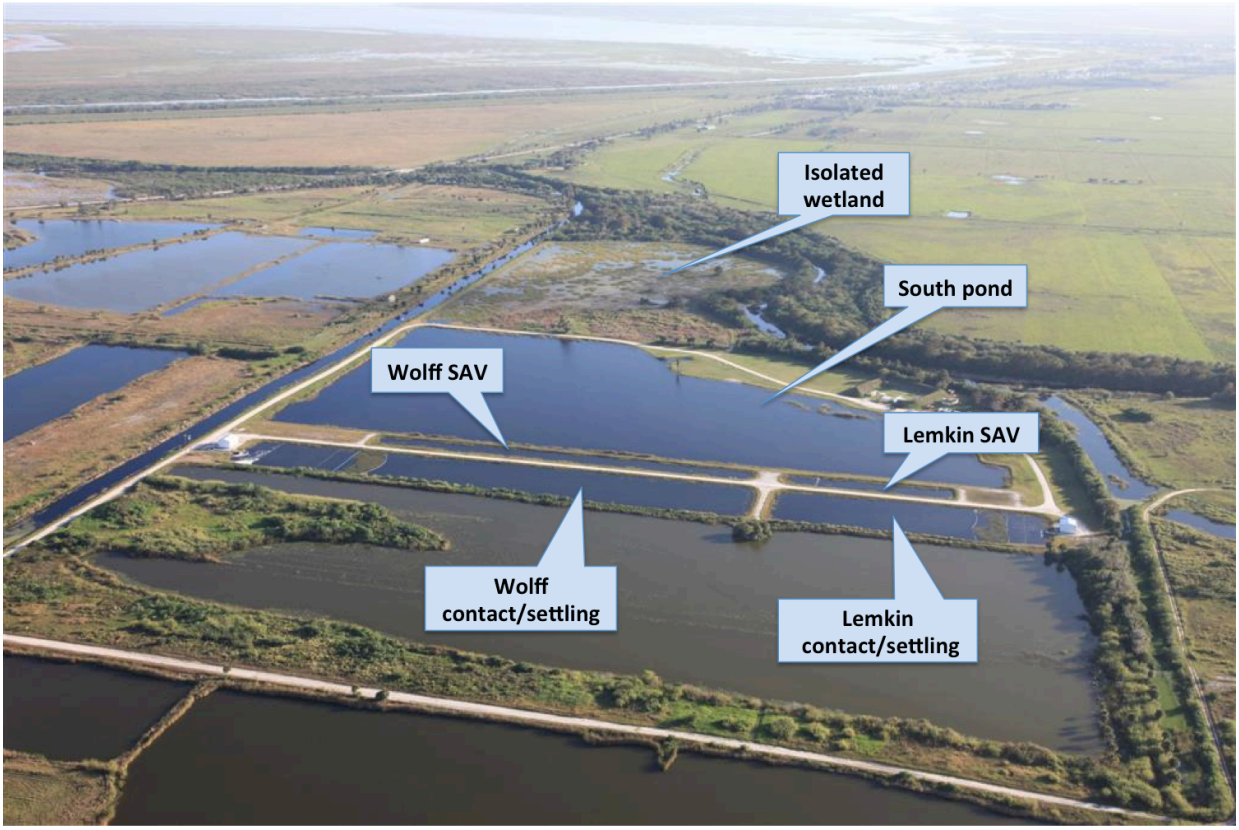


Figure 35. Aerial photo of the Lemkin (FDOT) and Wolff HWTT facilities.

The Lemkin system received alum dosing on an intermittent basis, at a nominal rate of 13.5 mg Al/L, with the alum injection cycle set to 25% of operational time. The resulting effective alum dose during the monitoring period was 3.4 mg Al/L. The Wolff system received intermittent alum dosing ranging from ca. 16 to 24 mg Al/L, at a frequency of 25%, for an overall mean effective dosing rate of 4.6 mg Al/L. Daily system flow status is provided in the Chapter II appendices.

Water chemistry monitoring at the Lemkin and Wolff facilities was conducted on a weekly basis for the duration of the reporting period. Grab samples for routine monitoring were collected at the system inflows (Lemkin and Wolff ditch intakes) and SAV pond outflows. In addition, routine monitoring was conducted downstream at the outflows of the South Pond and Isolated Wetland. Samples were analyzed for total phosphorus (TP), soluble reactive P (SRP), dissolved organic P (DOP=TSP-SRP, where TSP is total soluble P), particulate P (PP=TP-TSP), alkalinity (biweekly), pH, color (biweekly), conductivity, turbidity (biweekly), nitrate + nitrite N (NO_x-N) and TKN. Total N (TN) was calculated as the sum of NO_x-N and TKN. Total aluminum (Al) (biweekly), and selected other constituents, also were monitored for permit compliance purposes. Routine water chemistry data for the July 2013 – June 2014 monitoring period are presented in the following sections. Additional data, related to compliance monitoring, are presented later in this report.

Routine Monitoring Site 5 (Lemkin HWTT Facility)

Inflow TP concentrations in the Lemkin system were higher and more variable during the wet season months than during the balance of the monitoring period (Figure 36). Most notable was an unusually high spike of inflow TP (including SRP and DOP forms) that occurred during mid June, and was likely associated with antecedent rain events totaling ca. 7 inches. During July – October 2013, inflow TP concentrations averaged 145 µg/L, while during the subsequent period (dry season), prior to the TP spike in mid-June 2014, inflow TP averaged only 42 µg/L. The overall mean inflow TP concentration during the monitoring period was 97 µg/L, while the range was 25 to 612 µg/L. Outflow TP

concentrations exhibited a temporal trend similar to that of inflow TP. During July – October, outflow TP averaged 37 µg/L, while from November through early June outflow TP averaged 20 µg/L. The overall range for outflow TP was 14 - 99 µg/L, while the mean and median values were 29 and 21 µg/L, respectively.

Inflow SRP trends corresponded closely to inflow TP concentrations, with the highest values measured during the first half of the monitoring period and again in mid to late June (Figure 37). Values spanned a wide range, from ≤2 (MDL) to 532 µg/L, while the overall mean value was 57 µg/L. Outflow SRP concentrations were less than 10 µg/L during all but two sampling events, and averaged 2 µg/L over the entire monitoring period. The overall range for outflow SRP was ≤2 – 18 µg/L. Inflow DOP concentration generally followed the temporal trend observed for TP and SRP, but with greater short-term variability (Figure 38). Inflow DOP ranged from 6 to 57 µg/L and averaged 16 µg/L. Outflow concentrations of DOP were substantially lower than inflow concentrations during the July – October period, and moderately lower than inflow DOP during most of the remainder of the monitoring period. The overall mean concentration of DOP at the outflow was 7 µg/L, while the range was 4 to 13 µg/L. Particulate P concentration in the inflow stream exhibited considerable short-term variability, especially during the July – October period (wet season) (Figure 39). Inflow PP concentrations averaged 24 µg/L and ranged from 12 to 68 µg/L. Outflow PP concentrations were comparable to inflow PP during July – October, then decreased relative to inflow concentrations during the dry season months before increasing dramatically during the wet season "flush" at the end of June. Based on field observations, outflow PP levels were likely enhanced by algal biomass entering the treatment system via the inflow stream. Outflow PP concentrations averaged 19 µg/L and ranged from 7 to 68 µg/L during the monitoring period.

Alkalinity levels in the Lemkin HWTT inflow stream were somewhat greater and more variable during the first half of the monitoring period (Figure 40). However, alkalinity in both the inflow and outflow streams increased at the end of June 2014, following a gradual decrease during the dry season. Outflow alkalinity levels were slightly lower than inflow alkalinity during the majority of the monitoring period. Inflow alkalinity averaged 179

mg/L and ranged from 130 to 230 mg/L, while outflow alkalinity averaged 163 mg/L and ranged from 116 to 210 mg/L. Inflow and outflow pH were relatively constant over time, varying within one pH unit during the monitoring period (Figure 41). Outflow pH was slightly higher throughout most of the period. Mean inflow pH was 7.5, with a range of 7.0 to 7.9, while the mean outflow pH was 7.7 with a range of 7.3 to 8.0. Inflow color fluctuated between ca. 100 and 250 PCU during July-October, then decreased slightly for the remainder of the monitoring period (Figure 42). Inflow color levels averaged 134 PCU and ranged from 78 to 245 PCU. Outflow color followed a similar trend, at levels generally lower than inflow color, averaging 97 PCU and ranging from 68 to 199 PCU. Inflow and outflow conductivity levels were nearly identical throughout the period, exhibiting a gradual overall increase through May 2014, followed by a sharp decrease in June in response to greatly increased rainfall (Figure 43). Inflow conductivity averaged 884 µS/cm and ranged from 658 to 1037 µS/cm, while outflow conductivity averaged 882 µS/cm and ranged from 696 to 1062 µS/cm. Turbidity levels were highly variable in both the inflow and outflow streams, and similar in magnitude during a large portion of the monitoring period (Figure 44). Elevated outflow turbidity levels were attributed in large part to algal blooms originating in the system inflow stream. Inflow turbidity ranged from 0.9 to 5.8 NTU and averaged 2.3 NTU, while outflow turbidity ranged from 1.4 to 4.9 NTU and averaged 2.0 NTU.

Inflow TN concentrations were typically low in comparison to inflow TN at other HWTT sites (Figure 45). Mean inflow TN concentration was 1.59 mg/L, while concentrations ranged from 1.21 to 2.11 mg/L. TN levels were slightly lower at the outflow than in the inflow stream, during the majority of the monitoring period. Outflow TN concentration averaged 1.30 mg/L and ranged from 1.01 to 1.81 mg/L. NO_x concentrations were relatively low in both inflow and outflow streams, with outflow NO_x concentrations being slightly higher during much of the period (Figure 46). Inflow NO_x concentration averaged 0.012 mg N/L and ranged from ≤0.016 to 0.036 mg N/L, and outflow concentrations averaged 0.025 mg N/L with a range of ≤0.016 to 0.094 mg N/L. Despite the net export of NO_x from the Lemkin system, NO_x accounted for only a small fraction of TN in the Lemkin

HWTT inflow and outflow streams, and a net decrease in TN of ca. 20% was achieved during this period.

Total Al concentration in the Lemkin inflow stream was less than 200 µg/L during all but two sampling events, during which levels as high as 1170 µg/L were measured (Figure 47). The occurrence of "random" Al spikes in the Lemkin inflow stream has been documented in previous reports, although the origin of these events is unknown. Inflow TAl ranged from 3 to 1170 µg/L during the recent monitoring period, and averaged 85 µg/L. Outflow TAl concentrations were relatively constant, and somewhat higher than inflow TAl, with values ranging from 326 to 801 µg/L and averaging 479 µg/L.

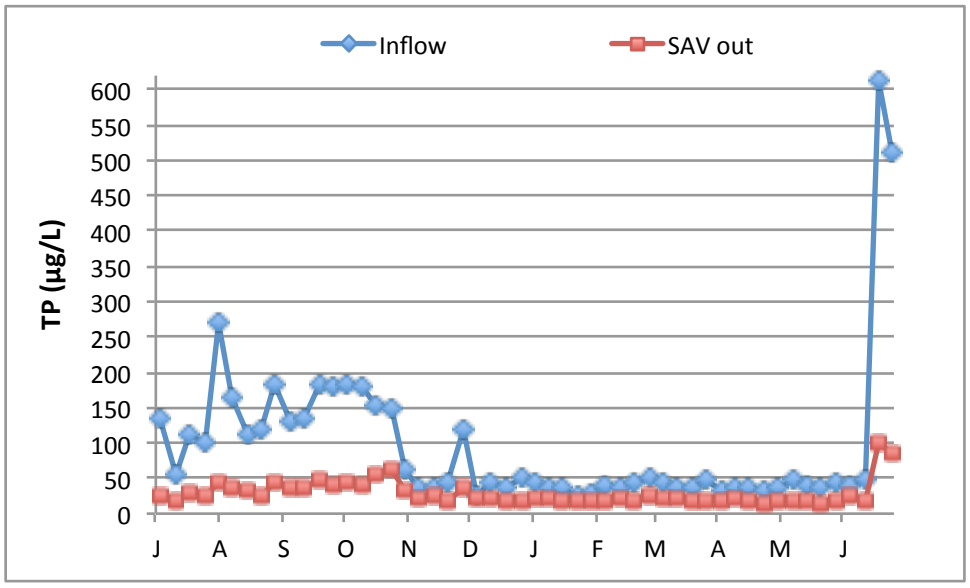


Figure 36. TP concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

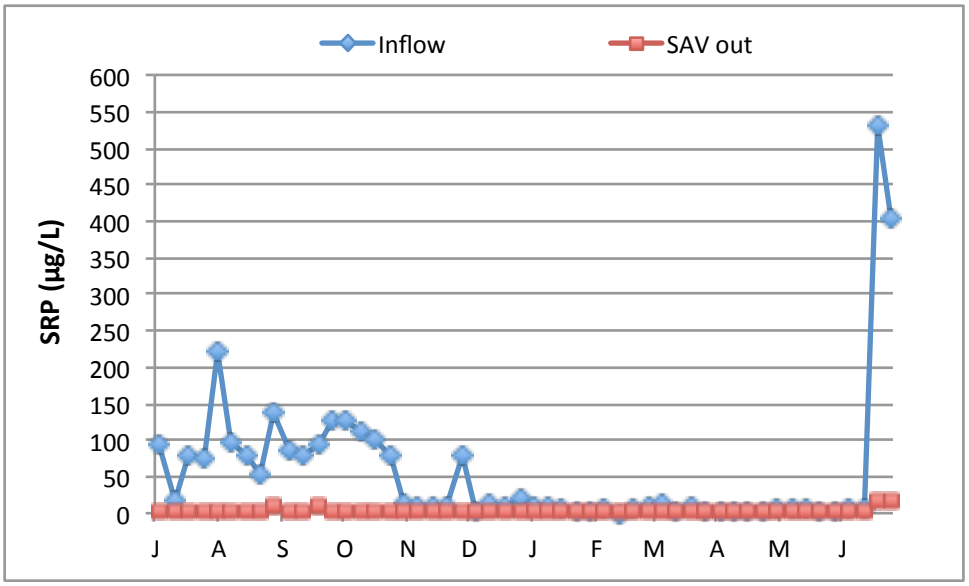


Figure 37. SRP concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

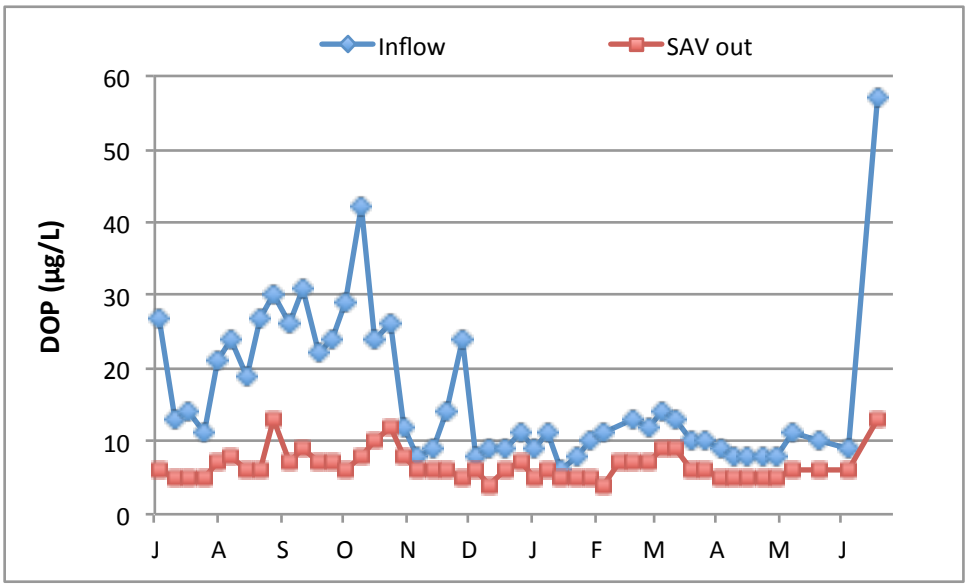


Figure 38. DOP concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

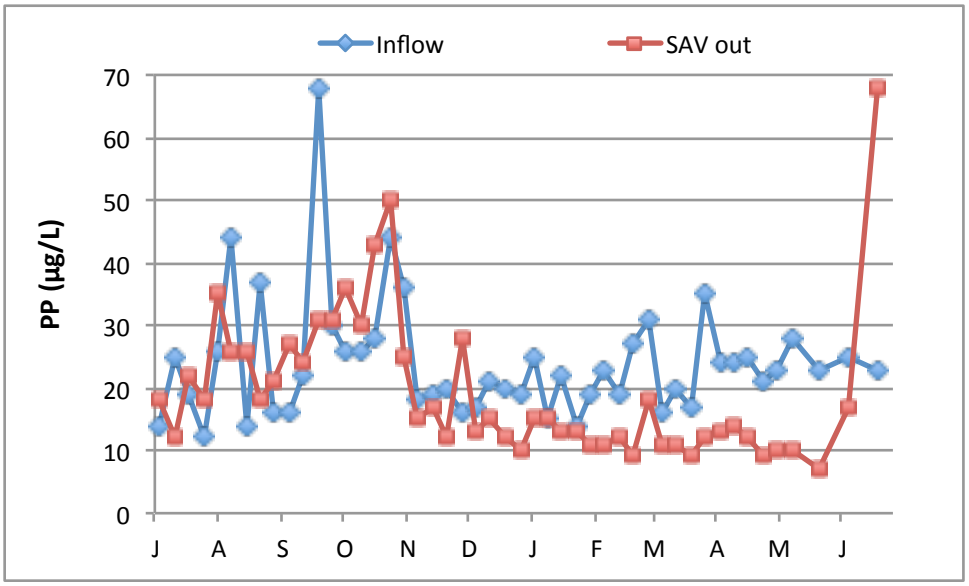


Figure 39. PP concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

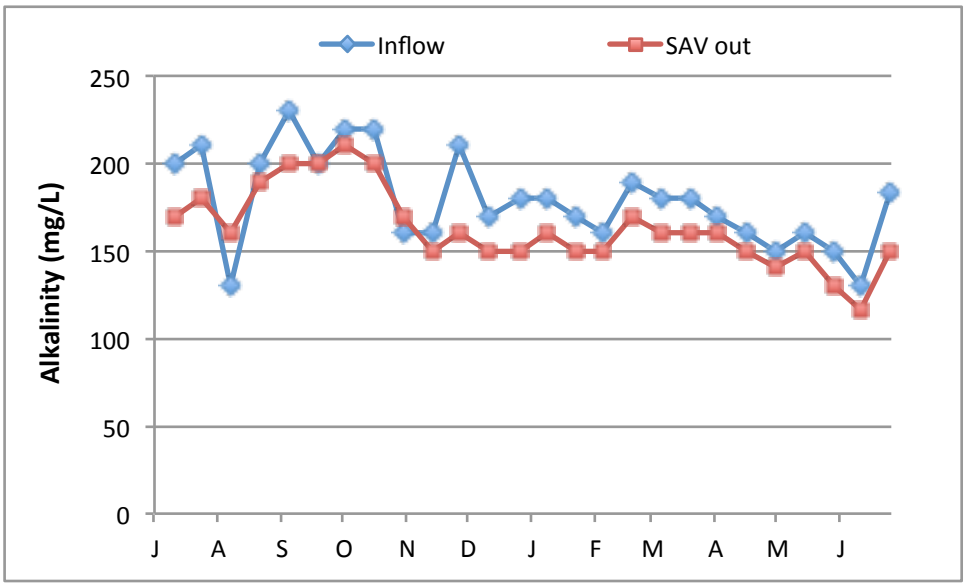


Figure 40. Alkalinity in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

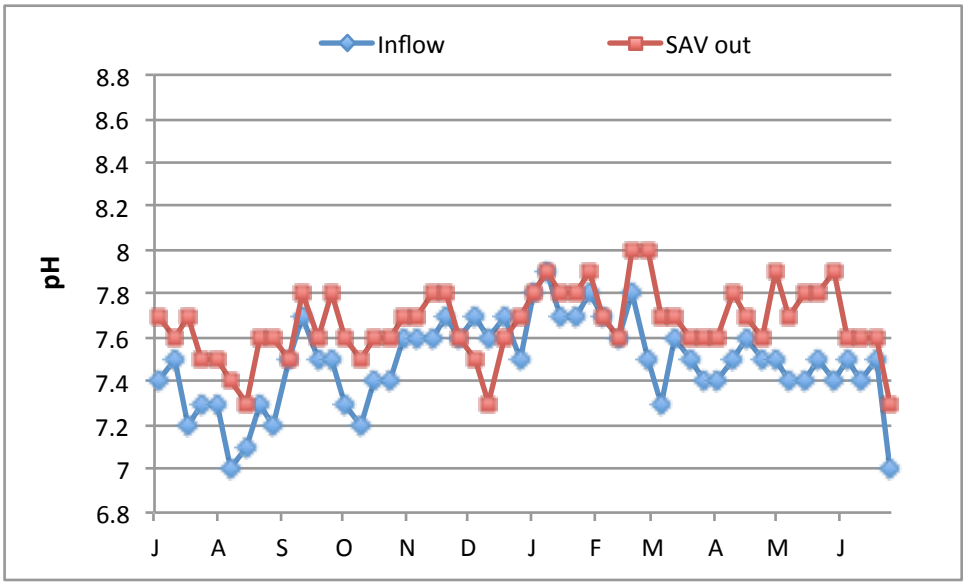


Figure 41. pH in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

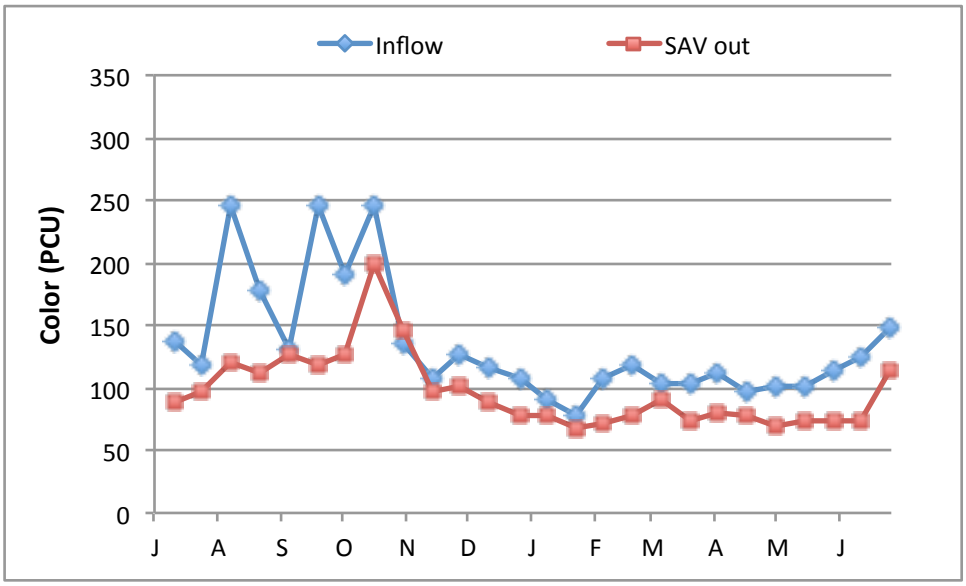


Figure 42. Color in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

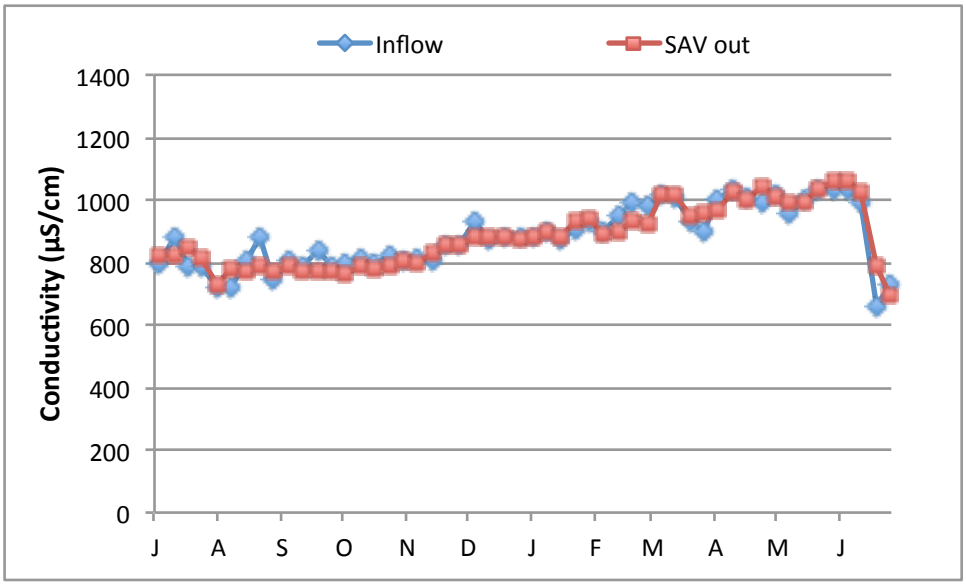


Figure 43. Conductivity in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

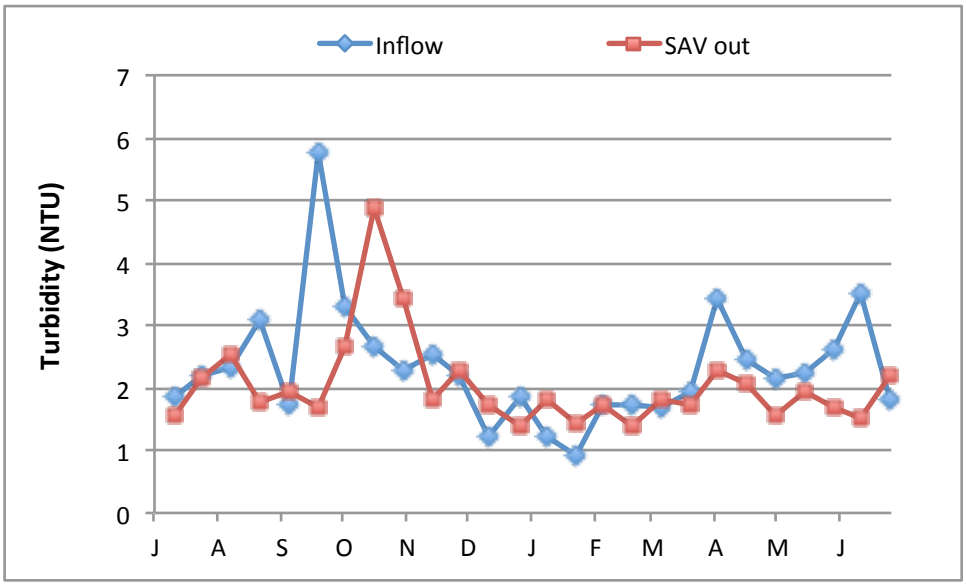


Figure 44. Turbidity in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

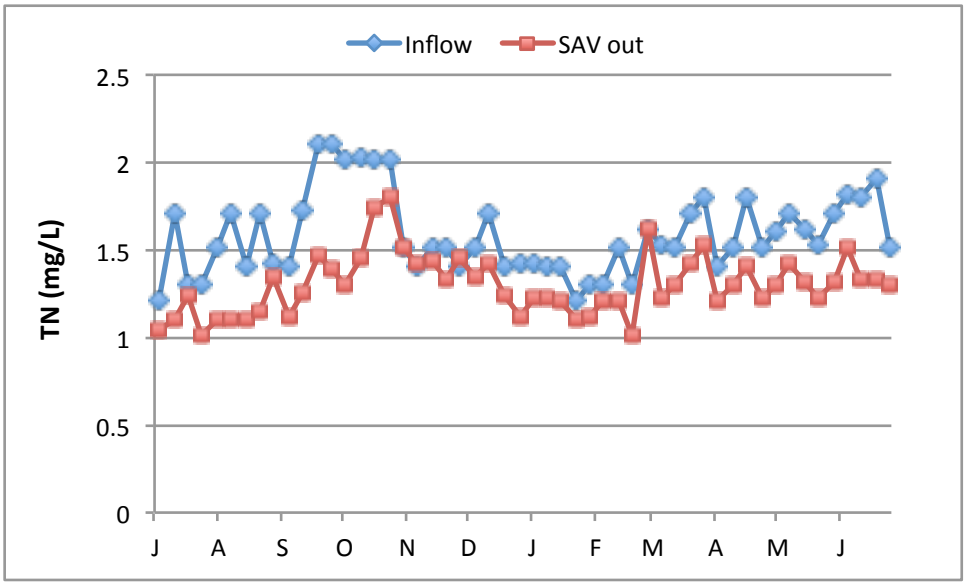


Figure 45. TN concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

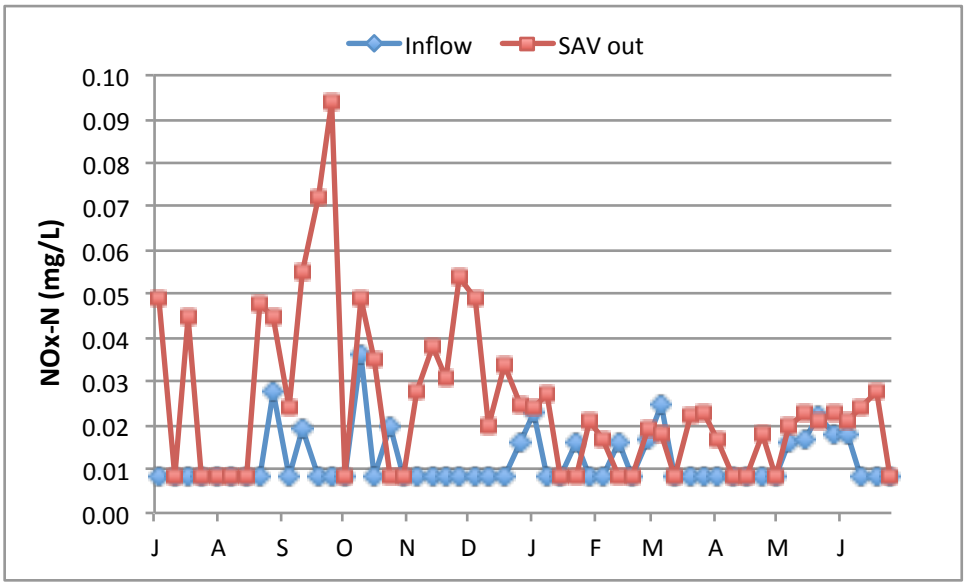


Figure 46. NO_x-N concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

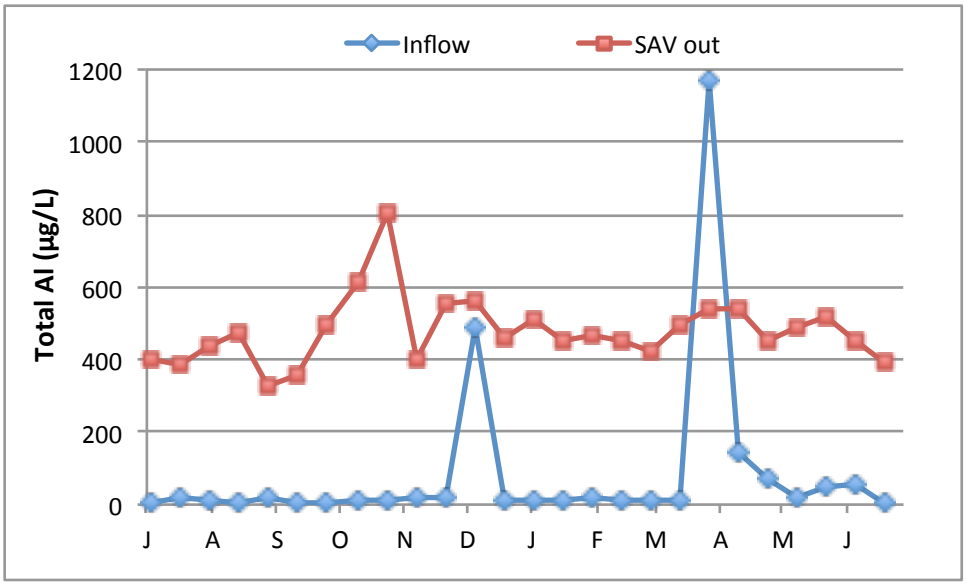


Figure 47. Total Al concentration in the inflow stream (FDOT Ditch) and SAV outflow stream of the Site 5 HWTT system during the July 2013 – June 2014 monitoring period.

Monthly flow volume treated in the Lemkin HWTT system was relatively consistent throughout the monitoring period (Figure 48). Treated volume ranged from 21.8 Mgal in February 2014 to 45.5 Mgal in April 2014. Mean monthly flow volume was 34.6 Mgal, while total flow treated during the period July 2013 – June 2014 was 415.5 Mgal.

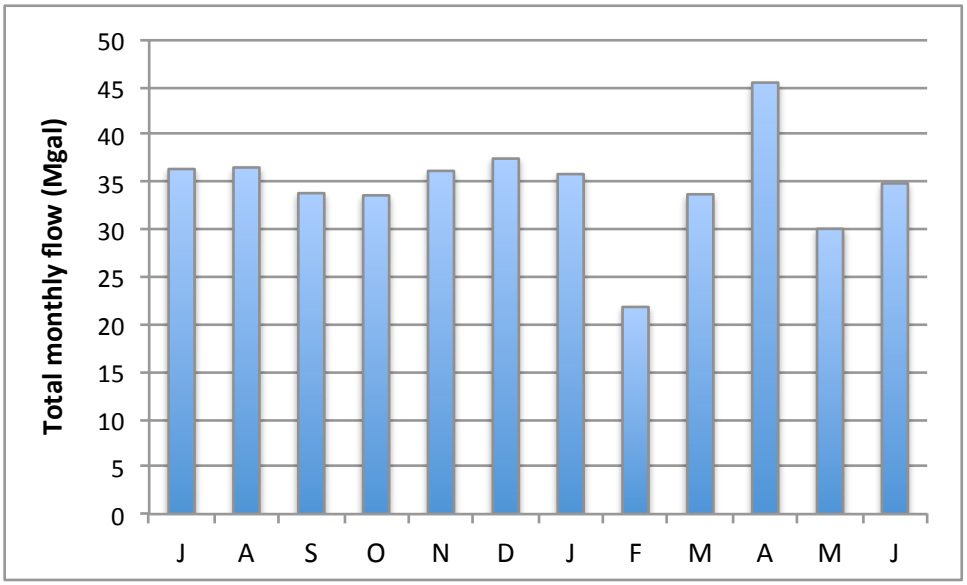


Figure 48. Total monthly flow treated by the Lemkin Creek (Site 5) HWTT system during the period July 2013 – June 2014.

Routine Monitoring Site 6 (Wolff HWTT Facility)

As observed for the Lemkin treatment system, Wolff HWTT inflow TP concentrations were highly variable during the initial portion (wet season) of the monitoring period, while the latter portion of the period was characterized by lower and somewhat less variable TP, prior to the early wet season (June 2014) TP spike (Figure 49). Inflow TP concentrations ranged from 50 to 368 µg/L and averaged 133 µg/L during the course of the monitoring period. Outflow TP concentrations were relatively consistent throughout the period, ranging from 15 to 37 µg/L, with an overall mean of 23 µg/L. Inflow SRP concentrations varied in similar fashion to inflow TP, with the highest level of variability observed during the first half of the monitoring period (Figure 50). Values ranged widely, from ≤2 to 254 µg/L, while the overall mean value was 72 µg/L. Inflow SRP levels were substantially lower toward the end of the dry season (through early June 2014), before spiking to a concentration of 235 µg/L. Outflow SRP concentrations were consistently very low, typically below detection (≤2 µg/L), and ranging upward to a maximum concentration of 9 µg/L. The overall mean concentration of SRP in the Wolff outflow was ≤2 µg/L.

Inflow DOP concentration followed the general temporal pattern described by inflow TP and SRP (Figure 51). Values ranged from 12 to 47 µg/L and averaged 26 µg/L for inflow DOP. Outflow DOP concentration exhibited substantially lower variability than inflow DOP. The overall mean concentration of DOP at the outflow was 7 µg/L, while the range was 2 to 12 µg/L. Particulate P concentration varied considerably in the inflow stream, while displaying a general seasonal trend of depressed PP during dry season months (Figure 52). Based on field observations, PP levels were likely enhanced by algal biomass entering the treatment system via the inflow stream. Although outflow PP concentrations were occasionally comparable to inflow PP (e.g., late October – December), outflow PP was generally much lower. Inflow PP concentrations averaged 33 µg/L and ranged from 10 to 64 µg/L, while outflow PP concentrations averaged 16 µg/L and ranged from 9 to 24 µg/L.

Alkalinity levels in both the Wolff HWTT inflow and outflow streams exhibited a moderate seasonal trend, with highest levels occurring during the dry season (Figure 53). In addition, the alkalinity decrease between inflow and outflow was relatively consistent throughout the period. Inflow alkalinity averaged 199 mg/L and ranged from 152 to 240 mg/L, while outflow alkalinity was slightly lower, averaging 168 mg/L and ranging from 120 to 210 mg/L. Inflow pH exhibited moderate seasonal variability, trending upward during the dry season before decreasing rapidly in June (Figure 54). Outflow pH showed a similar degree of variability, with no apparent seasonal trend. Mean inflow pH was 7.6, with a range of 7.0 to 8.6, while the mean outflow pH was 7.8 with a range of 7.4 to 8.1. Maximum color levels occurred during wet season months (July – October 2013; June 2014), in conjunction with peak TP concentrations (Figure 55). Substantial reduction of color in the Wolff system was observed for all sampling events. Inflow color averaged 187 PCU and ranged from 124 to 297 PCU, while outflow color averaged 108 PCU and ranged from 77 to 157 PCU. Conductivity levels were similar in the inflow and outflow streams throughout the monitoring period, and exhibited an increasing trend during the dry season before decreasing in June (Figure 56). Inflow conductivity averaged 920 µS/cm and ranged from 548 to 1127 µS/cm, while outflow conductivity averaged 926 µS/cm and ranged from 710 to 1114 µS/cm. Turbidity levels in the inflow and outflow streams tended to be lower during the middle of the dry season, with a high level of short term variability observed for

inflow turbidity (Figure 57). Inflow turbidity ranged from 1.2 to 6.9 NTU and averaged 2.8 NTU, while outflow turbidity ranged from 1.5 to 2.9 NTU and averaged 2.2 NTU.

Inflow TN concentration was relatively constant during the monitoring period, although slightly lower levels were observed during July (Figure 58). Mean inflow TN concentration was 1.66 mg/L, while concentrations ranged from 1.16 to 2.01 mg/L. Despite low inflow TN concentrations, a net reduction in TN was achieved by the Wolff system. Outflow TN concentration averaged 1.31 mg/L and ranged from 1.01 to 1.71 mg/L. NO_x concentrations were quite low in both inflow and outflow streams throughout the period, ranging from ≤0.016 to 0.034 mg N/L and ≤0.016 to 0.029 mg N/L, respectively (Figure 59). NO_x concentrations in both the inflow and outflow streams averaged 0.011 mg N/L, indicating no net removal of NO_x. However, NO_x was a very minor component of TN in the Wolff system, accounting for less than one percent of TN in the inflow and outflow streams.

Concentration of total Al in the Wolff HWTT inflow stream was relatively consistent, ranging from 3 to 38 µg/L and averaged 14 µg/L (Figure 60). Outflow TAl concentration was in the 200 – 400 µg/L range during the majority of the monitoring period, with substantially lower concentrations measured during single sampling events in December and May. Mean outflow TAl concentration was 290 µg/L, while the overall range was 13 to 417 µg/L.

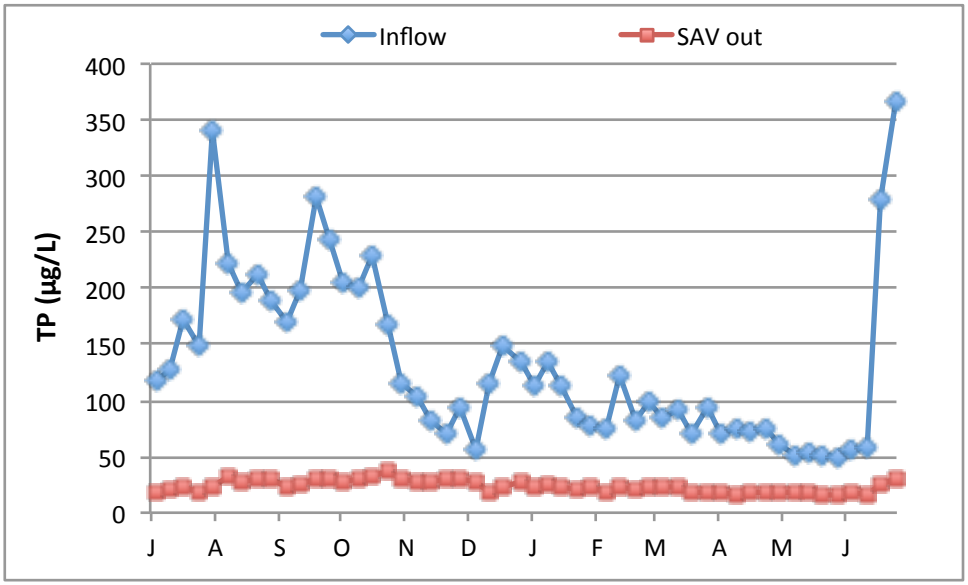


Figure 49. TP concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

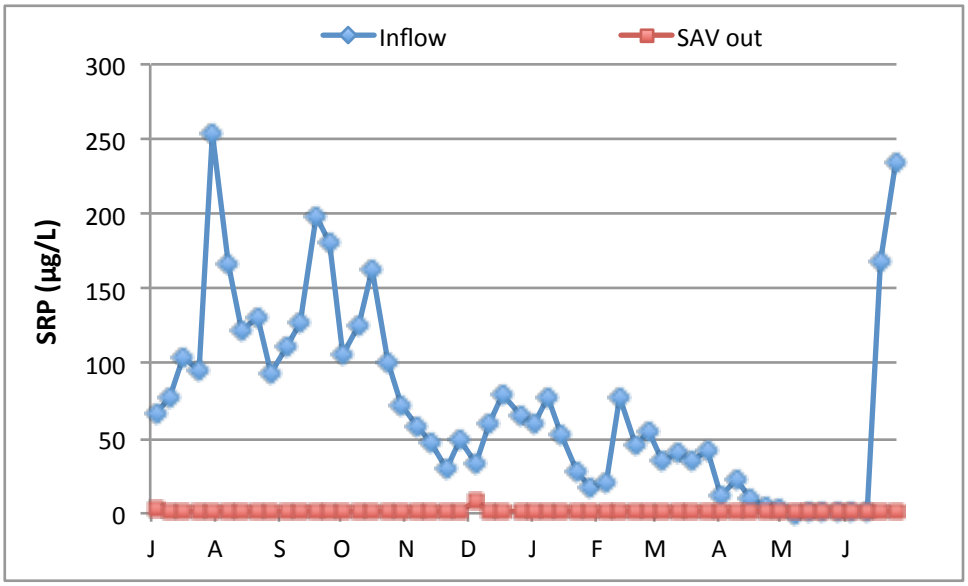


Figure 50. SRP concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

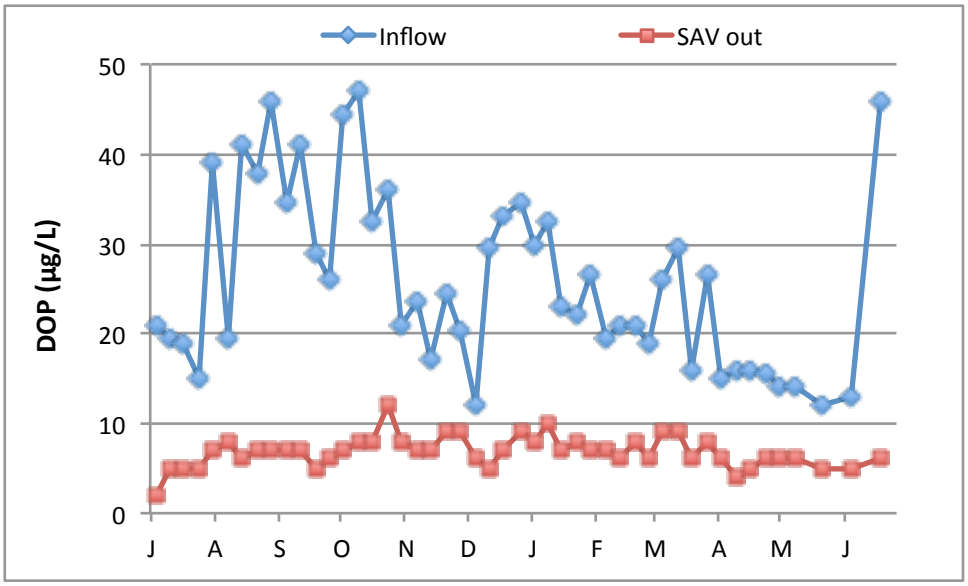


Figure 51. DOP concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

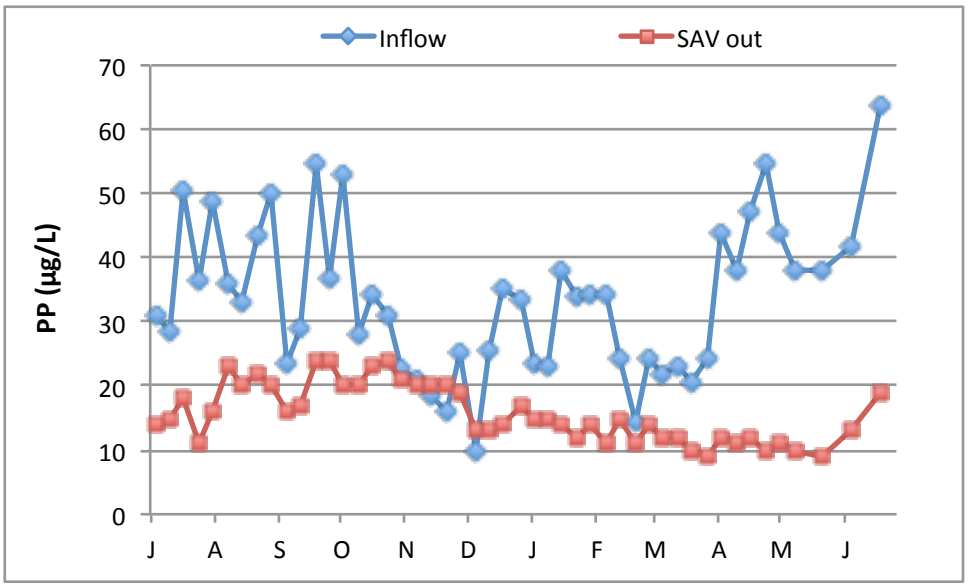


Figure 52. PP concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

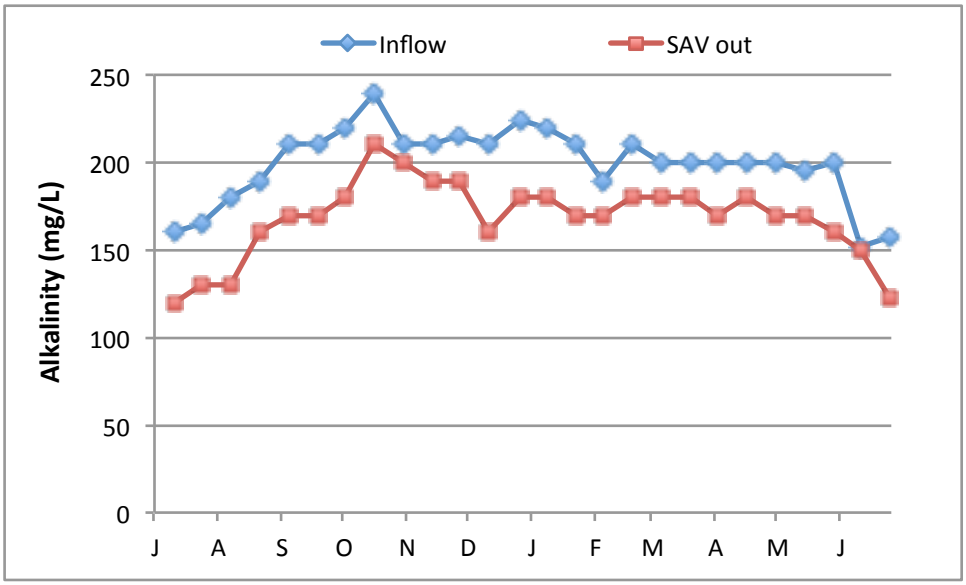


Figure 53. Alkalinity in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

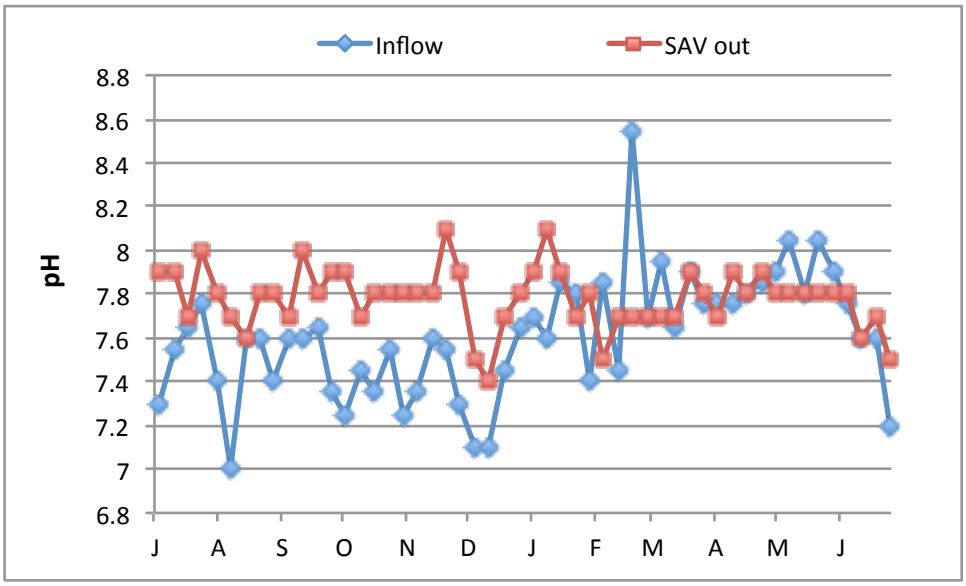


Figure 54. pH in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

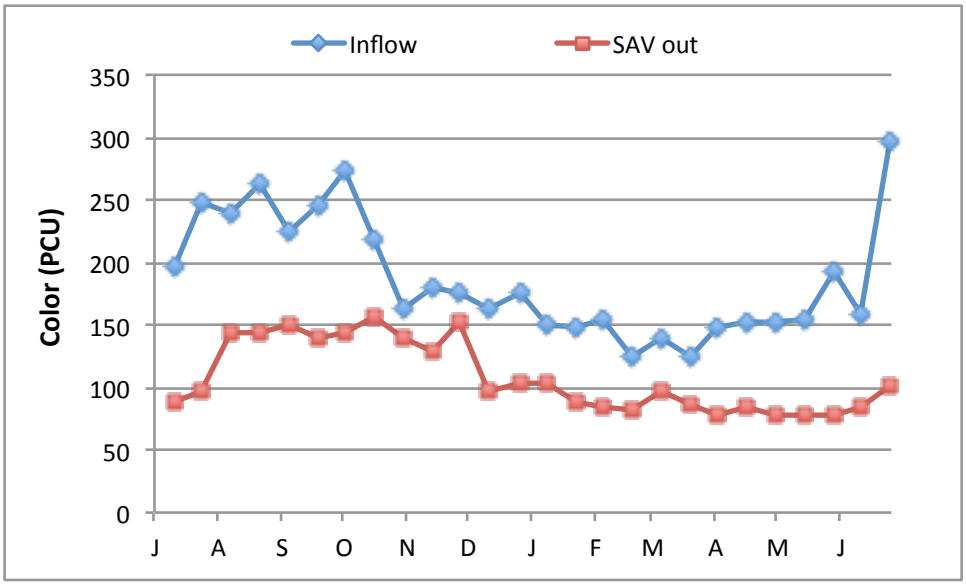


Figure 55. Color in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

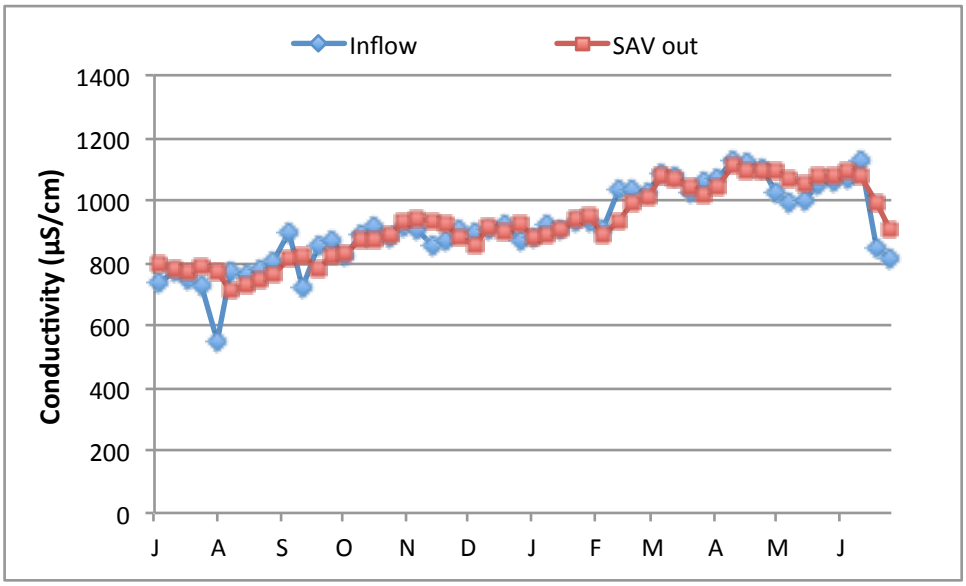


Figure 56. Conductivity in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

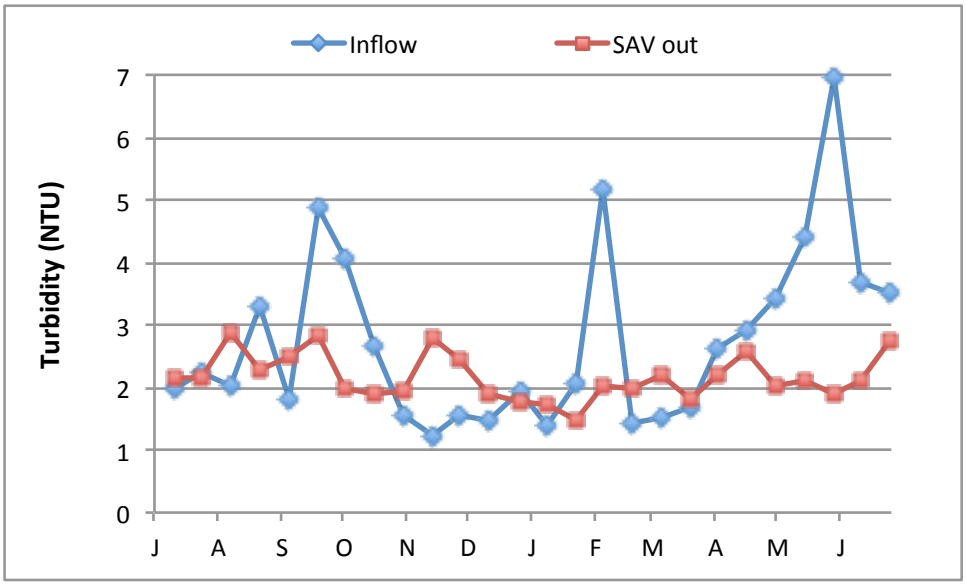


Figure 57. Turbidity in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

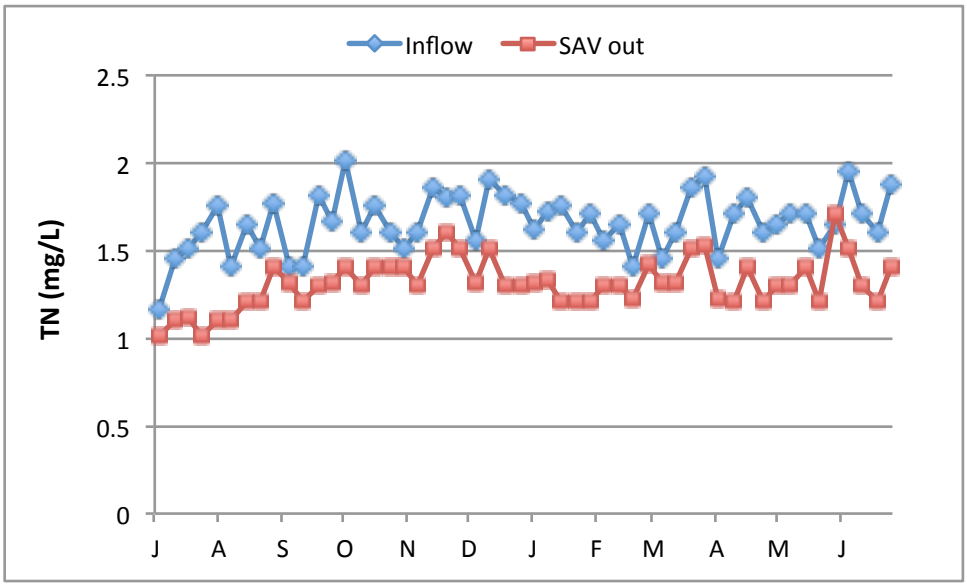


Figure 58. TN concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

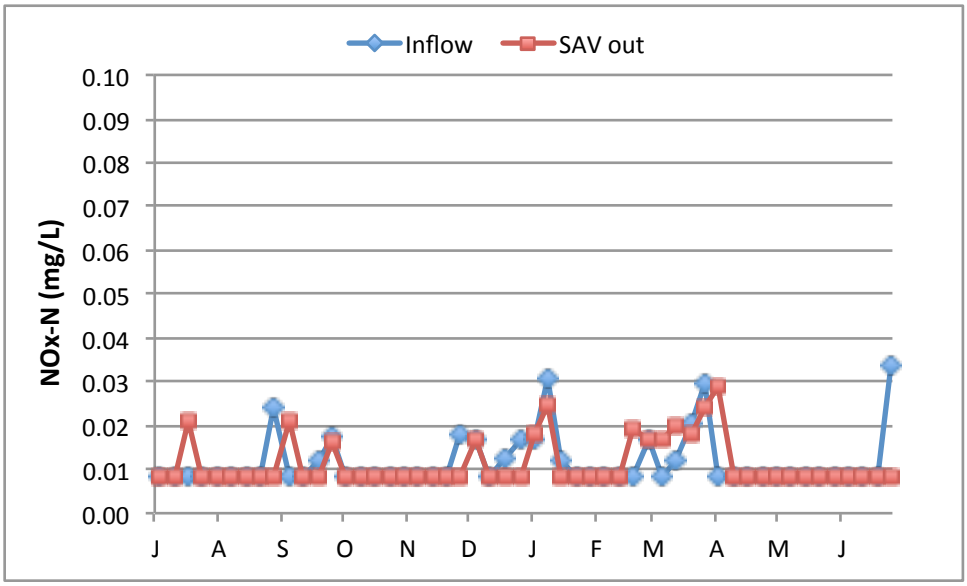


Figure 59. NO_x-N concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

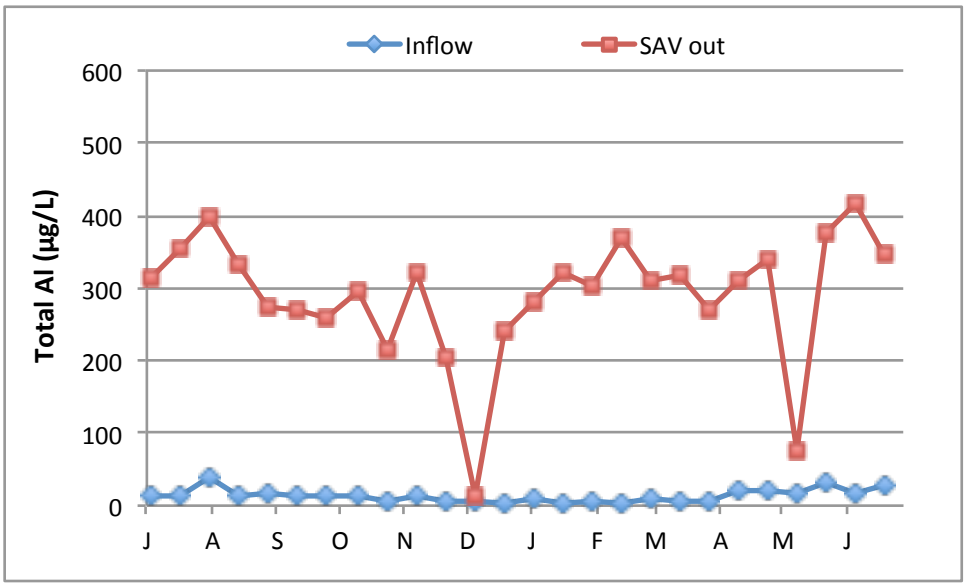


Figure 60. Total Al concentration in the inflow stream (Wolff Ditch) and SAV outflow stream of the Site 6 HWTT system during the July 2013 – June 2014 monitoring period.

Monthly flow volume treated in the Wolff HWTT system was relatively constant for the majority of the reporting period, with higher flows occurring in June 2014 during a period of increased rainfall rates (Figure 61). Treated volume ranged from 27.4 Mgal in May 2014 to 48.1 Mgal in June 2014. Mean monthly flow volume was 33.3 Mgal, while total flow treated during the period July 2013 – June 2014 was 399.5 Mgal.

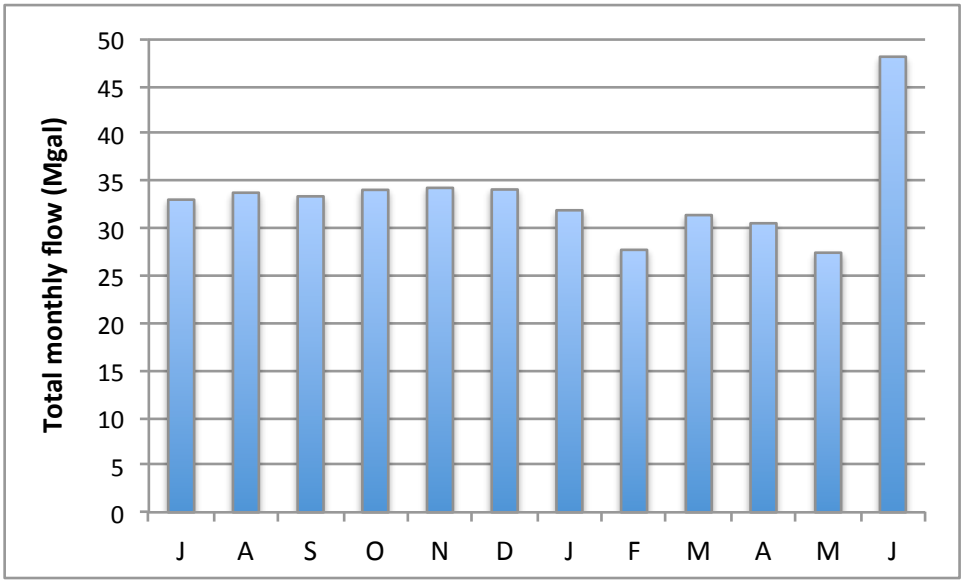


Figure 61. Total monthly flow treated by the Wolff Ditch (Site 6) HWTT system during the period July 2013 – June 2014.

Routine Monitoring at the South Pond and Isolated Wetland Outflows

TP concentrations did not exceed 20 µg/L at the south pond outflow, and rarely exceeded 15 µg/L at the wetland outflow, during the monitoring period (Figure 62). TP concentration at both sites was relatively stable, with no detectible seasonal trends. Overall mean TP concentrations were 17 µg/L for the south pond and 11 µg/L for the isolated wetland. Concentrations ranged from 13 to 20 µg/L in the south pond and from 8 to 16 µg/L in the wetland.

SRP concentrations in both the south pond and wetland were non-detectable (≤2 µg/L) for nearly all sampling events (overall means ≤2 µg/L), with maximum concentrations of 2 and 3 µg/L measured in the south pond and wetland, respectively (Figure 63). DOP

concentrations were similar in the south pond and wetland throughout the period, ranging from ≤2 to 7 and 2 to 6 µg/L, respectively (Figure 64). Mean DOP concentrations during the monitoring period were 4 µg/L for both south pond and wetland. The temporal pattern and magnitude of PP concentrations in the south pond and wetland were similar to those of TP, since PP was the predominant P fraction at these sites (Figure 65). Higher levels of PP in the south pond were attributed to algal blooms, based on field observations. PP concentrations averaged 12 µg/L and ranged from 8 to 16 µg/L in the south pond, while PP in the wetland averaged 6 µg/L and ranged from 3 to 10 µg/L.

Alkalinity levels exhibited a similar temporal pattern in the south pond and isolated wetland, with higher levels occurring primarily during the dry season months (Figure 66). Alkalinity was slightly lower in the wetland than in the south pond. Values ranged from 120 to 180 mg/L in the south pond, compared to a range of 96 to 170 mg/L in the isolated wetland. Mean alkalinity in the south pond was 158 mg/L, while the mean value for the wetland was 140 mg/L. pH was highly variable throughout the monitoring period, in both the south pond and wetland, with no apparent seasonal trends other than a sharp decrease during late May and early June (Figure 67). pH was consistently lower in the wetland, where values ranged from 6.9 to 8.3 and averaged 7.8. In comparison, pH in the south pond ranged from 7.8 to 8.8 and averaged 8.4. Color concentrations at both the south pond and isolated wetland outflows exhibited a slight seasonal trend of higher levels in the dry season (Figure 68). Color was consistently lower in the isolated wetland; mean color concentrations in the south pond and wetland were 107 and 69 PCU, respectively. Values ranged from 75 to 131 PCU in the south pond and 49 to 94 in the wetland. Conductivity levels tended to decrease during wet season months and increase during the dry season, in both the south pond and isolated wetland (Figure 69). Conductivity in the south pond ranged from 725 to 1100 µS/cm and averaged 881 µS/cm, while levels in the wetland ranged from 665 to 1067 µS/cm and averaged 858 µS/cm. Turbidity in the south pond was primarily associated with phytoplankton, and fluctuated widely throughout the monitoring period (Figure 70). South pond turbidity ranged from 1.9 to 5.1 NTU and averaged 3.6 NTU during the course of the monitoring period. Turbidity in the isolated wetland was

consistently lower than in the south pond, ranging from 0.7 to 3.6 NTU and averaging 1.1 NTU.

TN levels in the south pond and wetland were confined to a relatively narrow range of concentrations during the monitoring period, with concentrations being slightly lower overall in the wetland (Figure 71). TN concentrations in the south pond ranged from 1.01 to 1.81 mg/L and averaged 1.32 mg/L, compared to a range of 0.96 to 1.61 mg/L and mean of 1.26 mg/L for the isolated wetland. Concentrations of NO_x were quite low in both the south pond and wetland; levels were most often ≤0.016 (Figure 72). Maximum values of NO_x were 0.020 and 0.018 mg N/L in the south pond and wetland, while mean values were 0.009 mg N/L for both sites.

Total Al concentration at the south pond outflow ranged from 162 to 268 µg/L and averaged 209 µg/L during the monitoring period (Figure 73). Concentrations were consistently lower at the wetland outflow, averaging 110 µg/L and ranging from 80 to 155 µg/L.

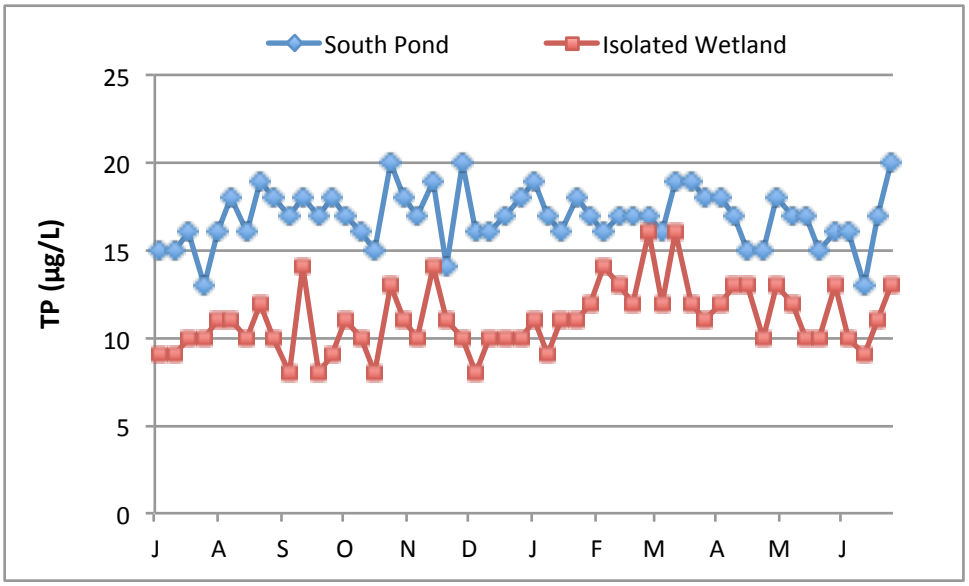


Figure 62. TP concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

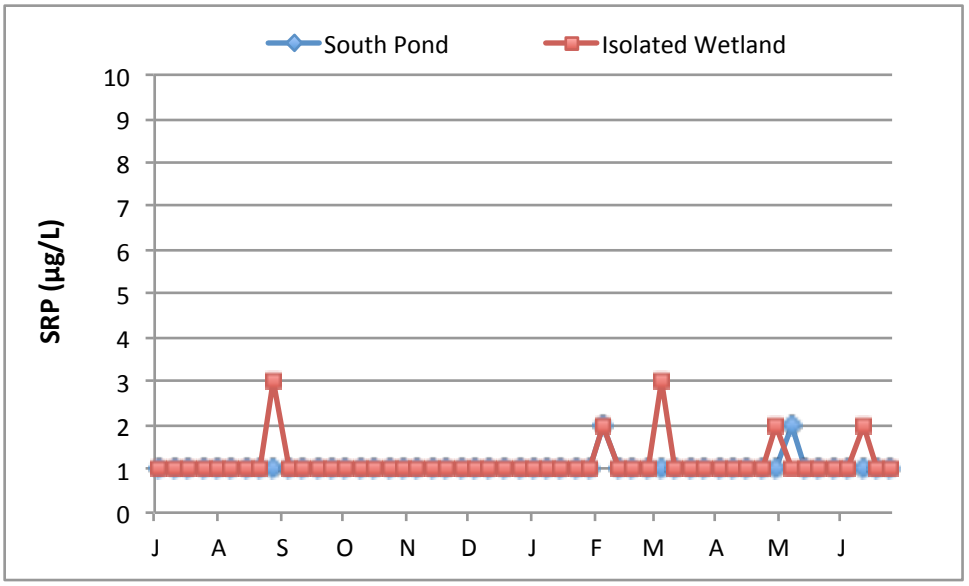


Figure 63. SRP concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

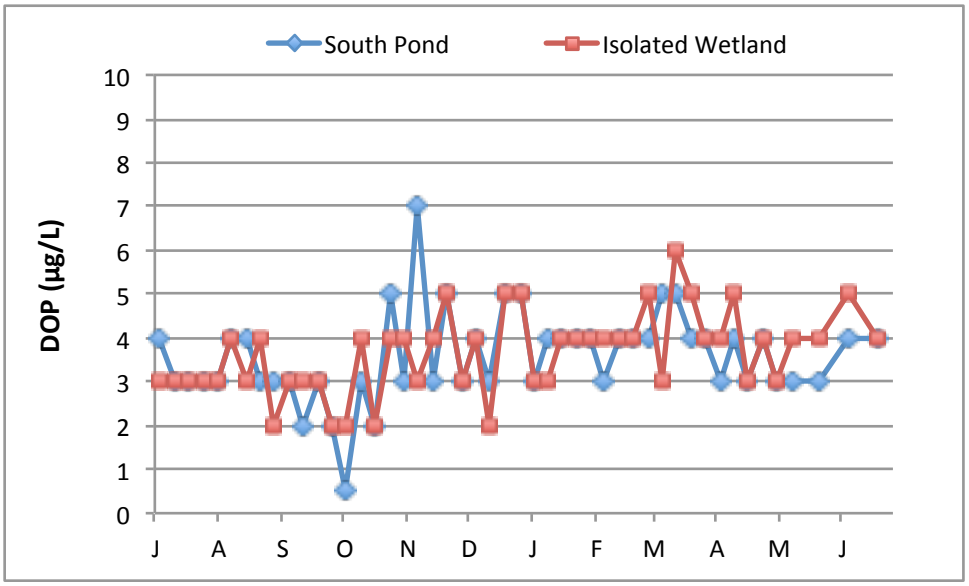


Figure 64. DOP concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

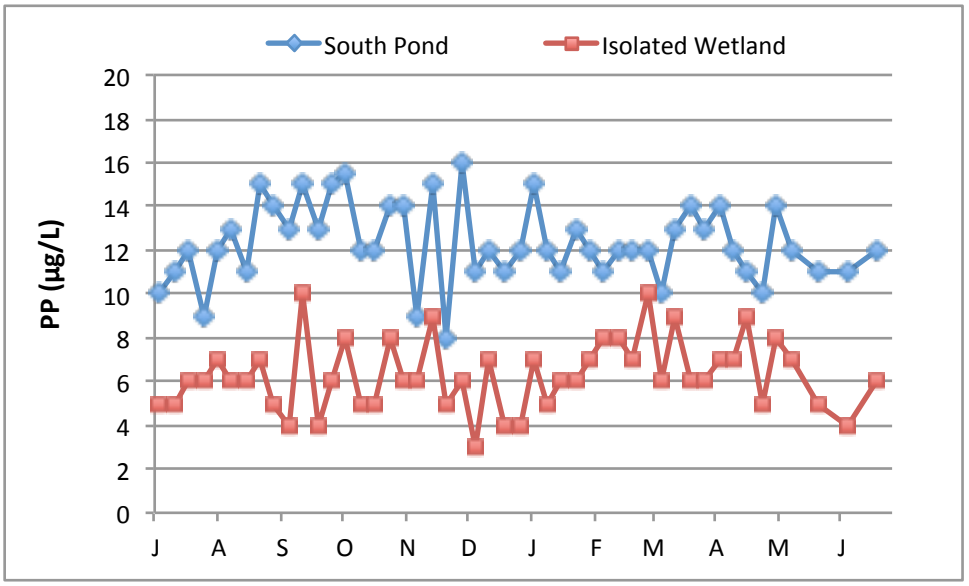


Figure 65. PP concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

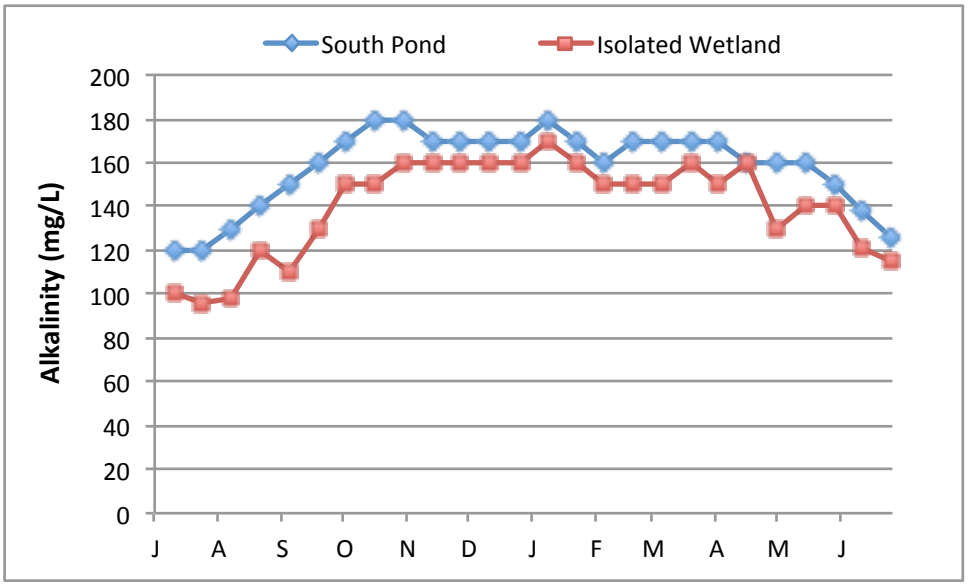


Figure 66. Alkalinity in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

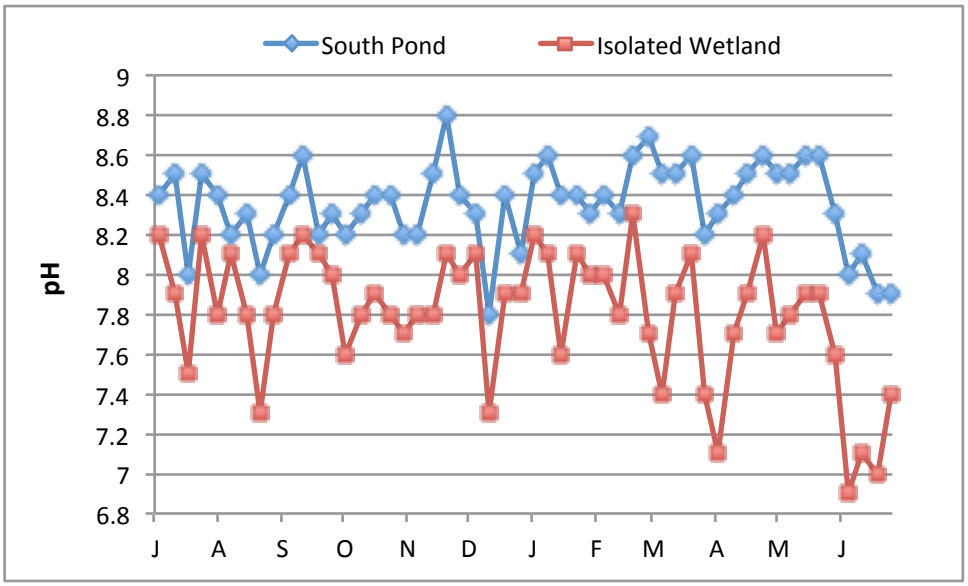


Figure 67. pH in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

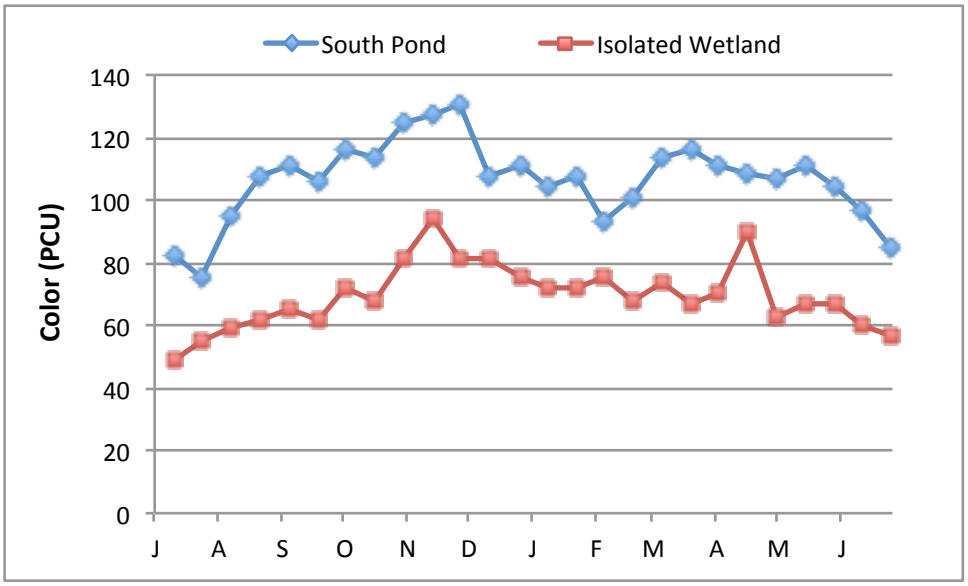


Figure 68. Color in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

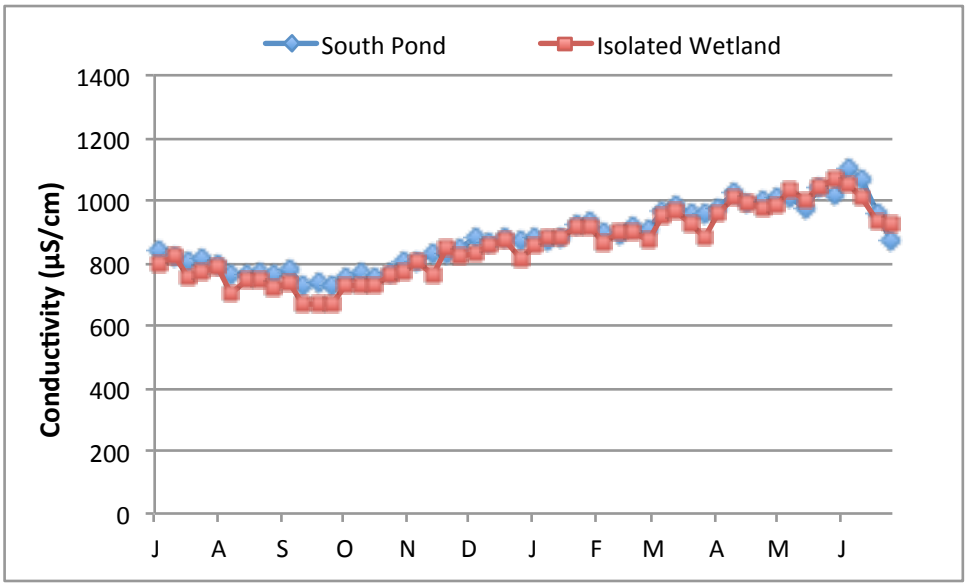


Figure 69. Conductivity in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

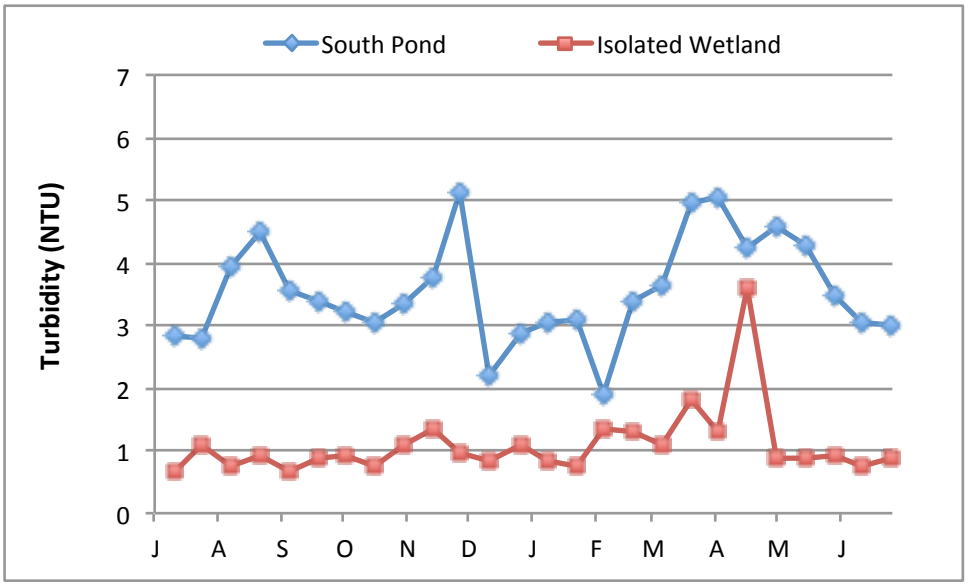


Figure 70. Turbidity in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

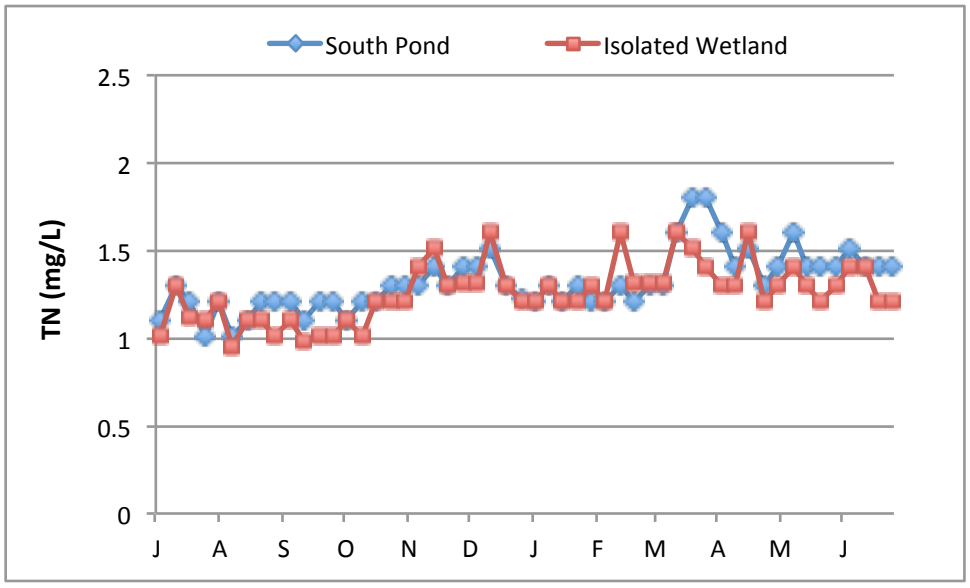


Figure 71. TN concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

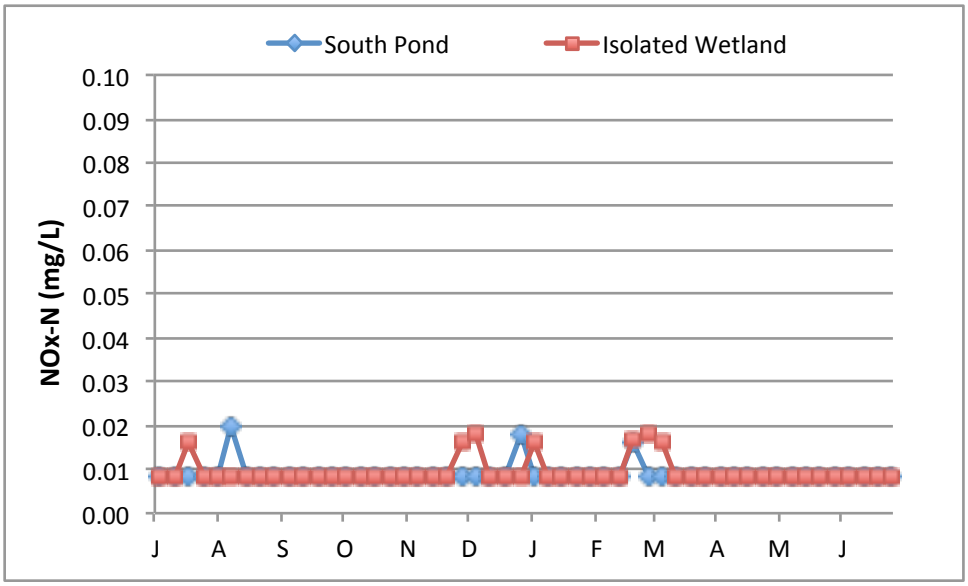


Figure 72. NO_x-N concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

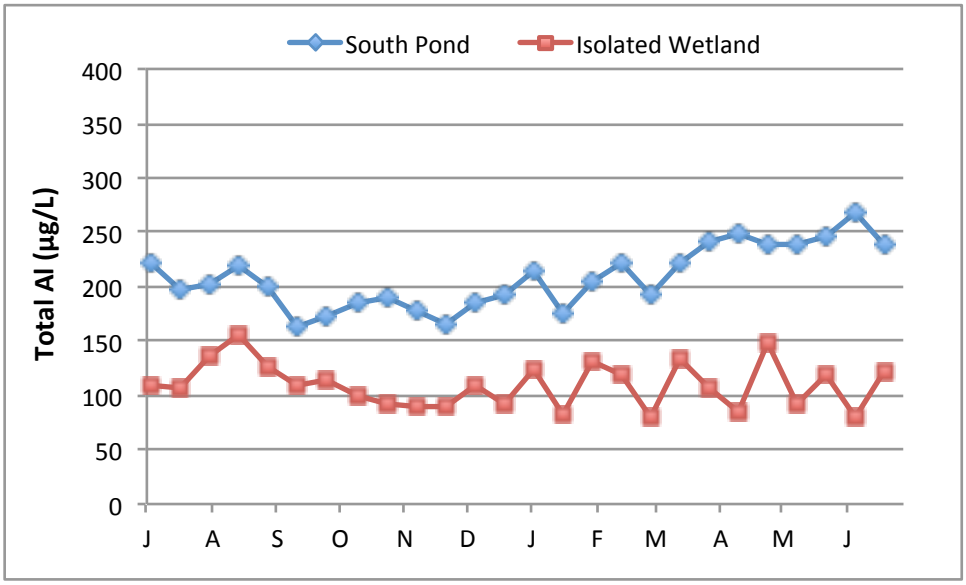


Figure 73. Total Al concentration in the outflow stream of the South Pond and Isolated Wetland, downstream from the Site 5 and Site 6 HWTT systems, during the July 2013 – June 2014 monitoring period.

Site 7: Grassy Island HWTT Facility

In 2011, we constructed a full-scale (10 cfs) Hybrid Wetland Treatment Technology (HWTT) facility on the District owned Grassy Island parcel north of the City of Okeechobee. The project site is part of a large parcel of land (see Section 20, Township 36 South, Range 35 East) adjacent to Taylor Creek, north of the location of the creek passage under US Hwy 441. An aerial photo of the Phase I HWTT facility is shown in Figure 74. Briefly, the design for the HWTT facility is as follows. Water pumped from Taylor Creek flows first through a limerock bed, after which it is dosed with coagulant and fed into one of three plastic-lined contact chambers. The contact chambers overflow into a settling pond, and then into an adjacent FAV pond. The final unit process is a SAV pond, which ultimately discharges back into Taylor Creek downstream of the inflow pump station location. Figure 75 through Figure 78 show the major facility components.

Phase III construction (pump station enhancements, and expansion of the western components to 15 cfs) that began in December 2012 was completed in June 2013 and is intended to provide a total of 30 cfs capacity upon completion of Phase II's initial flow through and optimization period and a permit modification request. Phase III construction was taking place during most of the current project year and this limited the system's operations to 15 cfs and the use of the eastern flow path only. As a result, the operational data provided below primarily reflects operations of the eastern flow path. Future Phase III operations are intended to utilize 15 cfs on the eastern flow path and 15 cfs on the western flow path. A schematic of the final build-out of the Phase III Grassy Island HWTT facility is shown in Figure 79.

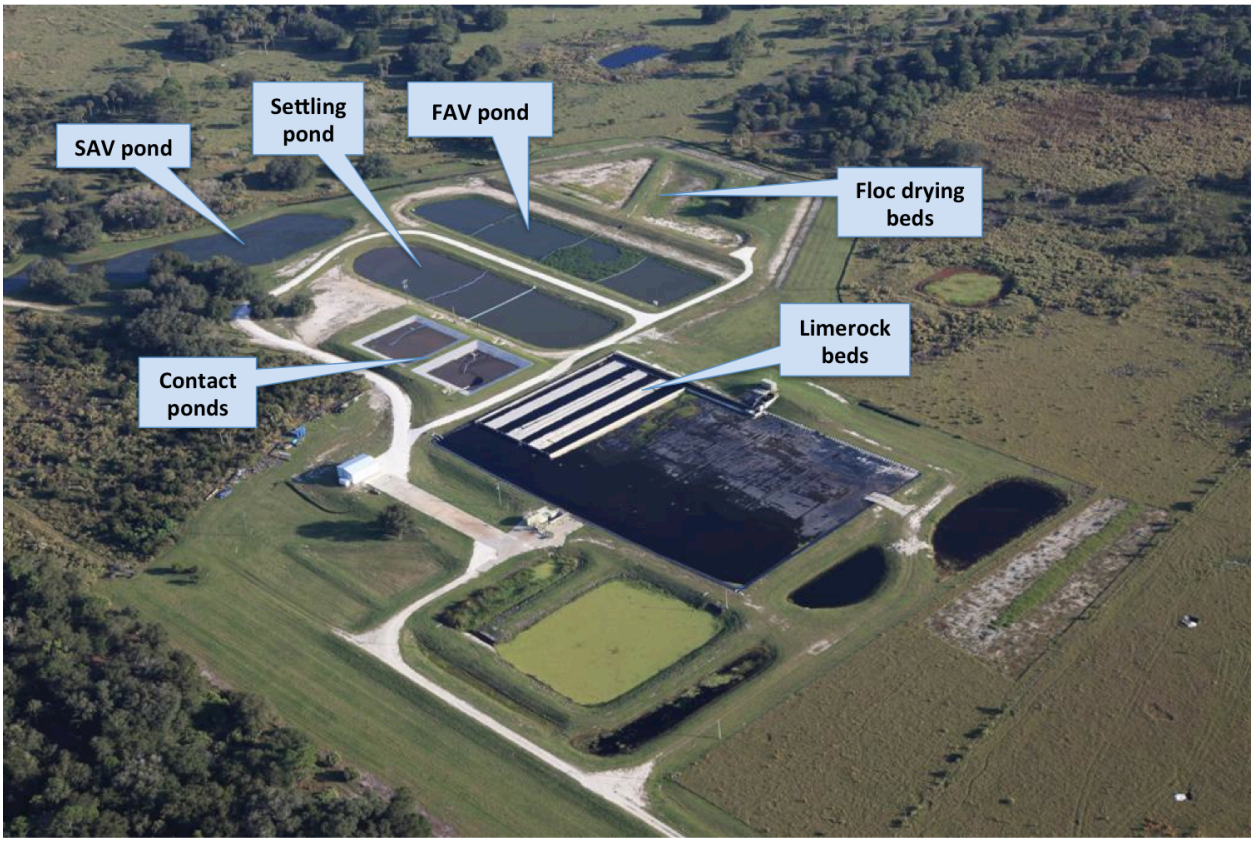


Figure 74. Aerial view of the Phase I Grassy Island HWTT facility.



Figure 75. The limerock bed component of the Grassy HWTT facility.



Figure 76. The eastern Grassy HWTT settling pond, with floating "floc line" that conveys wet floc to from the contact ponds to the drying bed.



Figure 77. The eastern Grassy HWTT facility FAV pond with three floating vegetation booms.



Figure 78. The eastern Grassy HWTT facility SAV pond, the final unit process in series.

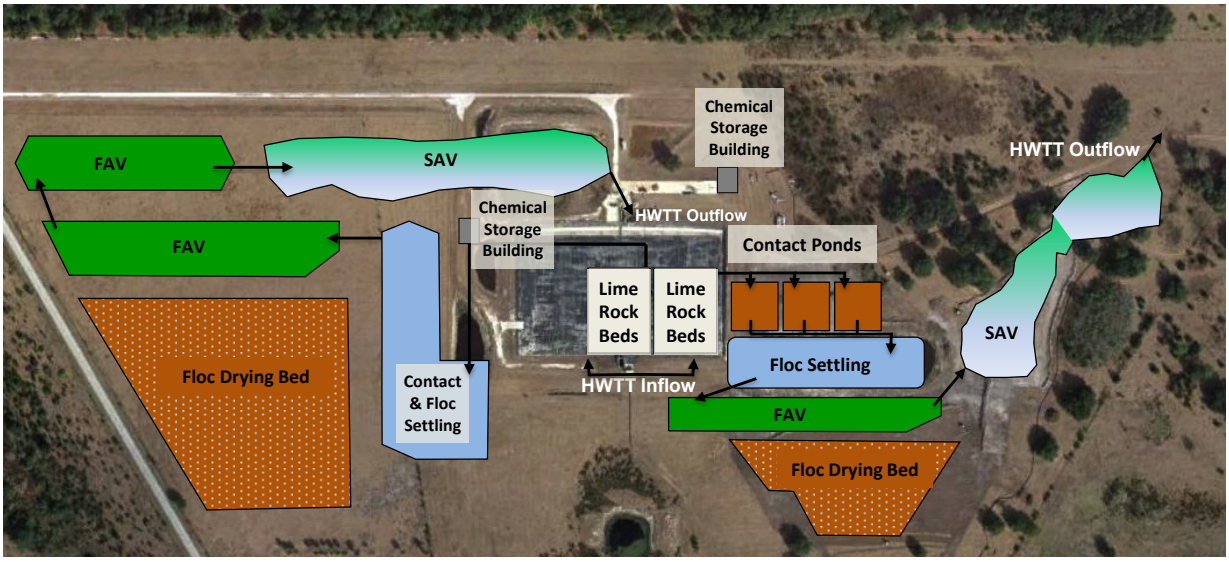


Figure 79. Schematic of the final build-out of the Phase III Grassy Island HWTT facility, completed in June 2013.

During the current period, the Grassy Island HWTT system received dosing of alum at various rates (mean = 14 mg Al/L), on an intermittent basis. Alum dosing frequency was primarily within the range of 50-90% (mean = 80%) of operational time, providing an overall effective dose of 11.3 mg Al/L. Beginning in October 2013, PAC was added as a secondary coagulant via intermittent dosing (approximately 80% of operational time) to provide an effective PAC dose of ca. 2.0 mg Al/L.

HWTT system inflow and outflow water samples were collected via grab sampling for chemical analyses on a weekly or biweekly basis. Samples were analyzed for total phosphorus (TP), soluble reactive P (SRP), dissolved organic P (DOP=TSP-SRP, where TSP is total soluble P), particulate P (PP=TP-TSP), pH and turbidity, on a weekly basis. Water samples were also analyzed for alkalinity, color, conductivity, nitrate + nitrite N (NO_x-N) and TKN on a biweekly basis. Total N (TN) was calculated as the sum of NO_x and TKN. Total aluminum (Al) and sulfate (SO_4) also were monitored biweekly, for permit compliance purposes. Water chemistry data for the July 2013 – June 2014 monitoring period are presented in Figure 80 through Figure 92. Additional data, related to compliance monitoring, are presented later in this report.

Inflow TP concentrations in the Grassy Island HWTT system typically were higher during the wet season months, with maximum concentrations occurring early in the 2013 and 2014 wet seasons (Figure 80). Most notably, inflow TP concentration increased ten-fold during June 2014, apparently associated with a series of major rainfall events. Inflow TP ranged from 92 to 955 µg/L and averaged 383 µg/L during the monitoring period. Outflow TP concentrations were moderately elevated during wet season months, but lower and relatively stable during the dry season. During the period from mid-October through mid-June outflow TP concentration averaged 18 µg/L. For the entire monitoring period the overall mean outflow TP concentration was 57 µg/L while the range was 7 to 324 µg/L.

Inflow SRP concentration varied concurrently with inflow TP, as SRP was the predominant P fraction in the inflow stream (Figure 81). Maximum SRP concentrations were measured during July 2013 and June 2014, following early wet-season rain events in the Taylor Creek watershed. Mean inflow SRP was 290 µg/L, while concentrations ranged from 59 to 745 µg/L. Outflow SRP concentrations were frequently lower than the MDL of 2 µg/L, and never exceeded 49 µg/L during the course of the monitoring period. The overall mean SRP concentration in the outflow streams was 7 µg/L. Inflow DOP concentrations also exhibited a temporal trend similar to that of TP, with somewhat lower concentrations measured during dry season months and maximum concentrations occurring during July 2013 and June 2014 (Figure 82). Outflow DOP concentrations were also slightly higher and more variable during wet season months than during the dry season, but substantially reduced in comparison to inflow DOP. Inflow DOP concentrations ranged from 6 to 140 µg/L and averaged 43 µg/L, while outflow DOP ranged from ≤2 to 27 µg/L and averaged 6 µg/L. PP concentrations were slightly higher in the outflow stream, as compared to inflow PP, during the wet season and slightly lower than inflow PP during the dry season (Figure 83). Outflow PP increased abruptly at the end of the monitoring period, in conjunction with rapid increases in inflow dissolved P, as discussed above. The overall range in inflow PP concentration was 3 to 278 µg/L, compared with a range of 3 to 225 µg/L in the outflow stream. Mean PP levels were 50 and 42 µg/L at the system inflow and outflow, respectively.

Alkalinity in the inflow stream exhibited a typical seasonal trend of increasing concentrations during dry season months, along with a relatively high degree of short-term variability (Figure 84), reflecting the rapidly changing water chemistry in Taylor Creek. Inflow alkalinity ranged from 28 to 130 mg/L and averaged 80 mg/L. Alkalinity levels were lower overall in the outflow stream, with less temporal variability, than in the inflow water. Mean outflow alkalinity was 32 mg/L, while levels ranged from 12 to 62 mg/L. Both inflow and outflow pH trended in similar fashion to inflow alkalinity, with outflow pH slightly lower in general than inflow pH (Figure 85). Inflow pH averaged 7.1 and ranged from 6.6 to 7.5, while outflow pH averaged 6.8 and ranged from 6.0 to 7.4. Inflow and outflow color varied roughly in proportion to TP concentrations during the monitoring period (Figure 86). Inflow color ranged as high as 802 PCU, in July 2013, to a minimum level of 92 PCU during April 2014. Mean inflow color concentration was 327 PCU. Color in the outflow stream was consistently lower than inflow color levels during the monitoring period. Outflow color levels ranged from 23 to 462 PCU and averaged 113 PCU. Conductivity in both the inflow and outflow streams exhibited a distinct seasonal trend, with minimum levels occurring during July and maximum levels in March (Figure 87). The sharp decrease in conductivity at the end of the monitoring period was indicative of high stormwater runoff flows in the watershed during early June. Mean conductivity levels were 487 and 510 µS/cm, respectively, in the inflow and outflow streams. Overall ranges for inflow and outflow conductivity were 202 to 778 and 233 to 777 µS/cm, respectively. Turbidity levels in the system tended to decrease during the monitoring period, prior to an increase during June (Figure 88). Outflow turbidity was generally lower than inflow turbidity during the majority of the period. Mean turbidity was 7.4 NTU in the system inflow stream, with an overall range of 1.3 to 66.9 NTU, while outflow turbidity averaged 4.3 NTU and ranged from 0.6 to 16.4 NTU.

Inflow TN concentrations followed a trend similar to that of inflow TP during the monitoring period, with a similar temporal pattern observed in outflow TN (Figure 89). Outflow TN concentrations were consistently lower than inflow TN. Mean TN concentrations at the inflow and outflow were 1.93 and 1.09 mg/L, respectively. Inflow TN ranged from 0.90 to 3.06 mg/L, while outflow TN ranged from 0.55 to 1.93 mg/L. Inflow

and outflow NO_x concentrations were characterized by a sharp increase from August through mid-October, followed by secondary peaks during December and February (Figure 90). Concentrations were more often lower at the outflow than in the inflow stream; accordingly, the mean outflow NO_x concentration was lower than mean inflow NO_x (0.217 vs. 0.288 mg N/L, respectively). Inflow NO_x concentrations ranged from ≤0.016 to 0.990 mg N/L, compared with a range of ≤0.016 to 0.825 mg N/L in the outflow stream.

Total Al and sulfate were monitored in the Grassy HWTT inflow and outflow streams, in association with the use of aluminum sulfate (alum) and polyaluminum chloride (PAC) as coagulants. Total Al concentration in the inflow stream ranged from 65 to 755 µg/L, and averaged 210 µg/L (Figure 91). Outflow TAl concentration varied considerably, with much higher levels occurring during the initial 2 months of the monitoring period. In comparison, outflow TAl concentration were generally reduced during the dry season months. Addition of PAC began in early October, shortly before a reduction in system flow rate, both of which may have contributed to decreased outflow TAl concentrations. The overall mean outflow TAl concentration during the monitoring period was 523 µg/L, while values ranged from 83 to 2170 µg/L (excluding the sample from 6/27/14; see note below). Concentration of sulfate in the inflow stream ranged from 6 to 117 mg/L and averaged 53 mg/L during the monitoring period (Figure 92). Outflow sulfate concentration ranged from 48 to 179 mg/L and averaged 108 mg/L during the same period.

At the end of the monitoring period (6/27/14), the TAl concentration reported for the outflow water sample was in question: the sample is being re-analyzed by the contract laboratory, and the verified concentration will be incorporated in this final report (at the time that revisions are made in response to reviewer's comments).

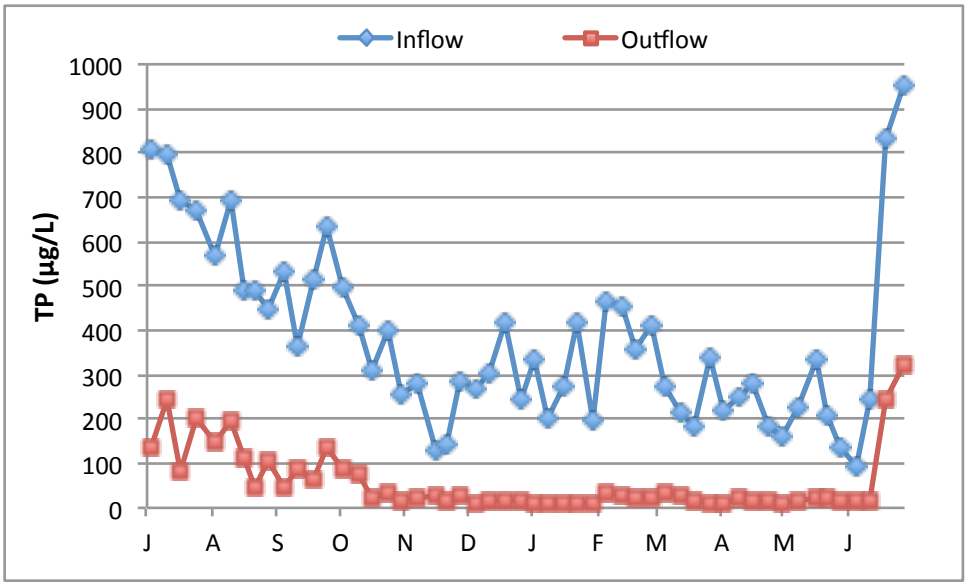


Figure 80. TP concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

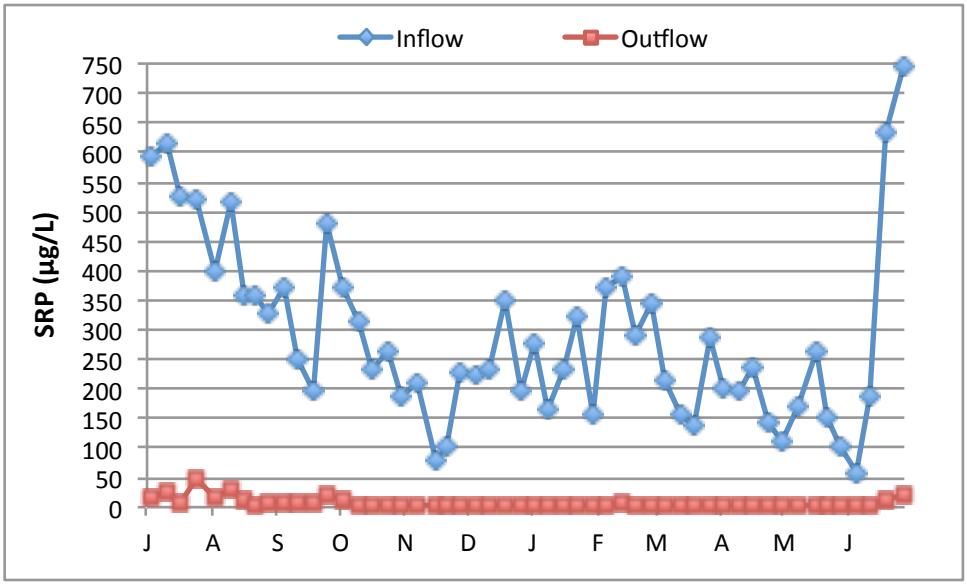


Figure 81. SRP concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

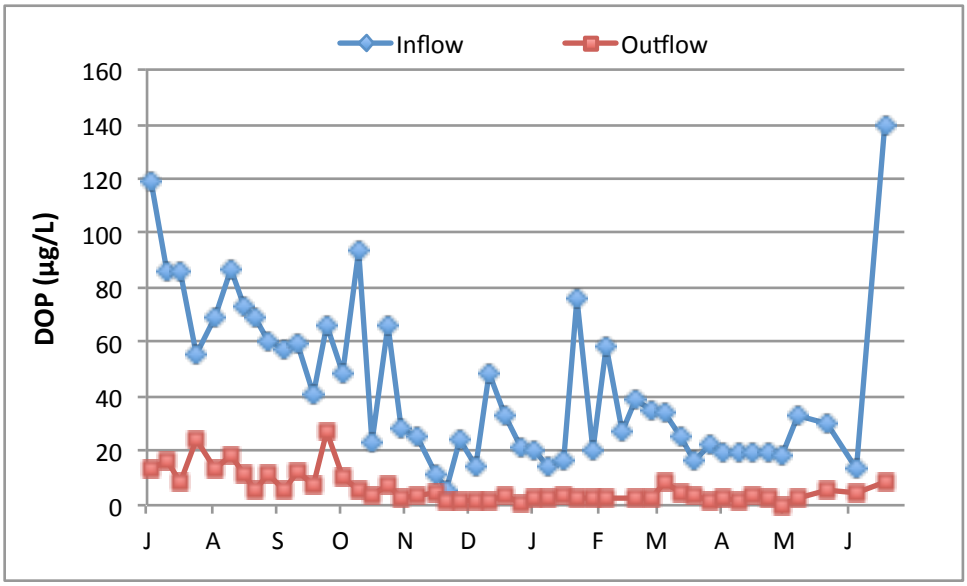


Figure 82. DOP concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

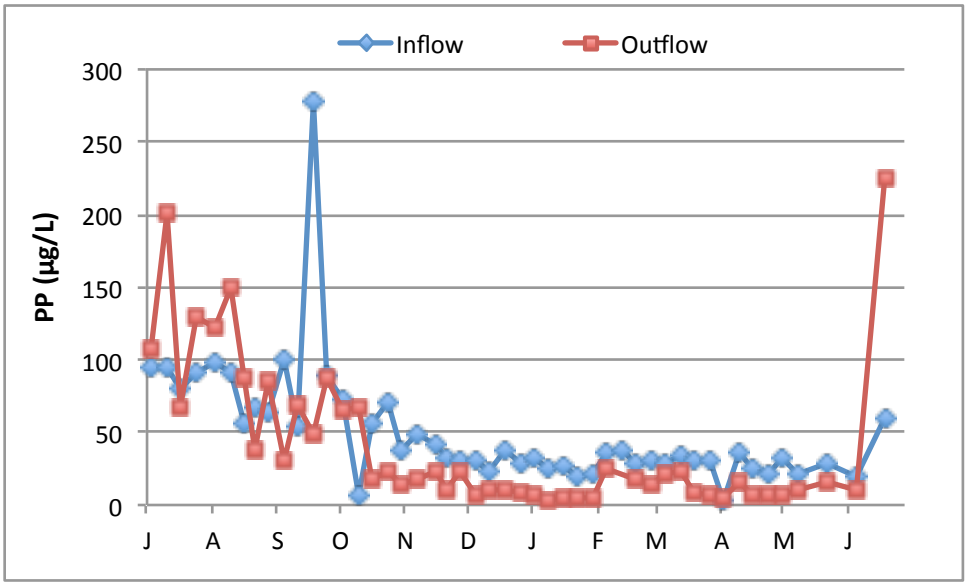


Figure 83. PP concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

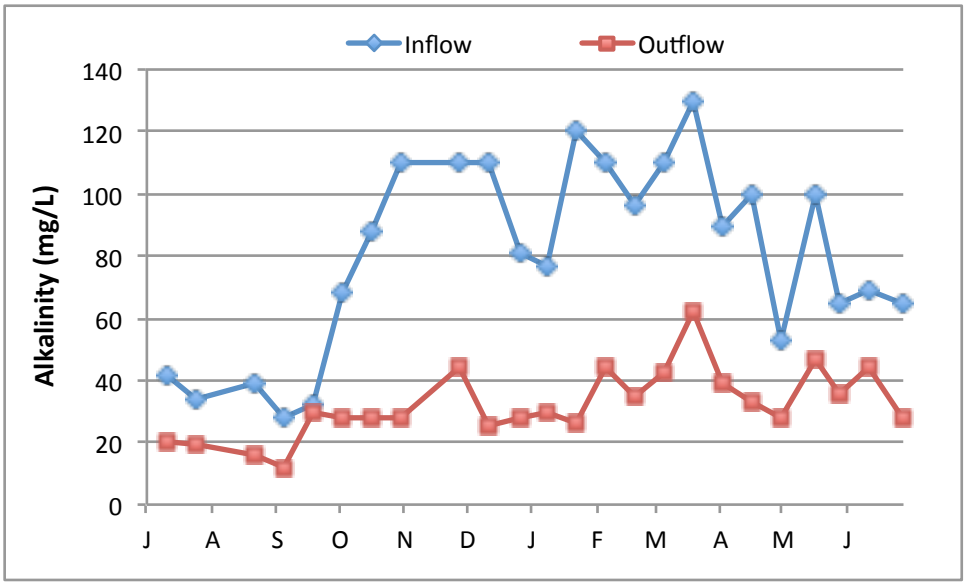


Figure 84. Alkalinity in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

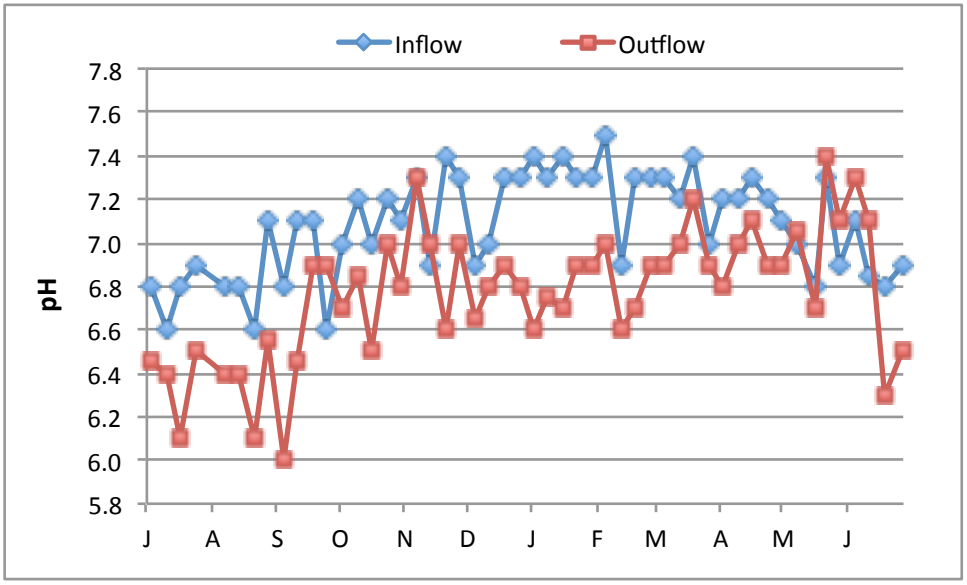


Figure 85. pH in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

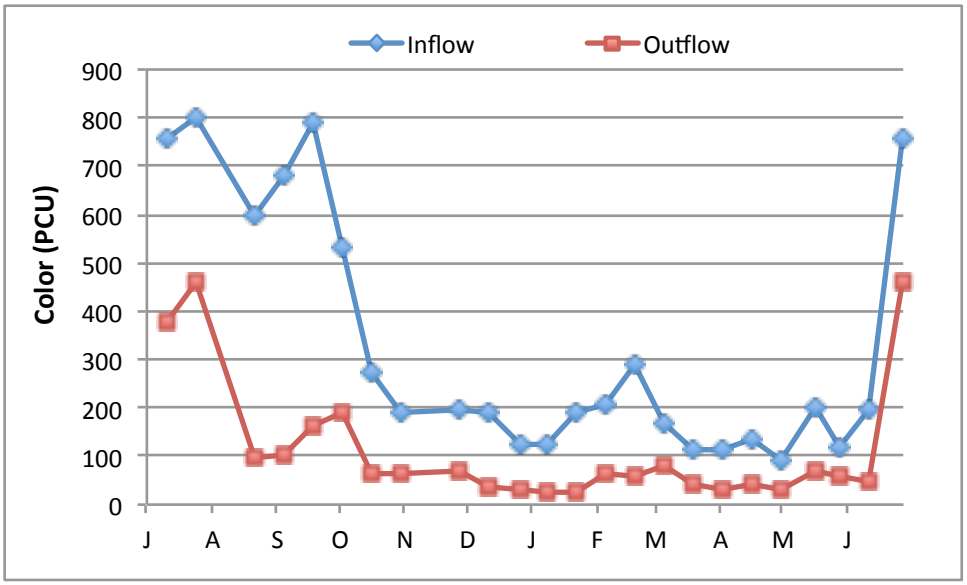


Figure 86. Color in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

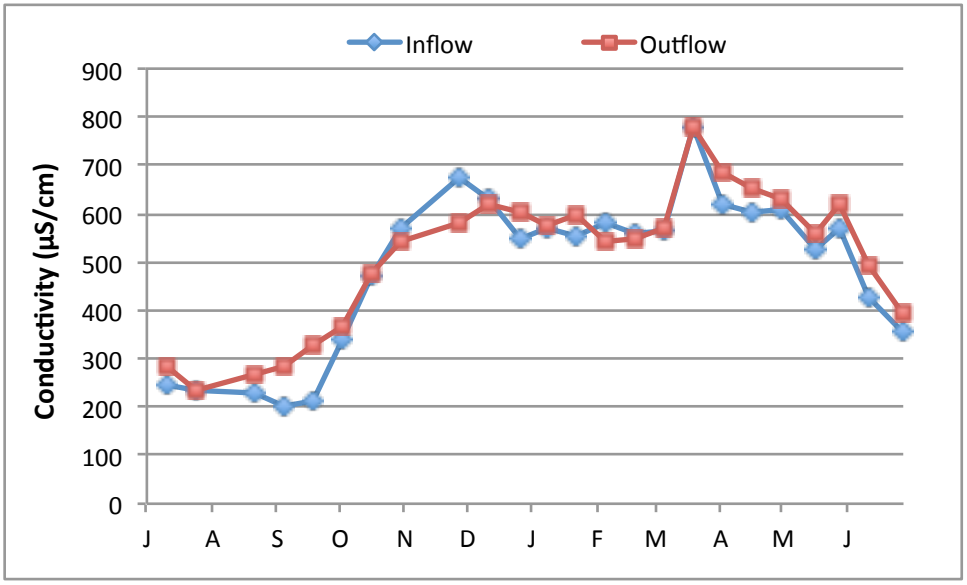


Figure 87. Conductivity in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

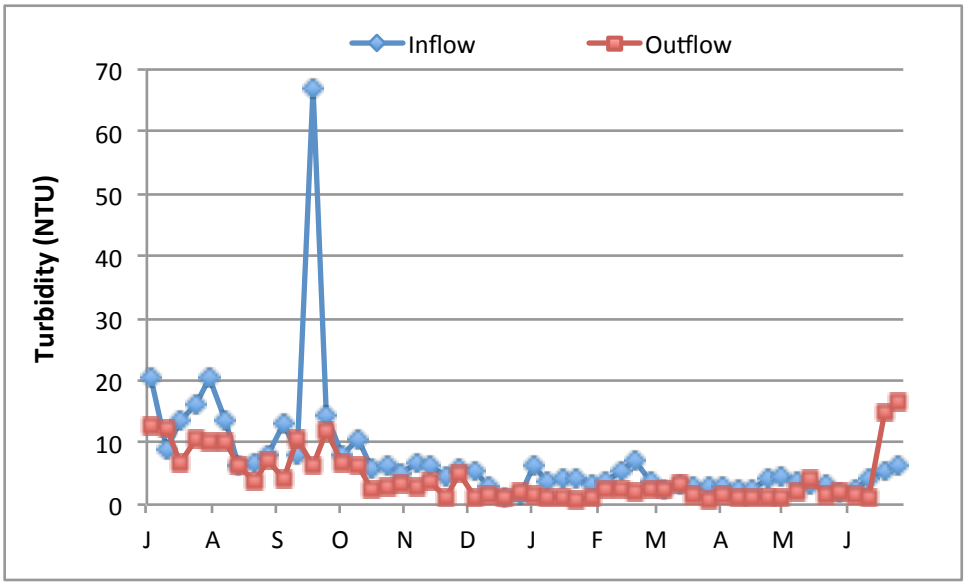


Figure 88. Turbidity in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

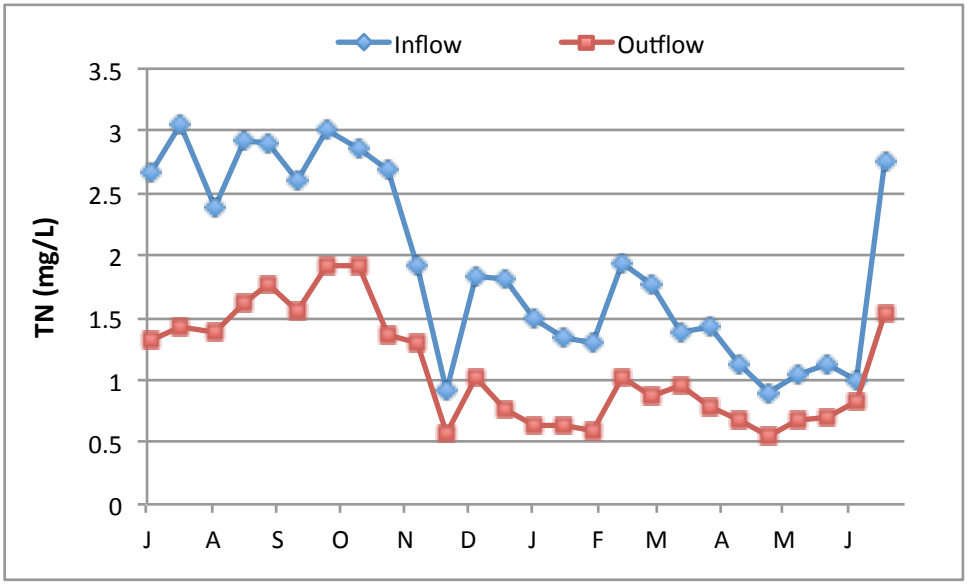


Figure 89. TN concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

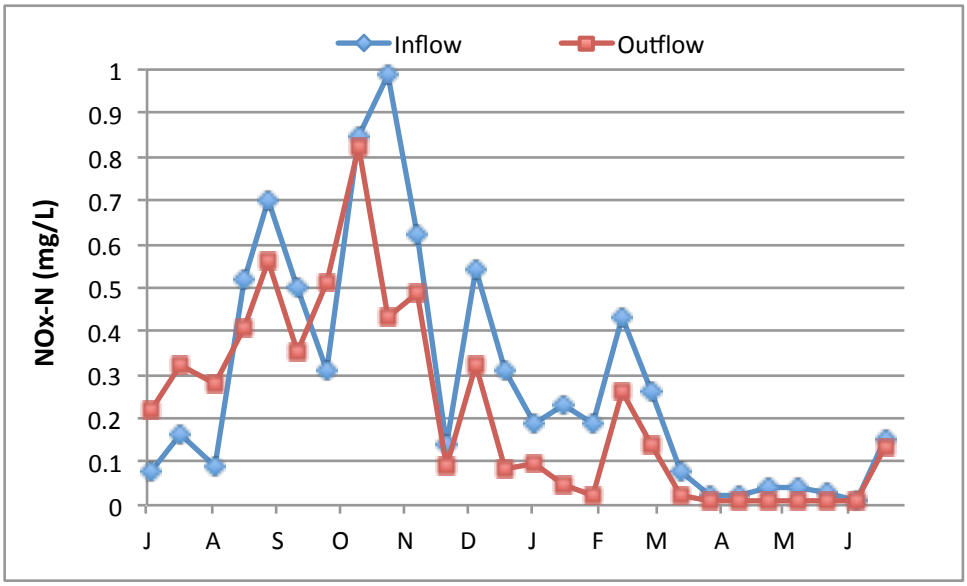


Figure 90. NO_x-N concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

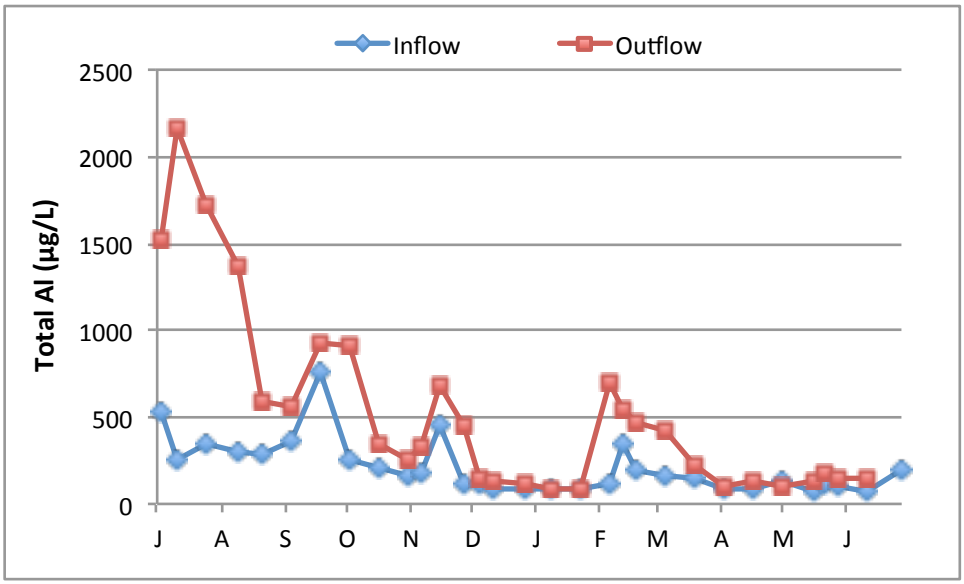


Figure 91. Total Al concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

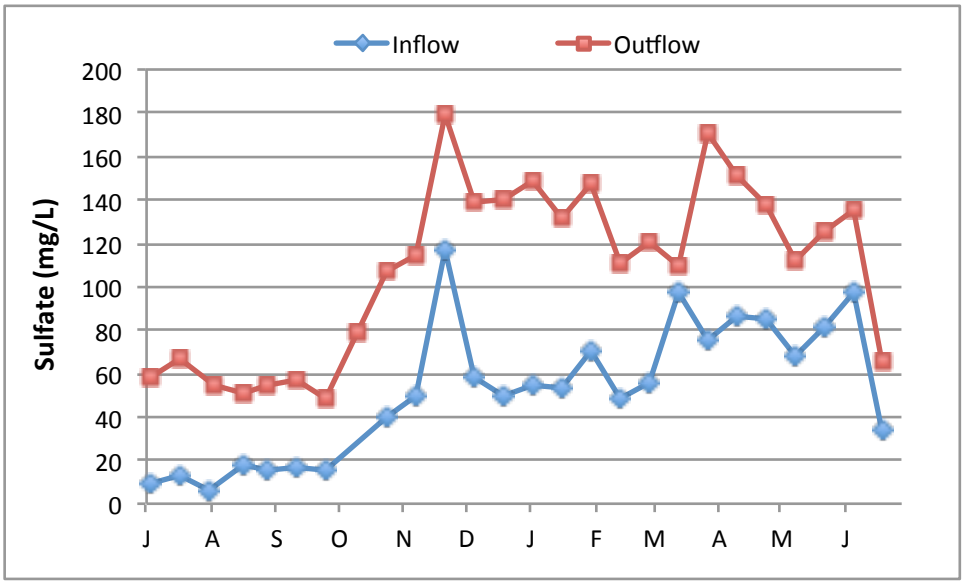


Figure 92. Sulfate concentration in the inflow and outflow streams at the Grassy Island HWTT system during the July 2013 – June 2014 monitoring period.

Monthly flow volume treated in the Grassy Island HWTT system ranged from 45.95 Mgal in April 2013 to 378.5 Mgal in July 2013 (Figure 93). Mean monthly flow volume was 167.3 Mgal, while total flow treated during the period July 2013 – June 2014 was 2007.5 Mgal.

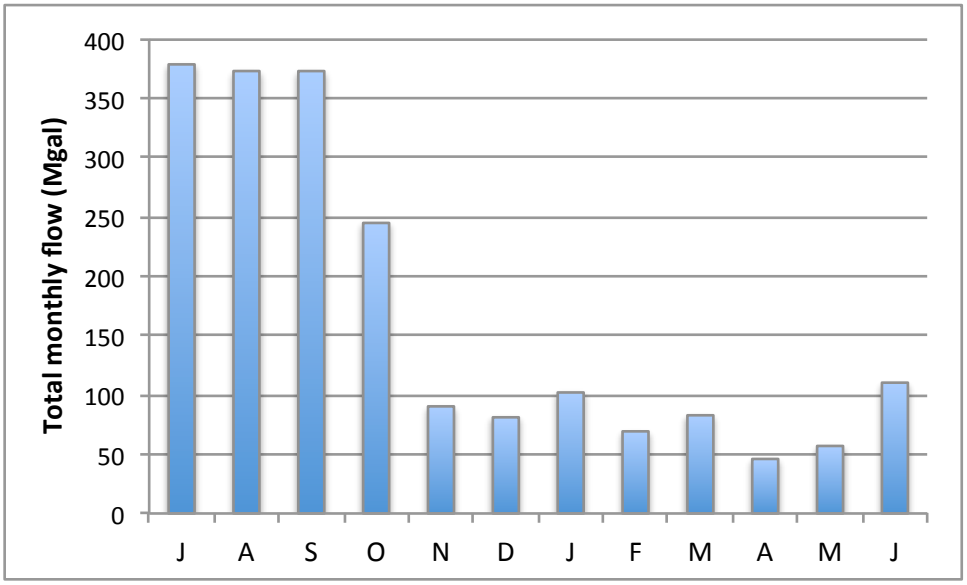


Figure 93. Total monthly flow treated by the Grassy Island (Site 7) HWTT system during the period July 2013 – June 2014. Total flow volume for May was reduced due to low creek flows, as well as the temporary suspension of operations for pump station improvements.

Permit Monitoring Data Summary

Monitoring at system inflows and outflows was conducted on a prescribed basis at the Lemkin Creek and Grassy Island HWTT sites, in compliance with FDEP permits #47-0254574-002 GL (issued May 5, 2009) and #0259591-004 (issued November 29, 2012), respectively. Results of these activities are presented in the following sections.

Monitoring at Lemkin Creek HWTT Inflow and Outflow Sites

Monitoring of system inflows and outflows at the Lemkin (FDOT) and Wolff HWTT facilities for compliance with permit No. 47-0254574-002 GL was conducted during the period July 2013 – June 2014. Locations of the sampling stations included in the permit monitoring program are provided in Figure 94 and Table 1.

Data for many of the water chemistry parameters monitored for permit compliance are presented in the HWTT Treatment Performance section of this report.

Inflow and outflow summary statistics for permit monitoring parameters for which water quality standards have been developed and listed in 62-302.530 are presented in Table 2 for comparison to criteria levels.

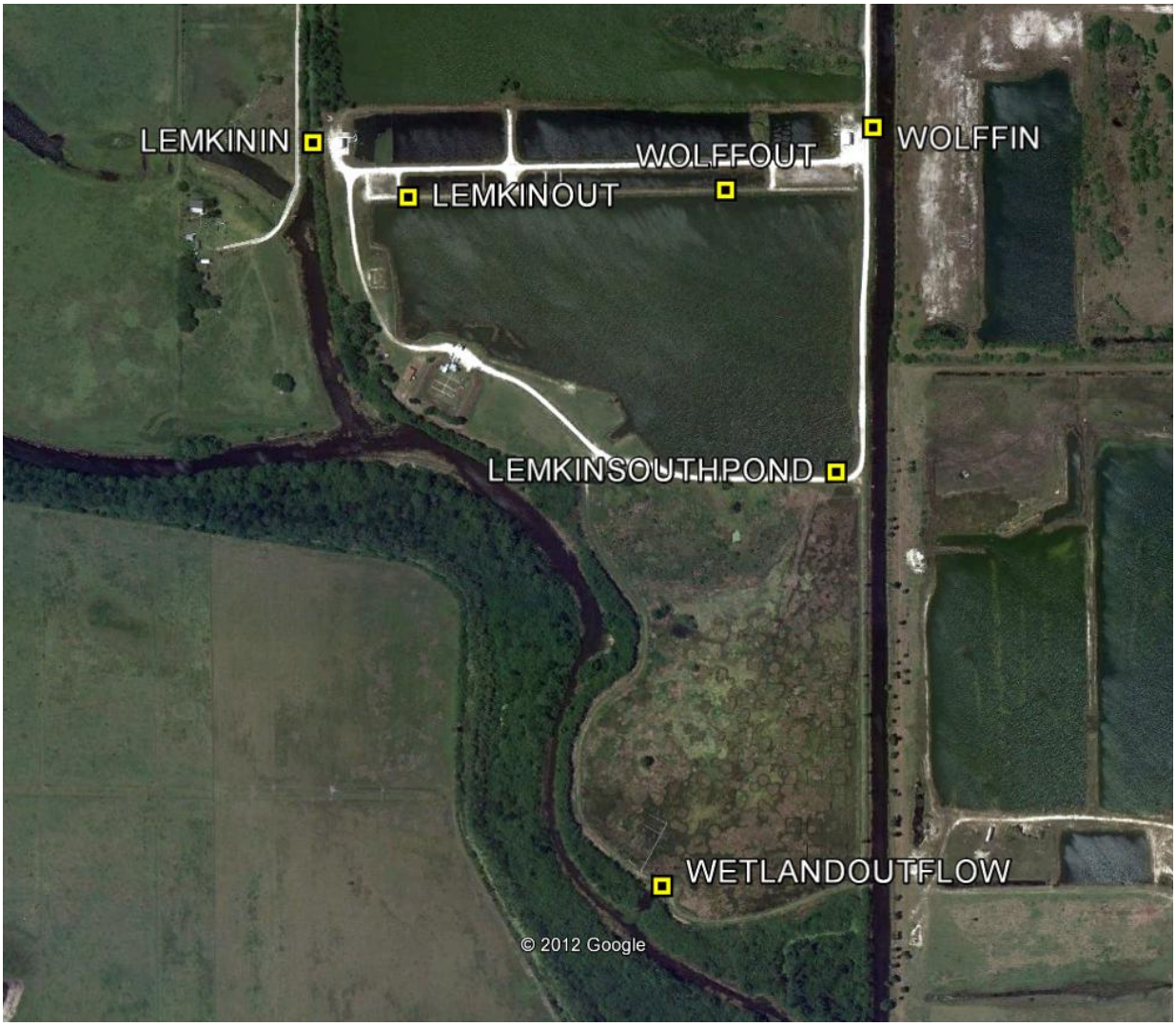


Figure 94. Map of Lemkin/Wolff HWTT sampling stations. Note that the wetland outflow is not a permit monitoring station, and its location is shown for reference only.

Table 1. Lemkin/Wolff HWTT sampling stations included in monitoring program.

Station ID	Description	Latitude[1]	Longitude[1]
WOLFFIN	Inflow to the Wolff Ditch HWTT	271155.12	805118.27
WOLFFOUT	Outflow from the Wolff Ditch HWTT	271153.03	805123.80
LEMKININ	Inflow to the Lemkin Creek HWTT	271154.61	805139.24
LEMKINOUT	Outflow from the Lemkin Creek HWTT	271152.79	805135.67
LEMKINSOUTHPOND	Inflow to the wetland downstream of HWTT	271143.65	805119.68

Note 1. Coordinates reference the WGS84 datum (in DDMMSS.SS format).

Table 2. Comparison of Lemkin/Wolff HWTT permit monitoring results with numeric water quality standards for Class III fresh waters, for the period July 1, 2013 – June 30, 2014.

Parameter	Statistic	Wolff Inflow	Wolff Outflow	Lemkin Inflow	Lemkin Outflow	South Pond	Numeric Standard (per 62-302.530 FAC)
pH	min	7.0	7.4	7.0	7.3	7.8	natural background ±1 unit, 6.0< pH <8.5
	mean	7.6	7.8	7.5	7.7	8.4	
	max	8.6	8.1	7.9	8.0	8.8	
Temperature (°C)	min	16.5	15.6	15.0	15.9	16.4	≤5 degrees above natural background
	mean	26.7	26.4	24.7	26.2	26.0	
	max	33.8	32.9	32.0	33.3	32.2	
Alkalinity (mg $CaCO_3$/L)	min	152	120	130	116	120	20 (minimum)
	mean	199	168	179	163	158	
	max	240	210	230	210	180	
Specific Conductance (µS/cm)	min	548	710	658	696	725	Greater of 50% above background or 1275
	mean	920	926	884	882	881	
	max	1127	1114	1037	1062	1100	
Turbidity (NTU)	min	1.2	1.5	0.9	1.4	1.9	≤ 29 NTU above natural background
	mean	2.8	2.2	2.3	2.0	3.6	
	max	6.9	2.9	5.8	4.9	5.1	

Monitoring at Grassy Island HWTT Inflow and Outflow Sites

Monitoring of system inflows and outflows at the Grassy Island HWTT facility for compliance with permit No. 0259591-004 was conducted during the period July 2013-June 2014. Locations of the sampling stations included in the permit monitoring program are provided in Figure 95.

Data for many of the water chemistry parameters monitored for permit compliance are presented in the HWTT Treatment Performance section of this report.

Inflow and outflow summary statistics for permit monitoring parameters for which water quality standards have been developed and listed in 62-302.530 are presented in Table 3 for comparison to criteria levels. The table includes summary data for all sampling dates in the reporting period, as well as data collected only during the deployment of PAC as a supplemental coagulant (October 2013 – June 2014)

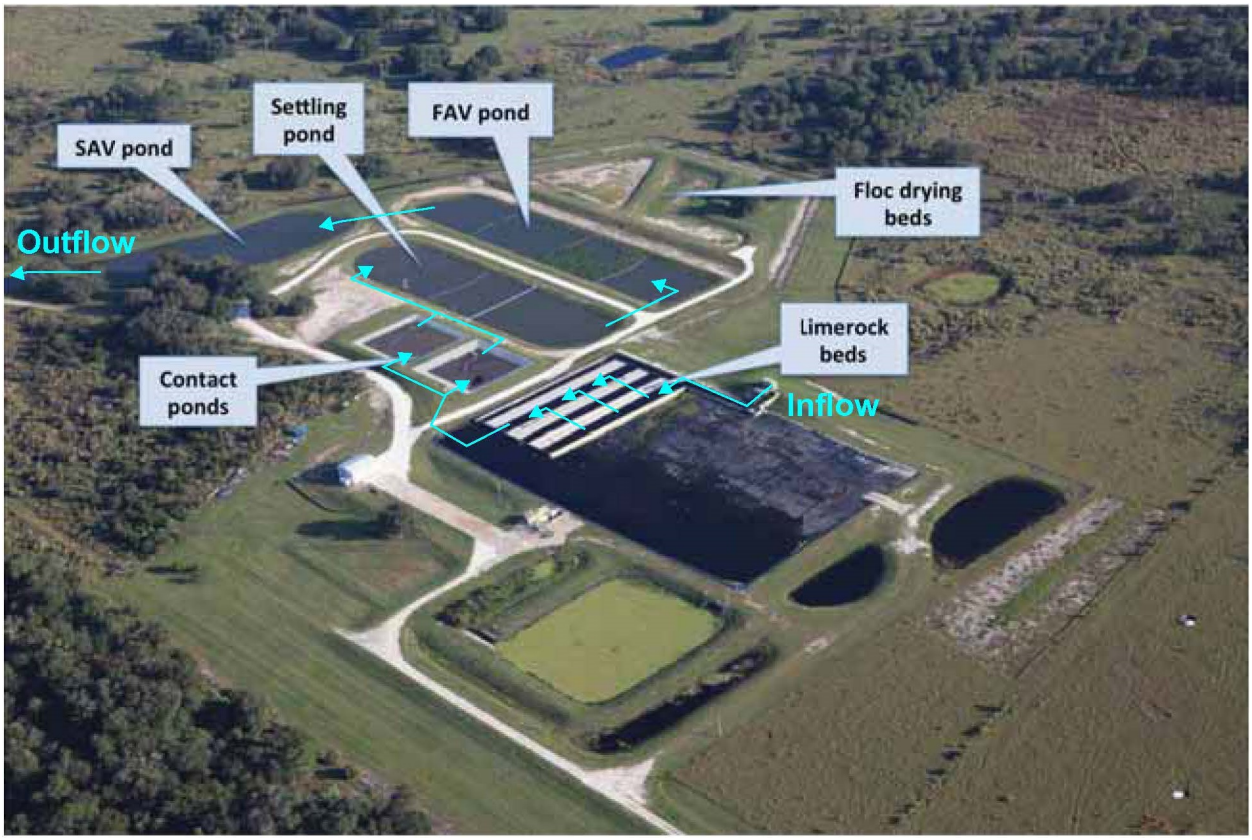


Figure 95. Aerial view of Grassy Island HWTT facility showing locations of inflow and outflow monitoring stations and water flow path (arrows).

Table 3. Grassy Island HWTT summary data for selected permit monitoring parameters, across all sampling dates in the reporting period and during the deployment of PAC as a supplemental coagulant (October 2013 – June 2014). Numeric water quality standards for Class III fresh waters are shown for comparison with monitoring results.

		All dates		PAC added		
Parameter	**Statistic**	**Grassy Inflow**	**Grassy Outflow**	**Grassy Inflow**	**Grassy Outflow**	**Numeric Standard (per 62-302.530 FAC)**
pH	min	6.6	6.0	6.8	6.3	natural background ±1 unit, 6.0< pH <8.5
	mean	7.1	6.8	7.2	6.9	
	max	7.5	7.4	7.5	7.4	
Temperature (°C)	min	14.8	14.4	14.8	14.4	≤5 degrees above natural background
	mean	24.0	24.3	23.0	22.9	
	max	29.3	30.3	28.9	29.4	
Alkalinity (mg $CaCO_3$/L)	min	28	12	53	26	20 (minimum)
	mean	80	32	92	36	
	max	130	62	130	62	
Specific Conductance (µS/cm)	min	202	233	341	366	Greater of 50% above background or 1275
	mean	487	510	556	571	
	max	778	777	778	777	
Dissolved Oxygen (mg/L)	min	1.90	5.80	1.90	5.80	5.0 (minimum)
	mean	5.25	7.74	5.28	8.12	
	max	13.00	10.15	13.00	10.15	

Effluent and Coagulant Toxicity Testing for the Grassy Island Facility

Chronic toxicity testing for Grassy Island HWTT effluent

Chronic effluent toxicity testing was conducted for the Grassy Island HWTT facility to demonstrate compliance with effluent limitations, as specified in Attachment 2 of FDEP Permit #0259591-004 (*Routine Monitoring of Chronic Effluent Toxicity Testing Requirements*). Testing was performed by Grove Scientific & Engineering Co. in Orlando, Florida.

Prior to the most recent (July 2013 – June 2014) reporting period, chronic effluent toxicity testing was conducted on nine occasions (over three reporting periods) following initiation

of full-scale operation of the Grassy HWTT facility. Results of these tests, presented in earlier project reports, are shown in Table 4 through Table 9.

Table 4 through Table 6 show inhibition concentrations (IC25) for fathead minnow (*Pimephales promelas*) and water flea (*Ceriodaphnia dubia*) test organisms. The IC25 is defined as the concentration of toxicant that would cause a 25% reduction in mean young per female or in growth for the test population. For all tests during these monitoring periods the IC25 was greater than 100% effluent. Table 7 through Table 9 show non-observable effects concentrations (NOEC) for the same organisms. The NOEC is defined as the highest concentration of toxicant to which organisms are exposed in a full life-cycle or partial life-cycle (short-term) test, that causes no observable adverse effects on the test organisms (i.e., the highest concentration of toxicant in which the values for the observed responses are not statistically significantly different from the controls). For all tests during these monitoring periods, there were no observable effects on the test organism population at an effluent concentration strength of 100%, that is, the NOEC was 100% effluent.

In summary, results of all of the chronic effluent toxicity tests conducted during previous monitoring periods indicated full compliance with effluent limitations specified in the Grassy Island HWTT operational permit.

Table 4. Inhibition concentrations (IC25) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR July-September 2011*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3]		
		7/25/11	8/22/11	9/19/11
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia* (water flea)
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 5. Inhibition concentrations (IC25) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR December 2011 – March 2012*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date 12/12/11	Test Date 3/5/12
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia* (water flea)
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 6. Inhibition concentrations (IC25) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR September 2012 – June 2013*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3] 9/17/12	12/3/12	3/11/13	6/24/13
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%	>100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%	>100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia* (water flea)
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 7. Non-observable effects concentrations (NOEC) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR July-September 2011*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3] 7/25/11	8/22/11	9/19/11
FM Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%
CD Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia*
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 8. Non-observable effects concentrations (NOEC) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR December 2011 – March 2012*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date	
		12/12/11	3/5/12
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia* (water flea)
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 9. Non-observable effects concentrations (NOEC) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream, for *POR September 2012 – June 2013*.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3]			
		9/17/12	12/3/12	3/11/13	6/24/13
FM Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%
CD Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia*
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

For the most recent reporting period (July 2013 – June 2014), the chronic effluent toxicity test was performed on the effluent from the Grassy HWTT facility on five occasions (9/17/13, 12/10/13, 1/14/14, 2/11/14 and 5/28/14). Test results are presented in Table 10 and Table 11.

Results of all chronic effluent toxicity tests for this period indicated no adverse effects to test organisms. However, it should be noted that at the time of this report, the results of these tests are still pending approval from FDEP.

Table 10. Inhibition concentrations (IC25) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3]				
		9/17/13	12/10/13	1/14/14	2/11/14	5/28/14
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%	>100%	>100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	>100%	>100%	>100%	>100%	>100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia* (water flea)
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Table 11. Non-observable effects concentrations (NOEC) for fathead minnow and water flea test organisms as determined by chronic effluent toxicity testing of the Grassy Island HWTT facility outflow stream.

Test Species[1]	Test Concentration[2] (% Effluent)	Test Date[3]				
		9/17/13	12/10/13	1/14/14	2/11/14	5/28/14
FM Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%	100%
FM Growth (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%	100%
CD Survival (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%	100%
CD Reproduction (Eff)	0%, 100%, 50%, 25%, 12.5%, & 6.25%	100%	100%	100%	100%	100%

[1] FM: *Pimephalus promelas* (fathead minnow); CD: *Ceriodaphnia dubia*
[2] Concentrations of effluent used.
[3] Initial date of the seven day test.

Analysis of metals in alum floc and fish tissue in Grassy HWTT settling pond

The Grassy Island FDEP Permit #0259591-004 (Specific Condition #24) requires post-startup monitoring of the metals content of settled flocs and mosquitofish (*Gambusia holbrooki*) in the HWTT settling pond, as well as mosquitofish in Taylor Creek. As of 6/30/14, a total of ten monitoring events have been conducted. Samples of floc and mosquitofish were collected at three locations within the settling pond, and mosquitofish were sampled in Taylor Creek, upstream of the system intake structure (unaffected by the HWTT discharge). Although the permit specifies collection of three fish samples in Taylor Creek, fewer samples were collected on some occasions (including no samples on 8/13/12, 11/12/12 and 12/9/13) due to the scarcity of fish (possibly due to high flow/stage conditions). The floc and fish samples were analyzed for a suite of metals, which included arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg) and lead (Pb). All analyses were performed by Brooks Rand Laboratories in Seattle, Washington.

Analytical results from the six monitoring events during October 2011 – June 2014 are presented in Figure 96 and Figure 97. Metals concentrations in mosquitofish in the floc settling pond have been comparable to or less than concentrations in fish collected from Taylor Creek during the majority of the sampling events (Figure 96). Tissue concentrations of Cd and Cr were frequently below detection limits. For all sampling events, fish tissue metals concentrations in both the settling pond and Taylor Creek were substantially lower than corresponding predator protection limits recognized by USFWS (Giggleman and Lewis, 2002) (Table 12).

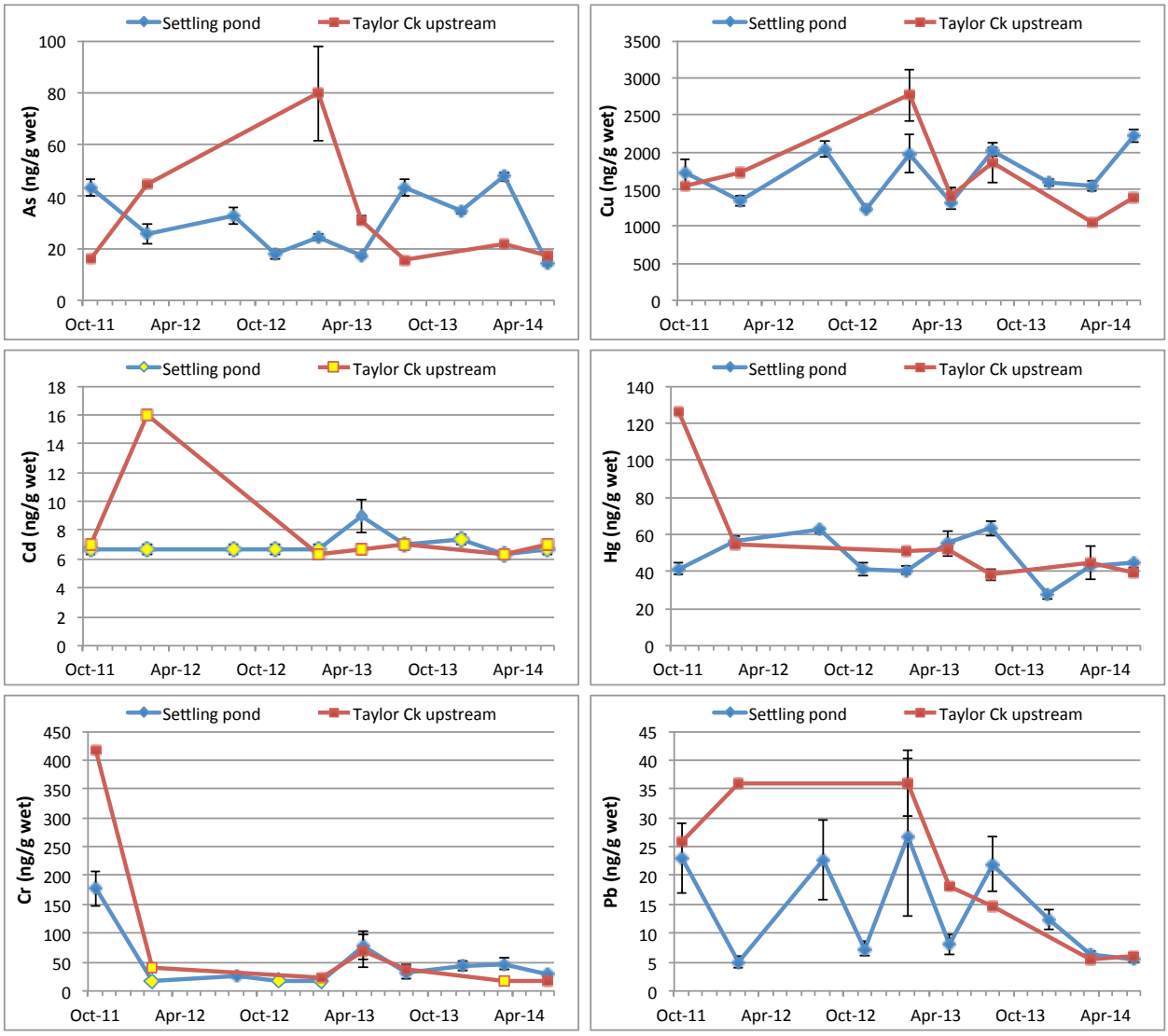


Figure 96. Total recoverable metal concentrations in *Gambusia* (ng/g wet) collected during sampling events from October 2011 – June 2014 in the Grassy HWTT settling pond and Taylor Creek, upstream of the Grassy HWTT facility.
We were unsuccessful in capturing fish from Taylor Creek during the 8/13/12, 11/12/12 and 12/9/13 sampling events. Values for the settling pond represent mean and SE of triplicate samples. MDL values are shown where concentrations were non-detectable (data points with yellow fill).

Table 12. Predator protection limits for tissue metal concentrations in prey fish, as cited by USFWS in Giggleman and Lewis (2002).

Analyte	Predator protection limit (ng/g wet)	Reference[1]
As	30000	Eisler (1988a)
Cd	500	Irwin (1988)
Cr	880	Eisler (1986a)[2]
Cu	300000	NRC (1980)
Hg	100	Eisler (1987)
Pb	50000	NRC (1980)

[1]References cited in Giggleman and Lewis, 2002 (USFWS).

[2]Cr guidance value of 4 mg/kg dry wt. was converted to wet wt. basis using mean total solids value of 22% for fish collected in Grassy pond.

Results of the analysis of bottom sediments (settled floc) in the Grassy HWTT settling pond (Figure 97) demonstrate that concentrations of all of the metals analyzed are consistently low relative to corresponding threshold effect (TEC) and probable effect (PEC) concentrations levels developed for sediments in Florida inland (fresh) waters (Table 13). It should be noted that apparent spikes in As, Cd and Cr during the 5th sampling event were an artifact of the relatively high MDL reported for those dates by the contract laboratory. The high MDLs, in turn, were caused by the low solids content of the submitted wet floc. For the most part, As and Cd concentrations have been below laboratory detection limits, while concentrations of Cr, Cu, Hg and Pb have been measureable, but considerably lower than TEC levels.

Overall, the analysis of metals in alum floc in the Grassy settling pond provides clear evidence that the use of alum coagulant in the HWTT system has not resulted in accumulation of harmful levels of As, Cd, Cr, Cu Hg or Pb in residual floc and sediments. Furthermore, analysis of metals in *Gambusia* tissue shows no indication of bioaccumulation of these metals relative to that in Taylor Creek upstream of the Grassy facility.

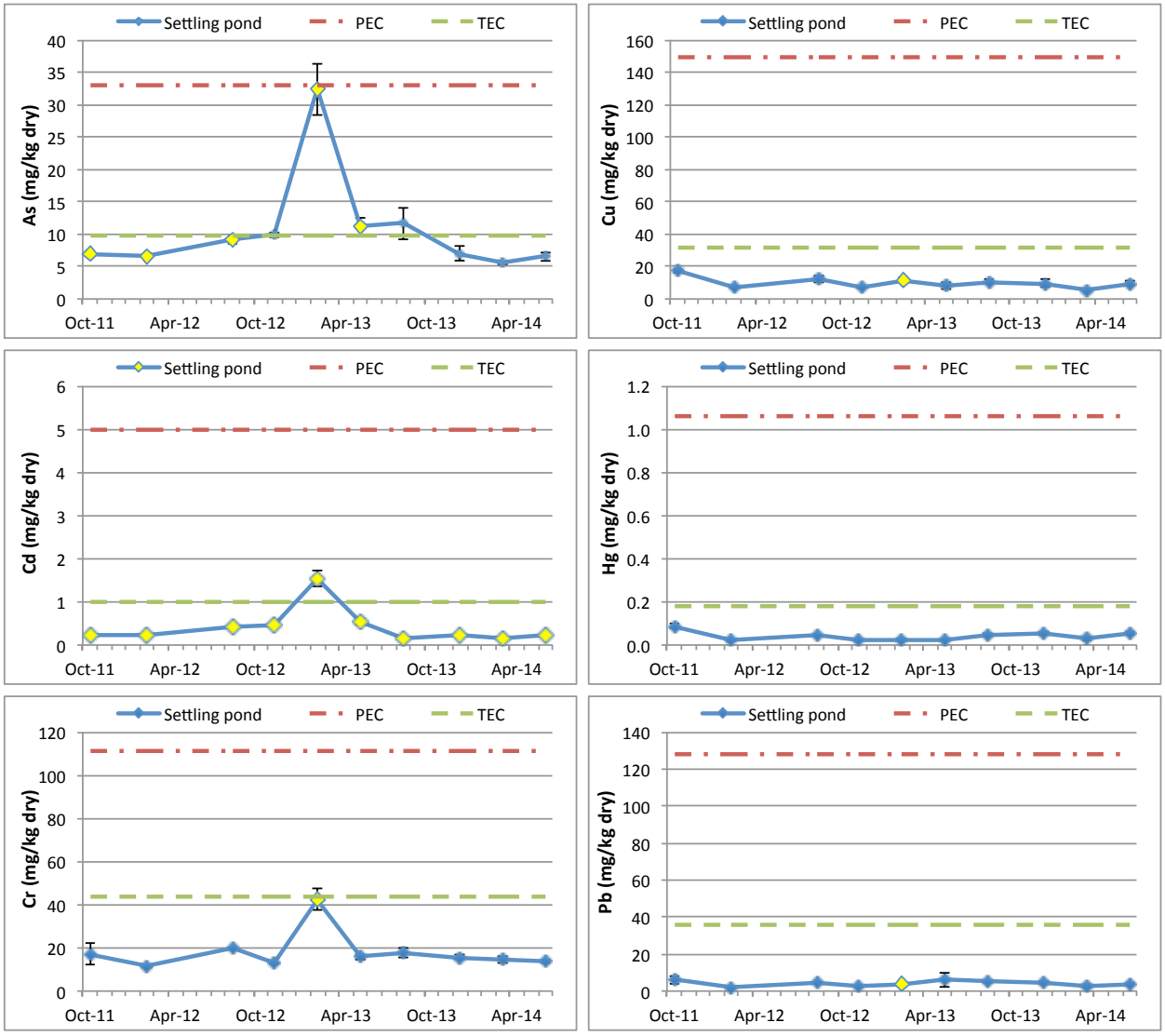


Figure 97. Total recoverable metal concentrations in floc (mg/kg dry) collected during sampling events from October 2011 – June 2014 in the Grassy HWTT settling pond.
Values for the settling pond represent mean and SE of triplicate samples. MDL values are shown where concentrations were non-detectable (data points with yellow fill).

Table 13. Numerical sediment quality assessment guidelines (mg/kg dry wt.) for selected metals in Florida inland waters (MacDonald et al., 2003). TEC = threshold effect concentration; PEC = probable effect concentration.

Metal	PEC	TEC
As	33	9.79
Cd	4.98	0.99
Cr	111	43.4
Cu	149	31.6
Hg	1.06	0.18
Pb	128	35.8

Discussion

For decades, chemical treatment systems and treatment wetlands have been utilized independently for treating wastewaters and surface waters. Due to their low land area requirements, chemical treatment systems often are utilized in urban settings. However, these systems have moderate to high operating costs due to their continuous consumption of chemicals (i.e., coagulant, buffers, coagulant aids). In chemical treatment systems the pollutant removal efficiency (and outflow concentration) is controlled largely by inflow pollutant concentrations, chemical characteristics of the water (alkalinity, color, turbidity) and the coagulant dose. In these systems, pollutants are removed from the water column by adsorption to, or incorporation into, a chemical floc that settles to the bottom of a pond or clarifier. The floc is periodically removed from the system, dried, and typically transported to another site for land application or disposal, often at a relatively high cost. While extremely effective for removing many water pollutants such as P, chemical treatment is less effective for removing other constituents, such as dissolved inorganic nitrogen (N) species.

In contrast to chemical treatment systems, treatment wetlands occupy a much larger area (footprint), and differ markedly with respect to contaminant removal efficiencies. For example, wetlands are quite effective (on an areal basis) at removing inorganic N species, but require large amounts of land for effective P removal (DeBusk et al., 2005). Pollutant removal in treatment wetlands is usually controlled by manipulating system hydraulic residence time (HRT) (i.e., footprint) (Kadlec and Wallace, 2009), and to a lesser extent, the type(s) of dominant vegetation. Unlike chemical treatment systems, pollutant removal in treatment wetlands is accomplished through both transformations and sequestration. For example, constituents such as N and carbon (C) typically are transformed within treatment wetlands, with a portion liberated as gaseous forms and the remainder sequestered in the sediments. Other constituents, such as P and heavy metals, rely solely on sediment sequestration (burial) as an ultimate removal mechanism. Extremely large treatment wetlands, termed Stormwater Treatment Areas (STAs), have been constructed throughout south Florida for reducing P levels in runoff. Depending on environmental conditions, P in

wetland sediments that is associated with either recalcitrant organic matter, or bound to metal (iron, calcium and particularly, aluminum) compounds in the sediments, can remain permanently sequestered. Environmental perturbations, such as system drydown and reflooding, can result in the release of sediment P associated with organic matter, thereby impairing the long-term removal efficiency.

The HWTT concept was developed with the intent of harnessing and integrating the strengths of both wetland and chemical treatment technologies. HWTT systems are comprised of vegetated zones (primarily with floating and/or submerged macrophytes) and non-vegetated zones, and utilize internal floc recycling as well as the drying of floc material with subsequent re-introduction into the treatment train. Chemical coagulants are added to the front-end of the system, which is equipped with one or more deep zones to capture and store the resulting chemical flocs. A fundamental concept of the HWTT is that the floc material resulting from coagulant addition remains at least temporarily viable, and can be "re-used" for additional P removal. Findings from the present study demonstrate that the HWTT configuration offers a superior alternative to conventional chemical treatment systems and STAs for treatment of Northern Everglades runoff. Key attributes of this technology, as demonstrated by current and previous investigations, are as follows:

- HWTT systems can achieve low outflow TP concentrations
- HWTT systems provide effective nitrogen removal
- HWTT systems provide efficient floc management alternatives
- HWTT systems are economical, and further minimization of coagulant use may be attainable for Northern Everglades sub-basins

The optimization plan for HWTT system operations is intended to maximize phosphorus removal in the most cost effective manner. Since chemical coagulant (aluminum sulfate or alum) accounts for a significant portion of operational costs, many strategies for minimizing its use (thereby limiting excessive aluminum outflow concentrations) have been incorporated into the design and operation of HWTT systems, such as:

- optimization of the chemical coagulant dosage

- active reuse of flocculants in the contact pond
- passive reuse of flocculants in the floating aquatic vegetation pond

Monitoring results from the most recent reporting period (July 1, 2013 through June 30, 2014) reflect the high efficiency of HWTT systems for treatment of waters with widely varying chemical characteristics and P loads. In addition, these results provide clear evidence of the sustainability and long-term P removal capacity of these systems.

All of the HWTT systems continued to provide effective removal of TP during the July 2013-June 2014 monitoring period. In particular, the Ideal Grove and Grassy Island systems were exemplary in this regard, despite extremely variable inflow TP concentrations at these sites. Flow-weighted mean inflow TP concentrations were reduced from 799 to 247 µg/L (69% reduction) at the Nubbin facility, 862 to 48 µg/L (94% reduction) at Ideal, 640 to 150 µg/L (77% reduction) at Mosquito, 101 to 29 µg/L (71% reduction) at Lemkin, 146 to 24 µg/L (83% reduction) at Wolff, and 490 to 93 µg/L (81% reduction) at the Grassy facility.

Total N concentration was effectively reduced in all of the HWTT systems during the monitoring period. Mean inflow TN concentration ranged from 1.59 mg/L at the Lemkin HWTT facility to 4.55 mg/L at the Mosquito Creek facility. The lowest mean outflow TN concentration (1.09 mg/L) was observed at the Grassy Island HWTT system, which achieved an average reduction in TN concentration of 43 percent. N removal in this system appears to be enhanced by the shallow SAV zone, which provides an extended HRT in the back end of the system. The Ideal Groves HWTT system, which also incorporates a back-end SAV zone, achieved an average TN reduction of 57 percent, from a mean concentration of 2.81 mg/L at the inflow to 1.20 mg/L in the outflow stream. Lower percent reduction of TN was observed at the Lemkin and Wolff HWTT facilities (18 and 21 percent, respectively), owing to the relatively low inflow concentration at both sites. Outflow TN concentrations at both Lemkin and Wolff (1.30 and 1.31 mg/L, respectively), however, were comparable to outflow TN at the Ideal and Grassy facilities. Mean outflow TN concentrations were highest for Nubbin Slough (2.29 mg/L) and Mosquito Creek (2.38 mg/L), the two HWTT systems lacking a shallow vegetated zone. Nevertheless, reductions

in mean TN concentrations were favorable at both sites: 28 and 48 percent at Nubbin and Mosquito Creek, respectively.

Inflow water chemistry at several of the HWTT sites exhibited a typically high degree of variability during the reporting period, due to both seasonal trends and short-term fluctuations. Short-term temporal changes in inflow water chemistry are likely caused by a combination of interrelated factors. These may include dilution of dissolved constituents from rainfall and resulting increases in streamflow, increased particulate load during major rain events, variable loading of P and other constituents in the watershed, accelerated transport (flushing) of these constituents from watershed soils to receiving streams during rain events (counteracting dilution effects), and antecedent rainfall levels.

Wide fluctuations in water chemistry present a serious challenge to maintaining a consistently high level of TP removal, and can adversely affect the efficiency of the coagulation process, and subsequently the export of total Al from the system. For example, high levels of color (indicative of dissolved organic matter) tend to create problems with floc formation. Sharp increases in color were periodically observed, particularly under high stream flow conditions, at Nubbin, Mosquito and Grassy HWTT inflows during the monitoring period, with maximum levels reaching the 800 – 1000 PCU range.

Elevated outflow Al during the first three months of the most recent monitoring period (July 1 – October 2, 2013) at the Grassy Island HWTT system was associated (Figure 98) with a period of highly elevated and fluctuating stream flow in Taylor Creek. Outflow total Al concentrations during this period (wet season) averaged 1220 µg/L (median = 1150 µg/L) and ranged from 556 to 2170 µg/L (Figure 99). During the subsequent months, through early June 2014 (dry season), mean outflow total Al concentration decreased to 269 µg/L (median = 168 µg/L), ranging from 83 to 705 µg/L (Figure 100).

As commonly observed during the operation of the Grassy HWTT system, increased wet season flow in Taylor Creek often is accompanied by sharp increases in creek water TP and color and a substantial drop in alkalinity (Figure 101), all of which are detrimental to the effectiveness of the HWTT system alum coagulation process. For example, inflow alkalinity

averaged 41 mg/L and ranged from 28 to 68 mg/L during the 2013 wet season period, increasing to a mean of 95 mg/L and range of 53 to 130 mg/L during the subsequent dry season. In addition, inflow color and TP concentrations were substantially higher during the 2013 wet season (color mean = 693 PCU and range = 530-802 PCU; TP mean = 585 µg/L and range = 363-807 µg/L) than during the following dry season (color mean = 172 PCU and range = 92-291 PCU; TP mean = 276 µg/L and range = 92-468 µg/L). These chemical interferences result in the formation of poorly settling "microflocs", which in turn result in elevated total Al and particulate P levels in the system outflow. Total Al export during the wet season may be further exacerbated by elevated Al concentrations in the system inflow stream during this time (Figure 101).

In comparison to the Grassy HWTT system, inflow water chemistry at the Lemkin Creek and Wolff Ditch HWTT facilities is relatively consistent and, accordingly, outflow total Al concentrations are more stable throughout the year (Figure 102 and Figure 103). However, despite the fact that the Lemkin systems are achieving a high P removal efficiency (83% and 81% P removal, with 29 and 23 mg/L mean outflow P, for Lemkin and Wolff, respectively, for the recent monitoring period) on a relatively consistent basis, there remains a low-level net export of Al from both systems. During the recent monitoring period, mean outflow total Al concentrations of 479 and 290 µg/L were observed at the Lemkin and Wolff facilities, respectively.

There are reportedly around 55 surface water alum-based treatment systems in Florida (Bottcher et al., 2009), but few report inflow and outflow total Al levels. However, it should be noted that export of Al has been well documented at the Lake Apopka - Beauclair alum treatment system, reportedly the largest surface water alum-based treatment system in the world (Figure 104). Historical levels of outflow total Al at this facility are relatively high in comparison to the Wolff and Lemkin HWTT facilities, and more comparable (including high temporal variability) to wet season outflow total Al at the Grassy HWTT facility. During the period from March 2009 – September 2013, total Al concentration in the outflow of the Beauclair treatment system averaged 1090 µg/L and ranged from 167 to 1820 µg/L.

Although we have demonstrated that export of Al can be substantially minimized through optimization of treatment system parameters, release of at least some total Al from alum-based nutrient abatement facilities may be unavoidable, due primarily to the unpredictable nature of the inflow water chemistry. However, it is highly unlikely that exported Al in the amounts measured at the HWTT facilities represents a toxicity risk to organisms in downstream areas. Much is known about the behavior of aluminum in the environment, and it is considered relatively benign in situations where non-acidic conditions prevail (such as in south Florida wetlands). Aluminum released from HWTT systems is predominantly in the form of suspended "microfloc" [$Al(OH)_{3(s)}$], which has a minimum solubility in the pH range of 6-8, and ultimately becomes incorporated into downstream sediments. The stability of $Al(OH)_3$ increases with aging, as the amorphous form crystallizes over time (e.g., a period of months) to form the mineral gibbsite (Berkowitz et al., 2006).

It is also useful to examine the level of Al "enrichment" in downstream waters of Taylor Creek, which can be done via comparison of total Al concentrations at the Grassy HWTT inflow point with concentrations at the Taylor Creek STA inflow point 1.2 miles (1.9 km) downstream. Although the Al data availability was limited for the STA inflow site, it is evident that total Al concentrations downstream from the Grassy HWTT facility were comparable to upstream concentrations (Figure 105). The lack of Al enrichment downstream from the Grassy HWTT facility is undoubtedly due in part to dilution of Al in the Grassy outflow stream, but likely also reflects incorporation of insoluble $Al(OH)_{3(s)}$ into Taylor Creek sediments.

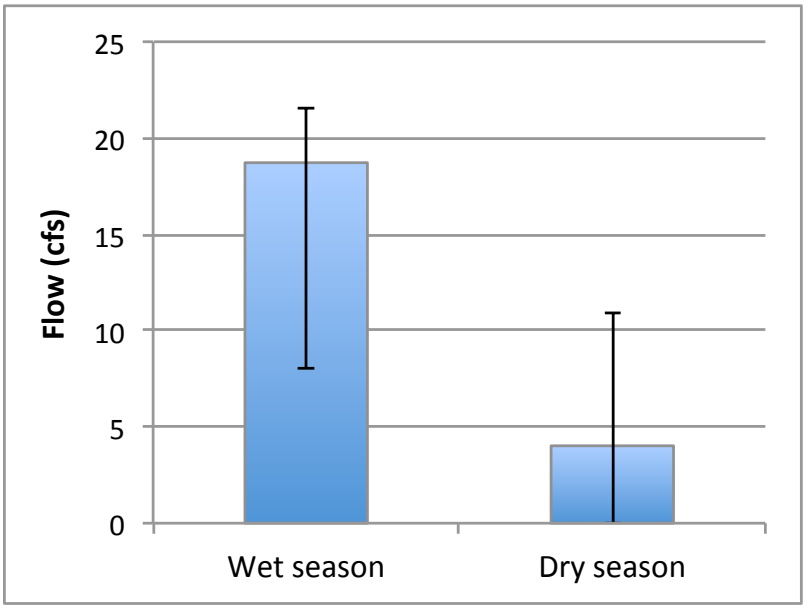


Figure 98. Mean Grassy HWTT system inflow rate during the periods 7/1 – 10/2/13 (wet season) and 10/16/13 – 6/11/14 (dry season). Error bars denote minimum and maximum daily flow rates during each period.

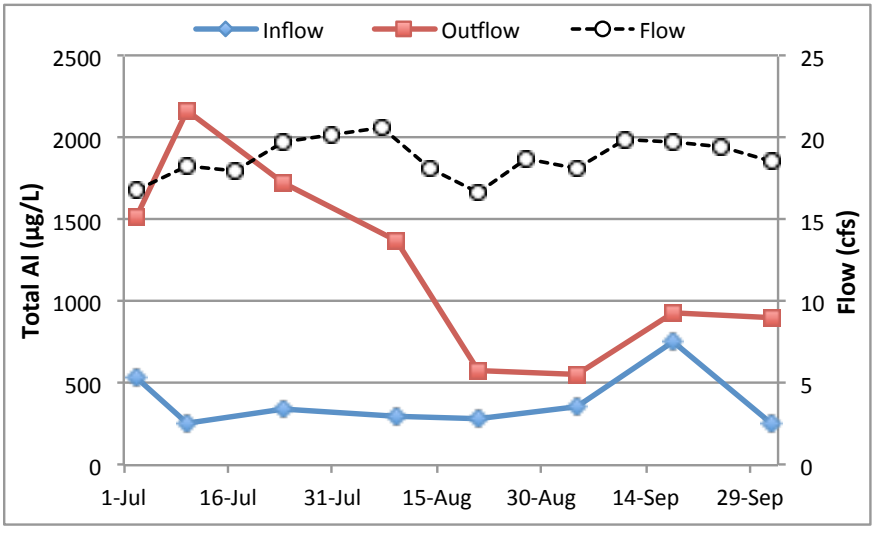


Figure 99. Total Al concentration in the Grassy HWTT inflow and outflow streams during the wet season period of July 1 – October 2, 2013. Also shown is the system flow rate (mean value for prior 7 days).

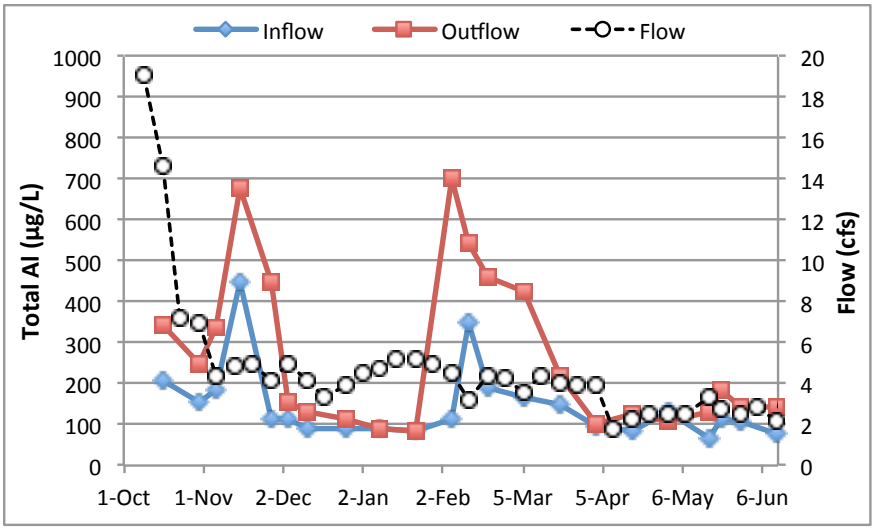


Figure 100. Total Al concentration in the Grassy HWTT inflow and outflow streams during the dry season period of October 16, 2013 – June 11, 2014. Also shown is the system flow rate (mean value for prior 7 days).

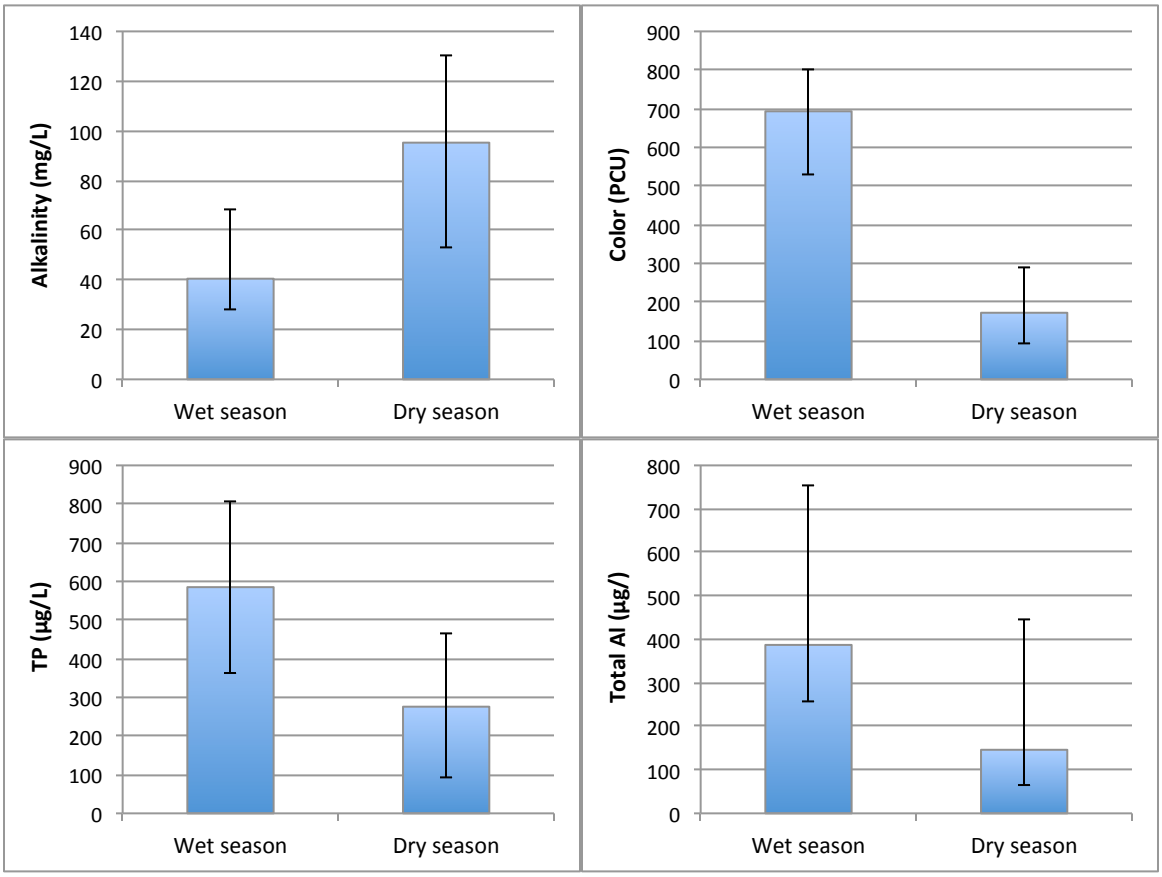


Figure 101. Mean concentrations of alkalinity, color, TP and total Al in the Grassy HWTT system inflow during the periods 7/1 – 10/2/13 (wet season) and 10/16/13 – 6/11/14 (dry season). Error bars denote minimum and maximum concentrations during each period.

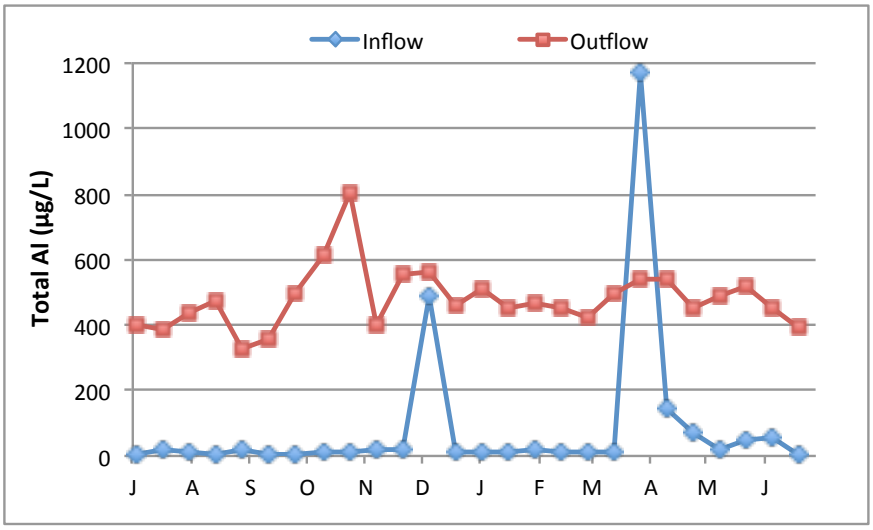


Figure 102. Total Al concentration in the Lemkin HWTT inflow and outflow streams during the period July 1, 2013 – June 30, 2014.

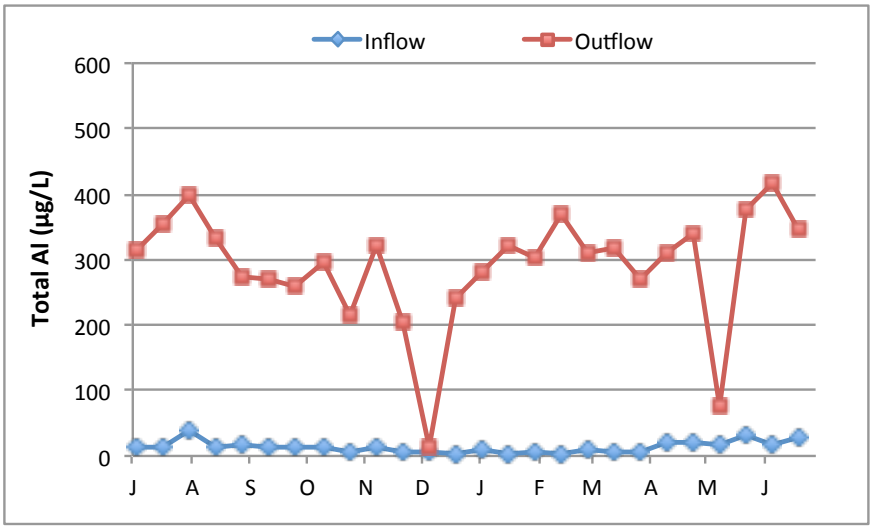


Figure 103. Total Al concentration in the Wolff HWTT inflow and outflow streams during the period July 1, 2013 – June 30, 2014.

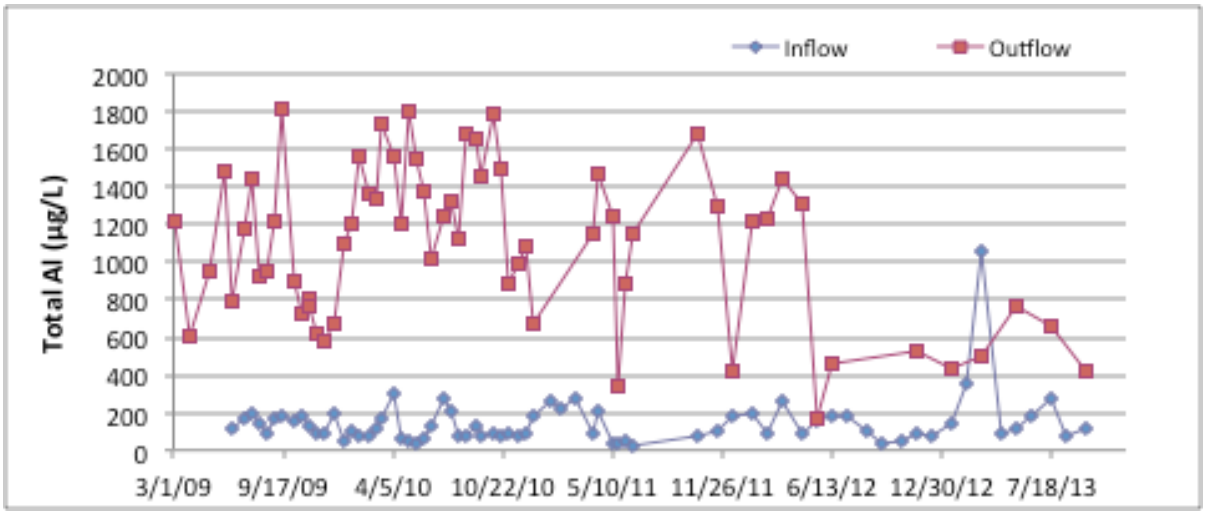


Figure 104. Total Al concentrations in the inflow and outflow streams of the Beauclair (Lake Apopka) alum treatment facility in Lake County, Florida. Note: operation of this facility was relatively continuous during 2009 – 2011, but was only intermittent during 2012 and 2013.

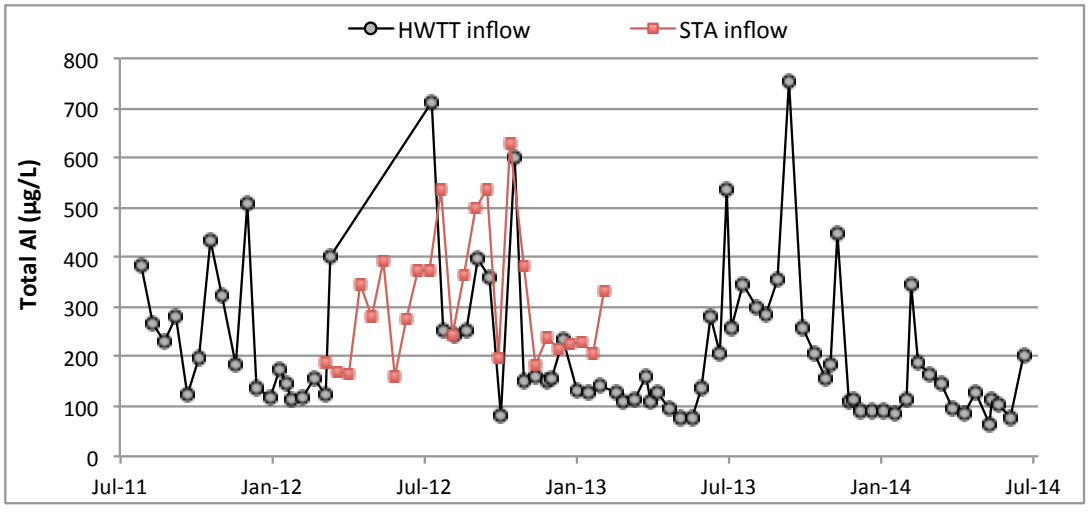


Figure 105. Total Al concentration in Taylor Creek, at the inflow sampling sites for the Grassy HWTT facility and the Taylor Creek STA, located 1.2 miles (1.9 km) downstream. Data for the STA inflow site (station S390) were obtained from the SFWMD DBHYDRO web site. Total Al data availability for S390 was limited to the period 3/6/12 – 2/5/13.

The use of alum (aluminum sulfate) in HWTT and conventional chemical treatment facilities also typically results in a net export of sulfate from the system. While this export is minimized in HWTT facilities due to the internal reuse of floc materials (and reduced use of alum), some increase in sulfate levels during passage through the system can still occur. Discussion presented in early chapters of the South Florida Environmental Report (SFER) published by the South Florida Water Management District (Axelrad et al., 2011 and others) suggest that sulfate, through its reduction to sulfide, can interfere with soil P retention and cause toxicity to emergent plants in south Florida marshes. Additionally, sulfate has been implicated in the methylation of mercury, through the activity of sulfate reducing bacteria.

More recent research (Dierberg, et al. 2011) has shown that due to the unique biogeochemical characteristics of south Florida marshes, sulfate has little to no effect on wetland soil P retention. Similarly, recent experiments also suggest that sulfate/sulfide in south Florida is probably not hindering growth of native marsh plants such as sawgrass. Finally, it remains unclear as to whether sulfate controls are an effective means of curtailing mercury methylation in south Florida marshes. There is new evidence that a potentially significant amount of Hg methylation in the Everglades occurs in the presence of low-level (ca. 1 mg/L) "background" sulfate levels in Florida marshes, as well as a result of syntrophic (as opposed to sulfidogenic) microbial metabolism (Bae et al., 2014), which would suggest that net mercury methylation is most likely not limited to the action of sulfate reduction. Until more data become available, the minimization of methylmercury in south Florida marshes via sulfate control remains speculative.

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Implementation of Hybrid Wetland Treatment Technology in the Northern Everglades Watershed

Task 30 Deliverable: Final Report

Chapter II: Performance Measures
Phosphorus Removal, Economic Analyses and Environmental & Ancillary Benefits
Sites 1-3, 5-7

Prepared for:
Florida Department of Agriculture and Consumer Service (FDACS)

August 11, 2014
Revised August 28, 2014

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Glossary of Acronyms

Al:	Aluminum
ATS:	Algal Turf Scrubber
cfs:	Cubic Feet per Second
EOF:	Edge of Farm
FAV:	Floating Aquatic Vegetation
FDEP:	Florida Department of Environmental Protection
gpm:	gallons per minute
hp:	horsepower
HWTT:	Hybrid Wetland Treatment Technology
HRT:	Hydraulic Retention Time
lbs:	Pounds
µg/L:	Micrograms per Liter
mg/L:	Milligrams per Liter
NO_x	Nitrate + Nitrite
N:	Nitrogen
O&M:	Operations and Maintenance
P:	Phosphorus
PAC:	Polyaluminum Chloride
PP:	Particulate Phosphorus
POR:	Period of Record
PV:	Present Value
SAV:	Submerged Aquatic Vegetation
SFWMD:	South Florida Water Management District
STAs:	Stormwater Treatment Areas
SPLP:	Synthetic Precipitation Leaching Procedure
TMDL:	Total Maximum Daily Load
TN:	Total Nitrogen
TP:	Total Phosphorus
VFDs	Variable Frequency Devices

Executive Summary Chapter II

Table 1 provides a comparative summary of key parameters for the HWTT operational systems. The Table is linked to an Excel Spreadsheet, which can be accessed by double clicking on the image. The data is stored in a table format, and the drop down menus can be used to sort by specific parameters to perform both horizontal and vertical analyses over time for all sites. Additional data is available in the Parameter menu.

The Cost/Benefit values under the Full Capacity Amortized Loan methodology improved at all sites except Nubbin Slough and Wolff Ditch over the previous period. Grassy Island has the lowest Cost/Benefit calculation; the facility has relatively sustained flows and mid-range phosphorus (P) levels. The primary factors influencing cost/benefit at Nubbin Slough during the current period were additional expenditures incurred for limerock bed improvements and flow meter issues.

The percent reduction in total phosphorus (TP) flow weighted concentration in compared to flow weighted concentration out improved or remained relatively stable at all sites excluding Nubbin Slough and Grassy Island. Combined TP removal during the period was 9,965 pounds (lbs.), and the total flow treated was 3,421 million gallons. The inclusion of P outflow concentrations from the South Pond located downstream of Lemkin Creek and Wolff Ditch improve performance measurements. The cumulative TP removal rates for all operational periods range from 93% at Ideal Grove to 69% at Lemkin Creek (Figure 8). The flow meter issues affected TP removal at Nubbin Slough for the current period.

The locations of the HWTT systems are depicted in Figure 1, together with area Rain Stations and Regional and HWTT watersheds. The associated thirty-year average regional rainfall and the current contract period data are presented in Table 2, as compared to HWTT site capacity and TP removal. Rainfall for the current period was equivalent to or greater than the thirty-year average for all of the six systems. Watershed basin run-off into HWTT water sources is not necessarily proportional, however, to rainfall for any given period. Various factors affect the relationship, including the duration of the rain event and availability of associated detention systems.

Table 1. Key Parameters Sites 1-3, 5-7.

Double click image to open Excel Spreadsheet File. Use drop-down menus to select sort by site and/or desired parameters. Please note that additional data are available in the Parameter drop-down menu.

Key Parameters Sites 1-3, 5-7 Periods 1-6 (See Notes & Assumptions) *Projected Full Capacity Utilization							
Site	**Parameter**	**Period 1**	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
Nubbin Slough	Cost/Benefit $/lb. PV*	$51	$33	$30	$ 30	$ 34	$ 72
Nubbin Slough	Ave. FW TP Conc. In µg/L	905	794	792	819	775	799
Nubbin Slough	Ave. FW TP Conc. Out µg/L	274	73	109	231	169	247
Nubbin Slough	% Change TP Conc. In vs. Out	70%	91%	86%	72%	78%	69%
Nubbin Slough	Total TP Removal in lbs.	1,299	466	879	914	1,280	1,097
Ideal Grove	Cost/Benefit $/lb. PV*	$191	$85	$108	$ 163	$ 67	$ 67
Ideal Grove	Ave. FW TP Conc. In µg/L	N/A	258	347	421	623	862
Ideal Grove	Ave. FW TP Conc. Out µg/L	N/A	16	50	19	24	48
Ideal Grove	% Change TP Conc. In vs. Out	N/A	94%	86%	96%	96%	94%
Ideal Grove	Total TP Removal in lbs.	45	45	45	71	117	183
Mosquito Creek	Cost/Benefit $/lb. PV*	$54	$69	$80	$ 98	$ 123	$ 88
Mosquito Creek	Ave. FW TP Conc. In µg/L	N/A	345	506	435	541	640
Mosquito Creek	Ave. FW TP Conc. Out µg/L	N/A	61	149	85	118	150
Mosquito Creek	% Change TP Conc. In vs. Out	N/A	82%	70%	81%	78%	77%
Mosquito Creek	Total TP Removal in lbs.	373	664	591	669	1,214	1,357
Lemkin Creek	Cost/Benefit $/lb. PV*		$261	$359	$ 259	$ 283	$ 169
Lemkin Creek	Ave. FW TP Conc. In µg/L		85	76	87	85	101
Lemkin Creek	Ave. FW TP Conc. Out µg/L		30	22	31	24	29
Lemkin Creek	% Change TP Conc. In vs. Out		64%	71%	64%	71%	71%
Lemkin Creek	Total TP Removal in lbs.		155	50	149	223	254
Wolff Ditch	Cost/Benefit $/lb. PV*		$51	$252	$ 114	$ 105	$ 115
Wolff Ditch	Ave. FW TP Conc. In µg/L		114	44	95	156	146
Wolff Ditch	Ave. FW TP Conc. Out µg/L		28	23	35	52	24
Wolff Ditch	% Change TP Conc. In vs. Out		75%	48%	63%	66%	83%
Wolff Ditch	Total TP Removal in lbs.		393	57	285	472	405
Grassy Island	Cost/Benefit $/lb. PV*			$91	$ 90	$ 61	$ 59
Grassy Island	Ave. FW TP Conc. In µg/L			575	327	442	490
Grassy Island	Ave. FW TP Conc. Out µg/L			165	27	50	93
Grassy Island	% Change TP Conc. In vs. Out			71%	92%	89%	81%
Grassy Island	Total TP Removal in lbs.			1,897	971	4,493	6,670
Total Systems	Total TP Removal in lbs.	1,754	1,763	3,519	3,058	7,799	9,965

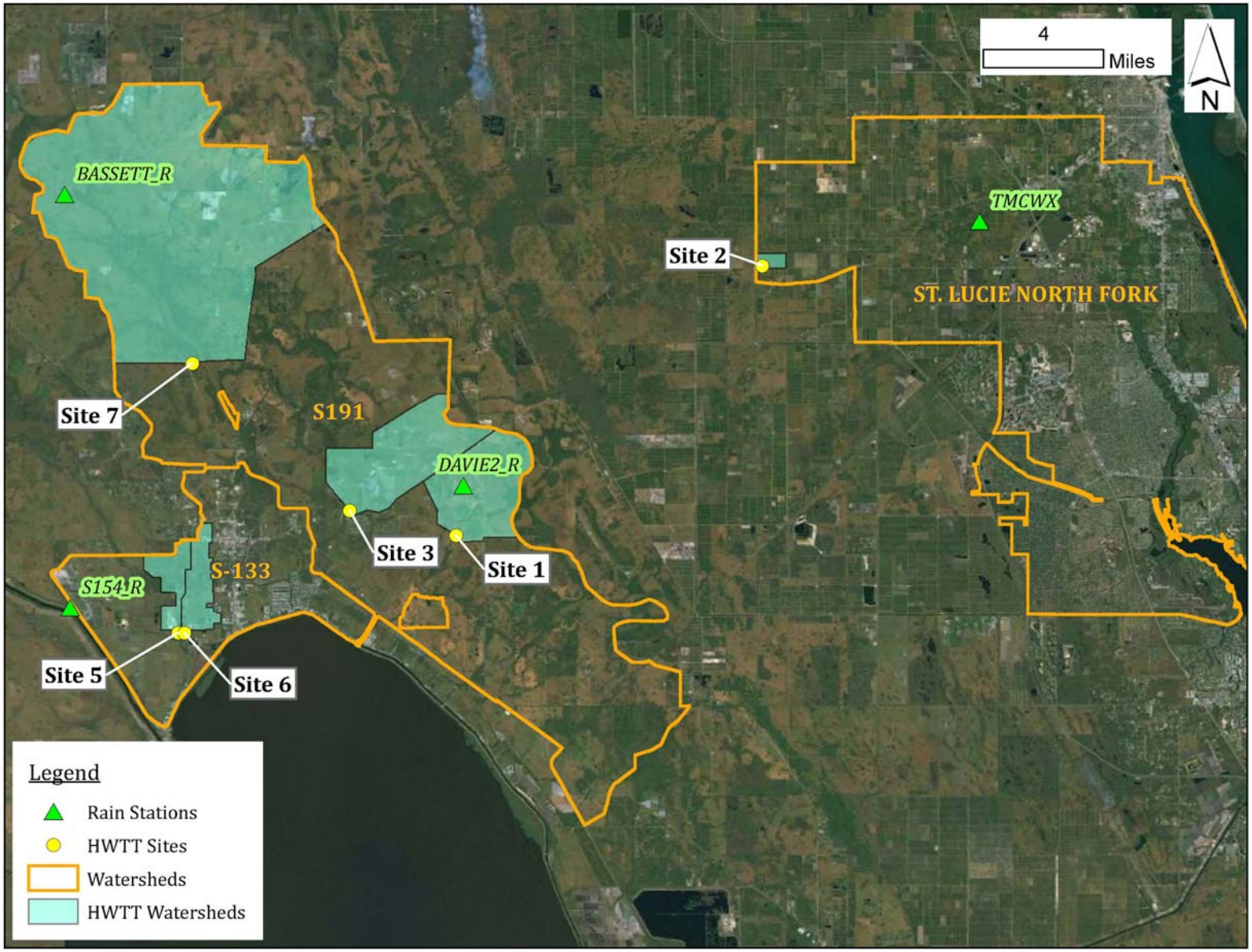


Figure 1. Project Site Map including Rain Stations and Watersheds.

Table 2. Average and POR Regional Rainfall and HWTT Site Capacity and TP Removal.

Site No.	Site Name	Rain Station Note 1	Historical Annual Avg. Rainfall (in) Note 2	POR Ave. Rainfall (in) Note 3	POR Rainfall as % of Historical	HWTT - Design Capacity (cfs) Note 4	HWTT - % Capacity Utilization for POR	HWTT - TP Removed for POR (lbs.)
1	Nubbin Slough	Davie2 R	44.19	52.10	117.9%	7.4	14%	1097
2	Ideal Grove	TMCWX	54.16	57.94	107.0%	1.3	9%	183
3	Mosquito Creek	Davie2 R	44.19	52.10	117.9%	6	28%	1357
5	Lemkin Creek	S154 R	44.19	44.51	100.7%	5	36%	254
6	Wolff Ditch	S154 R	44.19	44.51	100.7%	20	8%	405
7	Grassy Island	Bassett R	44.19	57.94	131.1%	20	43%	6670
Notes:	1. Rain stations are monitored and maintained by SFWMD.							
	2. Historical annual average rainfall based on 30 years (1981-2010) as reported by SFWMD for Lake Okeechobee and Martin/St. Lucie regions.							
	3. POR: 7/1/13-6/30/14; Total rainfall for period of record obtained via SFWMD's Dbhydro database.							
	4. Permitted capacity for Grassy Island.							

Phosphorus Removal Existing Operational Sites

The Hybrid Wetland Treatment Technology (HWTT) is a complete system that integrates the best aspects of chemical and wetland treatment technologies. A primary means of analyzing the technical capabilities of this system is through study of its effectiveness in removing P. A complete discussion of detailed operating conditions and sampling results of other water quality characteristics is contained within the Chapter I Technical Section of this Final Report.

Covered Sites, Data Period, Methodology & Records

Chapter II of this Final Report covers the following operational HWTT sites: Nubbin Slough (Site 1), Ideal Grove (Site 2), Mosquito Creek (Site 3), Lemkin Creek (Site 5), Wolff Ditch (Site 6) and Grassy Island (Site 7). The data presented relates to the period of record (POR) from 07/01/13 through 06/30/14 (365 days) for all sites (Period 6). References to the covered period will be assumed unless specified otherwise. Flow is measured and recorded daily for operational days; phosphorus concentrations, both in and out, are sampled in accordance with the Operations & Maintenance (O&M) Plan and linearly interpolated for daily estimates. Detailed daily records and activities are included by site in the accompanying Appendices. Data from previous contracts are also presented; however, comparisons to other periods may be skewed due to differences in the length of the periods and changes in capacity.

Phosphorus Removal Effectiveness

The HWTT can achieve low mean outflow TP concentrations in Northern Everglades' sub-basins. There are presently two numeric TP limits for Lake Okeechobee and its watershed. The first is a Total Maximum Daily Load (TMDL) for all Class III tributary waters in the Lake Okeechobee Basin of 113 μg/L; the second is a 105 metric ton limit from all combined surface waters entering Lake Okeechobee. The latter load limitation is functionally equivalent to approximately 40 μg/L TP Lake inflow concentration.

Table 3 provides a comparative summary of operating performance statistics for the HWTT systems for Period 6. (Comparable schedules are reproduced from previous Final Reports

for information purposes in Appendix I.) All sites met the Tributary TMDL except Nubbin Slough and Mosquito Creek, based on the interpolated average flow-weighted outflow concentrations for the period. Lemkin Creek and Wolff Ditch attained the more stringent Lake Okeechobee TMDL for the period. The physical configuration at Nubbin Slough is a factor in performance for that site. The chart also includes a summary of several operational days defined as follows:

1. # Days in Period – represents the days covered in the reporting period or POR.

2. # Days On-Line – represents the days the facility was on-line and available to operate regardless of flow capacity.

3. # Days On-Line Flow > 0 – represents the days included in Item 2 above in which flow was available to treat.

4. # Days in Period Flow >0 less Non-Controllable Downtime – represents the days covered in the period (Item 1 above) where flow was available to treat, less days the system was not operating for reasons outside the control of Watershed Technologies. Specific examples of non-controllable downtime include construction of limerock beds and power outages. Conversely, floc removal is considered to be a controllable occurrence since it is part of the HWTT process.

5. % Days On-Line vs. Available Days – Item 3 divided by Item 4 above.

Each of the data categories enumerated in the table provides varying means of analyzing operations during the period. Lemkin Creek, Wolff Ditch and Grassy Island were on-line and available to treat 100% of the time when flow was available, excluding any non-controllable down-time. Ideal Grove was available 99% of the time, Nubbin Slough 96% (limerock bed refurbishing), and Mosquito Creek 88% (floc removal and tilling). The percentage calculation does not measure capacity utilization, as there is no consideration for the actual quantity or level of flow.

Table 4 compares the percentage of TP concentration inflow on an average (interpolated) daily basis meeting the TMDLs versus the percentage of TP concentration outflow attaining

the TMDL following HWTT processing. Lemkin Creek and Wolff Ditch met the Tributary TMDL 94% of the time; Ideal Grove 87%; Grassy Island 82%; Nubbin Slough 49%; and Mosquito Creek 46%. TP average inflow concentration levels ranged from 862 micrograms per liter (µg/L) to 101 µg/L. Ideal Grove had the highest flow-weighted TP inflow concentrations (862 µg/L); Nubbin Slough averaged the second highest (799 µg/L) and Mosquito Creek levels were the third highest (640 µg/L). There generally were sustained TP inflow levels during the period. Nubbin Slough inflow concentrations were above the Tributary TMDL for 100% of the samples during the period; Grassy Island exceeded the limit 99% of the time; Ideal Grove and Mosquito Creek inflow levels exceeded the limit 94% of the time; Wolff Ditch exceeded the limit 44% of the time; and Lemkin Creek exceeded the limit for 27% of the samples. TMDL performance measures from previous periods are also shown in Appendix I for information purposes.

The HWTT system outflow P levels have previously been described to be far lower than those attained by Stormwater Treatment Areas (STAs) or other technologies north of Lake Okeechobee. A detailed comparison would require examination of numerous factors at all sites, including TP levels, which is beyond the scope of this Report. In addition to higher outflow TP levels, the percentage removal efficiencies for the wetland and algal technologies were markedly lower than those of the HWTT systems. Further, the percentage TP removal efficiencies of HWTT exceeded those of the conventional chemical technologies, despite the coagulant minimization techniques incorporated in the HWTT systems.

Water quality characteristics are summarized in Table 5. Please refer to this Chapter and Chapter I for a complete discussion of the results of operations. A listing of installed HWTT components at the various sites is shown in Table 6.

Table 3. Comparative Performance Statistics for Operational Sites Period 6 POR July 1, 2013 – June 30, 2014.

SUMMARY TP PERFORMANCE & COMPARISON Sites 1-3, 5-7												
Site	**Average Daily Flow gpm****	**Average Inflow Conc.***	**Average Outflow Conc.***	**lbs. of TP Removed per Day****	**Facility Size cfs******	**% Capacity Utilization Based on Flow**	**Facility Purpose**	**# Days in Period**	**# Days On-Line**	**# Days On-Line Flow > 0.0000**	**# Days in *Period* Flow > 0.0000 Less Non-Controllable Down Time**	**% Days On-Line vs. Available Days *****
Nubbin Slough	470	799	247	3.15	7.40	14%	Remove P & N in cost-effective & environmentally sound manner.	365	350	348	361	96%
Ideal Grove	52	862	48	0.50	1.30	9%	Remove P & N in cost-effective & environmentally sound manner.	365	362	362	364	99%
Mosquito Creek	760	640	150	4.49	6.00	28%	Remove P & N in cost-effective & environmentally sound manner.	365	310	302	344	88%
Lemkin Creek	806	101	29	0.71	5.00	36%	Remove P & N in cost-effective & environmentally sound manner; provide flow to downstream wetlands.	365	358	358	358	100%
Wolff Ditch	762	146	24	1.11	20.00	8%	Remove P & N in cost-effective & environmentally sound manner; provide flow to downstream wetlands.	365	364	364	364	100%
Grassy Island	3861	490	93	18.43	20.00	43%	Remove P & N in cost-effective & environmentally sound manner & provide lower input concentrations to downstream waters.	365	362	362	362	100%
Tributary TMDL			113									
Lake Inflow TMDL			40									
Notes:	*Flow Weighted in µg/L		**Average per on-line flow day			*** Excl. No Flow Days & Non-Controllable Downtime				****Grassy 10 to 20cfs 11/29/12		

Table 4. Percent of Inflow & Outflow Concentration Attaining TMDL's Period 6.

% of Interpolated Data Attaining TMDL (See Note)							
Site	**On-Line Flow Days>0 (184 Day Period)**	**Flow Weighted Average Inflow Concentration in µg/L**	**Flow Weighted Average Outflow Concentration in µg/L**	**Tributary TMDL (113 in µg/L) Met for Average Outflow Concentration**	**Lake TMDL (40 in µg/L) Met for Average Outflow Concentration**	**% Data Points Inflow Concentration Meeting Tributary TMDL**	**% Data Points Outflow Concentration Meeting Tributary TMDL**
Nubbin Slough	348	799	247	NO	NO	0%	49%
Ideal Grove	362	862	48	YES	NO	6%	87%
Mosquito Creek	302	640	150	NO	NO	6%	46%
Lemkin Creek	358	101	29	YES	YES	73%	94%
Wolff Ditch	364	146	24	YES	YES	56%	94%
Grassy Island	362	490	93	YES	NO	1%	82%
Note: Includes Linear Interpolation between Actual Measurements for On-Line Flow Days.							

Table 5. Summary of Water Quality Characteristics.
TP Flow Weighted; Mean Inflow and Outflow all other parameters; refer to text for complete discussion.

Summary Treatment Period Presented: Varies by system; refer to text for complete discussion.									
	Site 1 Nubbin Slough			**Site 2 Ideal Grove**			**Site 3 Mosquito Creek**		
Period Presented	July 1, 2013 - June 30, 2014			July 1, 2013 - June 30, 2014			July 1, 2013 - June 30, 2014		
	Inflow	Outflow	% Change	Inflow	Outflow	% Change	Inflow	Outflow	% Change
TP (µg/L) Flow Weighted	799	247	-69%	862	48	-94%	640	150	-77%
pH	6.4	6.6	3%	7.1	7.0	-1%	6.9	6.4	-7%
Alkalinity (mg/L)	38	40	5%	171	102	-40%	97	40	-59%
Color (PCU)	336	203	-40%	287	89	-69%	398	177	-56%
Turbidity (NTU)	2.5	7.0	180%	8.5	1.8	-79%	5.7	8.5	49%
Conductivity (µS/cm)	350	440	26%	1178	1180	0%	503	503	0%
TKN (mg/L)	2.36	1.41	-40%	2.67	1.19	-55%	3.64	1.66	-54%
NOx (mg/L)	0.830	0.883	6%	0.142	0.010	-93%	0.911	0.719	-21%
TN (mg/L)	3.19	2.29	-28%	2.81	1.20	-57%	4.55	2.38	-48%
Treatment Volume (MG)		235.7			27			330.4	

	Site 5 Lemkin Creek			**Site 6 Wolff Ditch**			**Site 7 Grassy Island**		
Period Presented	July 1, 2013 - June 30, 2014			July 1, 2013 - June 30, 2014			July 1, 2013 - June 30, 2014		
	Inflow	Outflow	% Change	Inflow	Outflow	% Change	Inflow	Outflow	% Change
TP (µg/L) Flow Weighted	101	29	-71%	146	24	-83%	490	93	-81%
SRP (µg/L)	57	2	-96%	72	1	-99%	290	7	-98%
DOP (µg/L)	16	7	-56%	26	7	-73%	43	6	-86%
PP (µg/L)	24	19	-21%	33	16	-52%	50	42	-16%
pH	7.5	7.7	3%	7.6	7.8	3%	7.1	6.8	-4%
Alkalinity (mg/L)	168	151	-10%	184	160	-13%	83	32	-61%
Color (PCU)	126	90	-29%	172	101	-41%	295	110	-63%
Turbidity (NTU)	2.3	2.6	13%	2.7	2.7	0%	7.4	4.3	-42%
Conductivity (µS/cm)	884	882	0%	920	926	1%	491	529	8%
TKN (mg/L)	1.58	1.28	-19%	1.65	1.30	-21%	1.64	0.87	-47%
NOx (mg/L)	0.012	0.025	108%	0.011	0.011	0%	0.288	0.217	-25%
TN (mg/L)	1.59	1.30	-18%	1.66	1.31	-21%	1.93	1.09	-44%
Total Al (µg/L)	85	479	464%	14	290	1971%	210	633	201%
Treatment Volume (MG)		415.5			399.5			2012.8	

Table 6. Installed HWTT Components by System.

HWTT Components Installed	Site 1 Nubbin Slough	Site 2 Ideal Grove	Site 3 Mosquito Creek	Site 5 Lemkin Creek	Site 6 Wolff Ditch	Site 7 Grassy Island
Mixing Chamber	Y	Y	Y	Y	Y	Y
Wet-Floc Settling Area	Y	Y	Y	Y	Y	Y
Wet-floc recycling/ Intermittent dosing	N	Y	Y	Y	Y	Y
Dry floc recycling	N	N	N	N	N	N
Floc disposal via tilling	N	Y	Y	N	N	N
Floating vegetation	Y	Y	Y	Y	Y	Y
Limerock buffering	Y	N	Y	Y	Y	Y
SAV buffering	N	Y	N	Y	Y	Y

Net export of nitrate + nitrite (NO_x) occurred at Nubbin Slough and Lemkin Creek. Nubbin Slough is one of the two facilities that lack a shallow vegetated zone at the back end of the system. The Lemkin system includes a shallow vegetated zone (as does Wolff, which did not experience a net export of NO_x) and, although there was a net export of NO_x at the Lemkin facility, the difference in concentration between inflow and outflow was quite small, i.e. less than 0.02 mg N/L. Furthermore, the outflow NO_x concentrations at Lemkin were low and represented only a small fraction of total N (TN). All of the systems achieved a net reduction of TN. Efforts are ongoing to further optimize alum dosing, floc formation and settling and other operational parameters at Lemkin Creek and Wolff Ditch to minimize export of Aluminum (Al).

The current POR includes 365 days from July 1, 2013 through June 30, 2014; the prior contract covered 365 days for all sites. Note that capacity increased at Grassy Island compared to the prior contract period. Figure 2 depicts the reduction in TP lbs. per day for the six HWTT flow-through operational facilities. All systems generally experienced sustained flows. Inflow TP mass was generally highest from July through October, 2013 and elevated in June 2014. Load reduction (reported as interpolated lbs. per day) was higher for four of the sites: Nubbin Slough at 3.2 (3.6 prior contract period); Ideal Grove at 0.5 (0.3 prior contract period); Mosquito Creek at 4.5 (3.6 prior contract period); Lemkin Creek at 0.7 (0.6 prior contract period); Wolff Ditch at 1.1 (1.3 prior contract period); and Grassy Island at 18.4 (14.3 prior contract period). Figure 3 shows the interpolated total lbs. of P removed for the period, which was higher at all systems except Nubbin Slough and Wolff Ditch. Total lbs. removed cannot be used to compare performance between the current period and the prior 365 day period due to changes in capacity at Grassy Island. The values are as follows: Nubbin Slough – 1,097 lbs. (1,280 prior contract period); Ideal Grove - 183 lbs. (117 prior contract period); Mosquito Creek – 1,357 lbs. (1,214 prior contract period); Lemkin Creek - 254 lbs. (223 prior contract period); Wolff Ditch - 405 lbs. (472 prior contract period); and Grassy Island – 6,670 lbs. (4,493 lbs. prior contract period). The current removal rate for all systems combined was 9,965 lbs. (7,799 lbs. prior contract period), as shown in Figure 4.

Interpolated TP mass inflow versus outflow and percent reduction by site for the period is illustrated in Figure 5. Nubbin Slough produced a 69% reduction between TP mass inflow and outflow (78% prior contract period); Ideal Grove resulted in a 94% reduction (96% prior contract period); Mosquito Creek operated at a 76% reduction (78% prior contract period); Lemkin Creek experienced a 72% reduction (71% prior contract period); TP was reduced by 83% at Wolff Ditch (67% prior contract period); and Grassy Island TP reduction was 81% (89% prior contract period). The Nubbin HWTT facility P removal effectiveness is influenced by the lack of mid-region or outflow region shallow zones that limit the proliferation and/or particle filtration effectiveness of back-end vegetation communities. TP flow-weighted concentration reductions (Figure 6) were the same as the

TP mass removal percentages with the exception of Mosquito Creek (77% versus 76%) and Lemkin Creek (71% versus 72%).

A number of factors affect P removal performance and the relative differences among sites. During the higher flows in the wet season, HWTT system TP mass removal effectiveness is influenced by the inflow TP concentration levels. The Grassy Island facility with mid-range flow-weighted mean inflow TP levels of 490 μg/L produced the third highest mass TP removal percentage (81%). Ideal Grove presented the highest TP inflow levels of 862 μg/L and removal rate (94%). The lowest TP inflow levels were at Lemkin Creek and Wolff Ditch with concentrations of 101 and 146 μg/L and removal rates of 71% and 83%, respectively. Mosquito Creek measured the third greatest inflow TP at 640 μg/L and a removal rate of 77%. Nubbin Slough presented the second highest TP inflow concentrations at 799 μg/L and a 69% removal rate; the physical configuration at this site is also a factor in performance (see Site Discussion below - additional information about system attributes, operations and performance, as well as in-depth site discussions, are included in the Chapter I of this Final Report.). All TP statistics are interpolated from sample measurements.

Figure 7 depicts reductions in the flow-weighted TP concentrations using the South Pond P data samples and Lemkin Creek and Wolff Ditch outflow volumes. (It is not possible to separate the South Pond P data between Lemkin Creek and Wolff Ditch; the data for the two sites are not combined to maintain the individual system integrities. The method employed provides a rough comparison of the impact of the South Pond on performance). These two facilities were sited primarily to supply needed hydration for the downstream wetland via the South Pond. During construction, Watershed Technologies made several material changes to the South Pond, including weir relocation, elevation adjustments, piping additions and general maintenance. Weekly grab samples are taken and laboratory analyses are prepared and tabulated, together with inflow measurements to the adjacent wetland. The submerged aquatic vegetation (SAV) community from the dual HWTT facilities has expanded into the South pond shallow zone, providing additional filtration. Using data from the South Pond for Lemkin Creek and Wolff Ditch, the removal

performance improves significantly. Lemkin TP concentration outflow drops from 29 to 17 µg/L and Wolff Ditches decreases from 24 to 17 µg/L. This represents an 83% and 88% reduction in TP levels at Lemkin Creek and Wolff Ditch, respectively.

Figure 8 illustrates the cumulative flow weighted TP concentrations and percent reductions for each of the six operational systems. The periods of record vary according to start date. Certain data has been excluded due to changes in flow configurations, early demonstration projects and availability of measurements between contract periods. Grassy Island includes the optimization period. The average percentage reductions in concentrations remained constant or improved for all sites, ranging from 93% for Ideal Grove to 69% at Lemkin Creek.

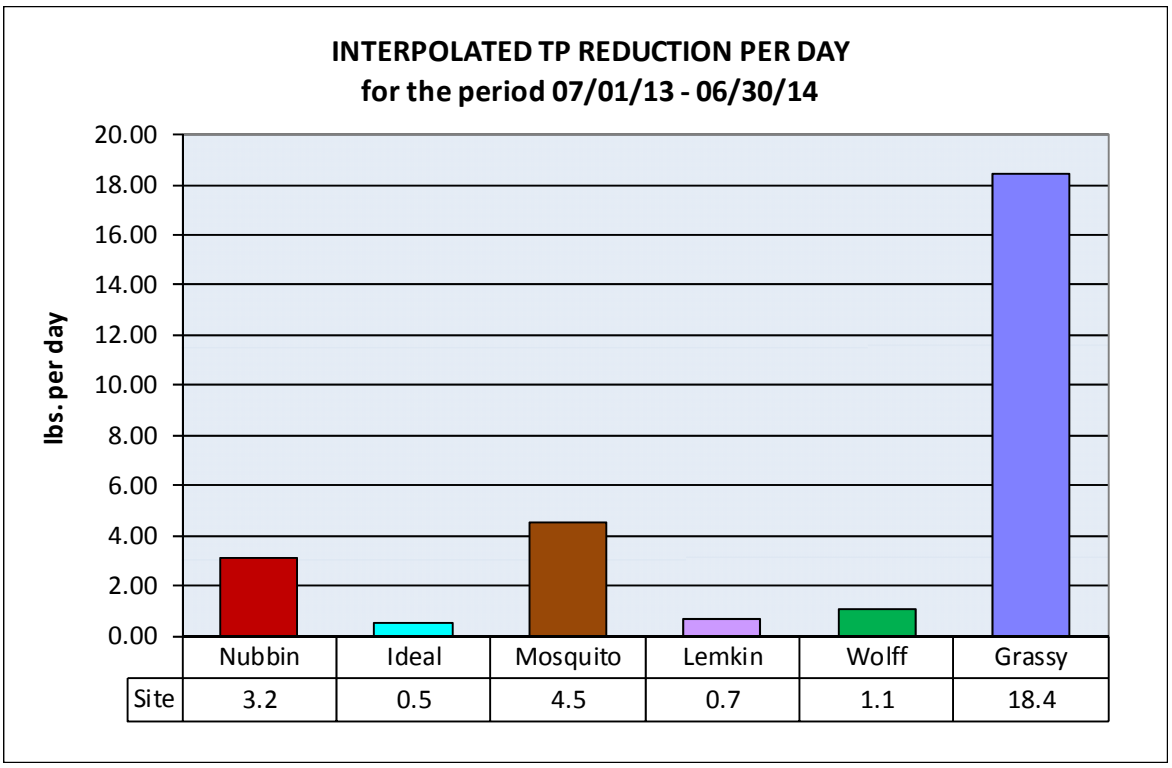


Figure 2. Load Reduction by Site per day.

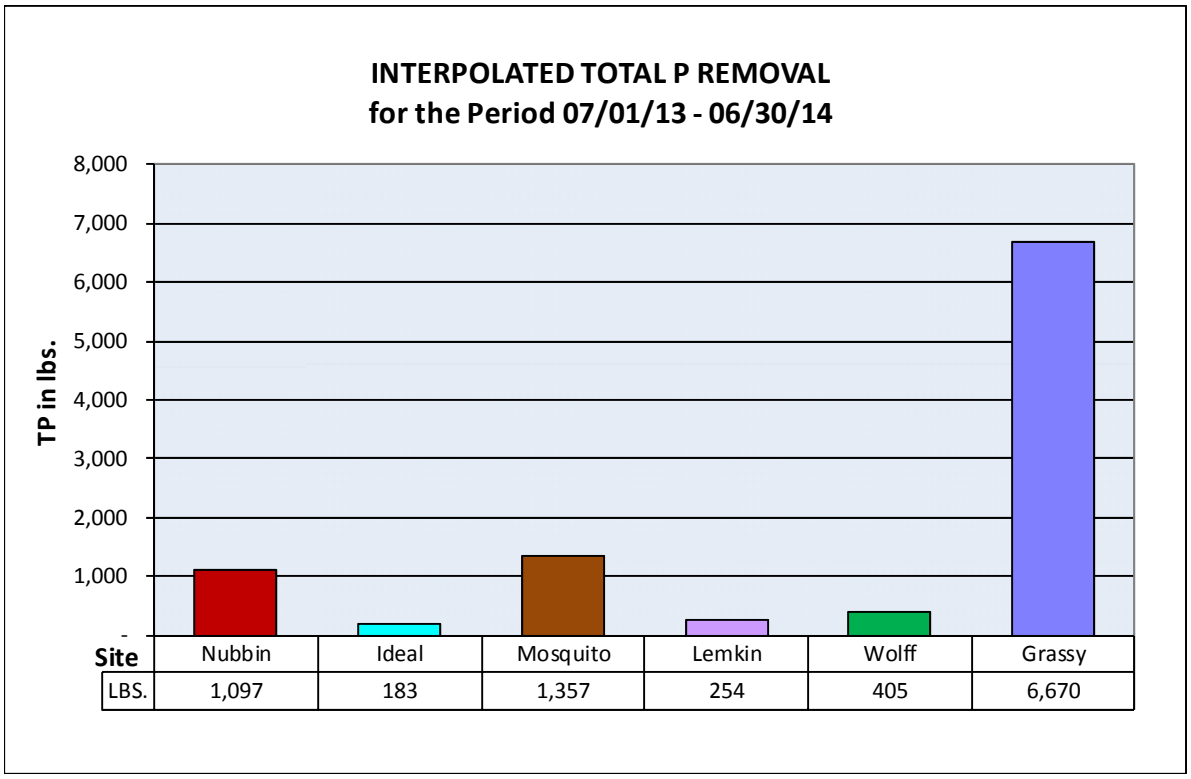


Figure 3. Total P Load Reduction by Site.

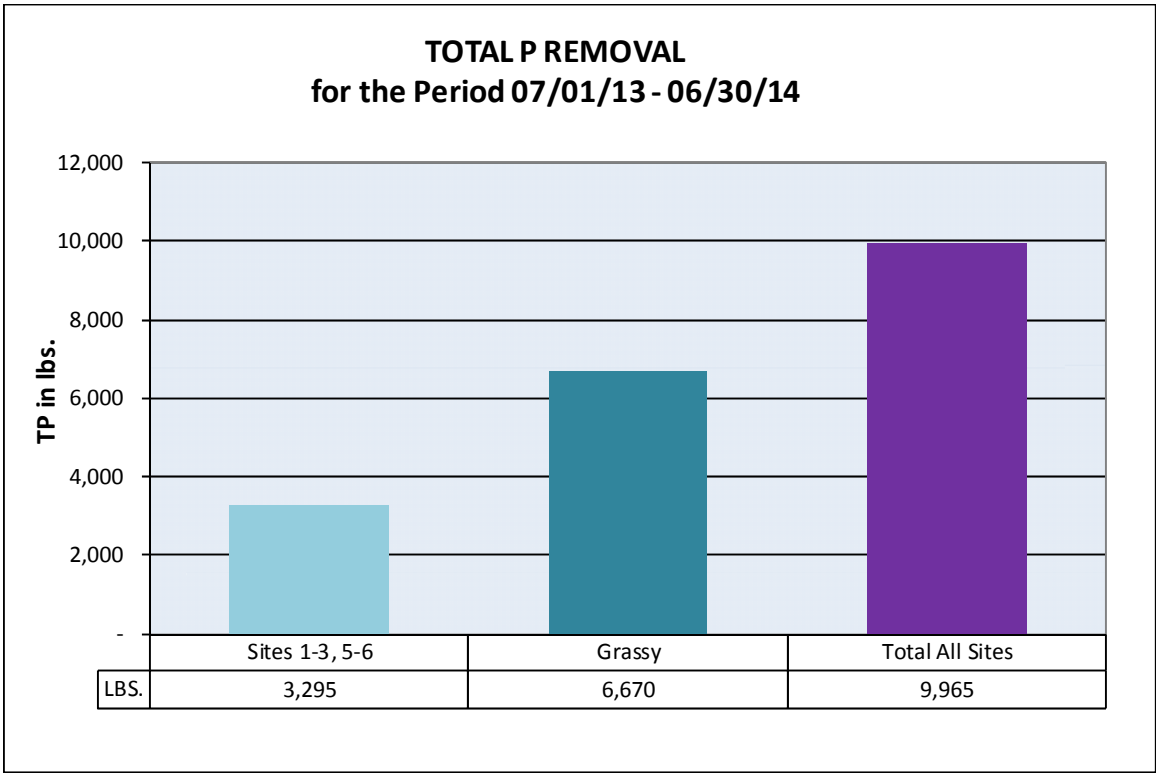


Figure 4. Total P Load Reduction Sites 1-3, 5-6, Grassy and all sites combined.

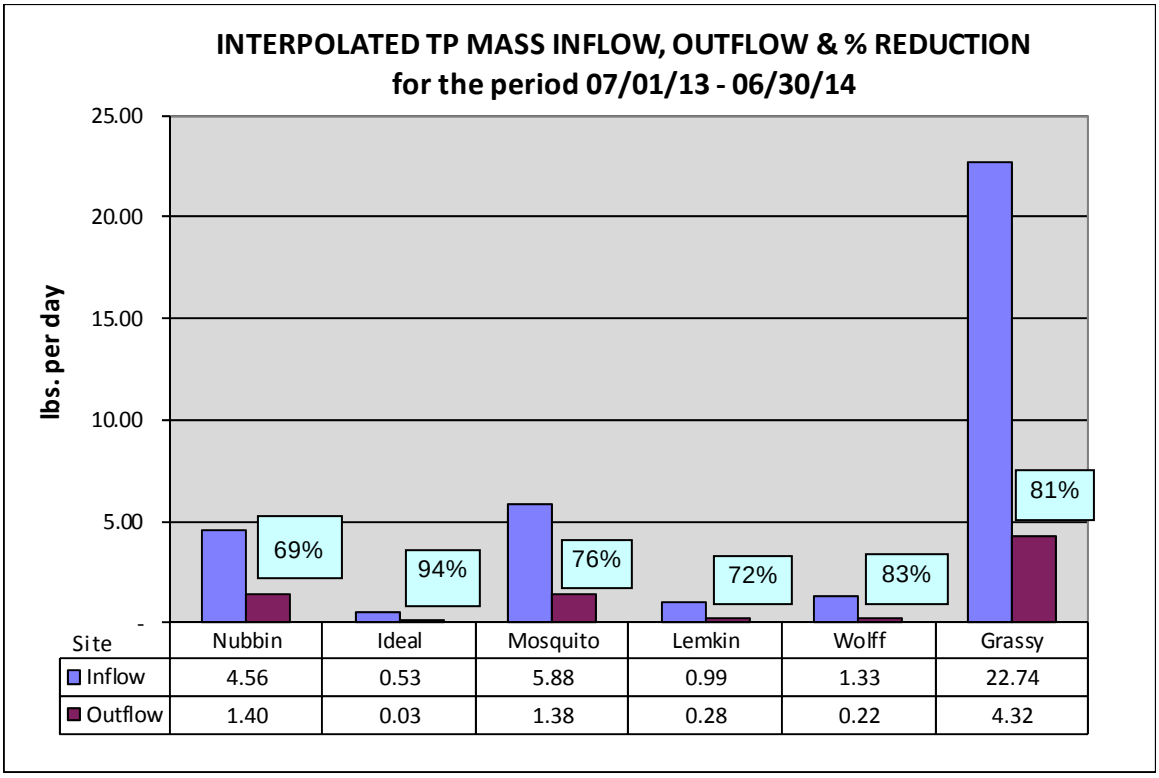


Figure 5. TP Mass Inflow & Outflow and % Load Reduction by Site.

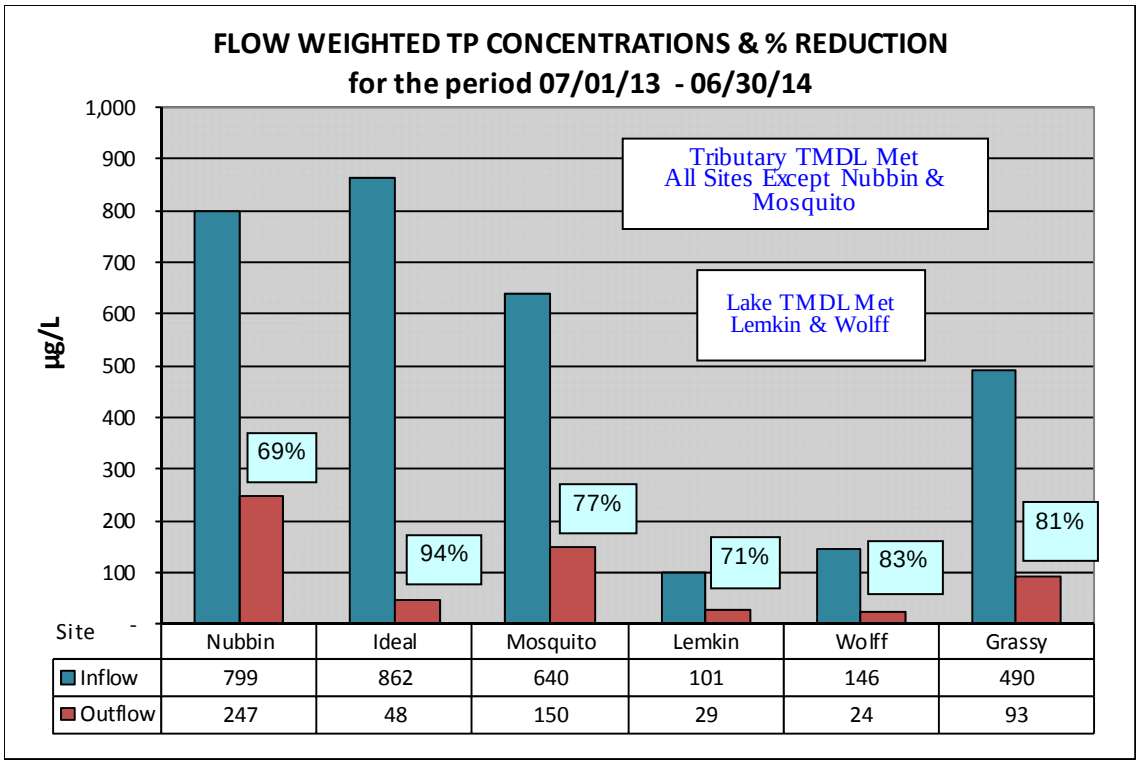


Figure 6. Flow Weighted TP Concentrations and % Reduction by Site.

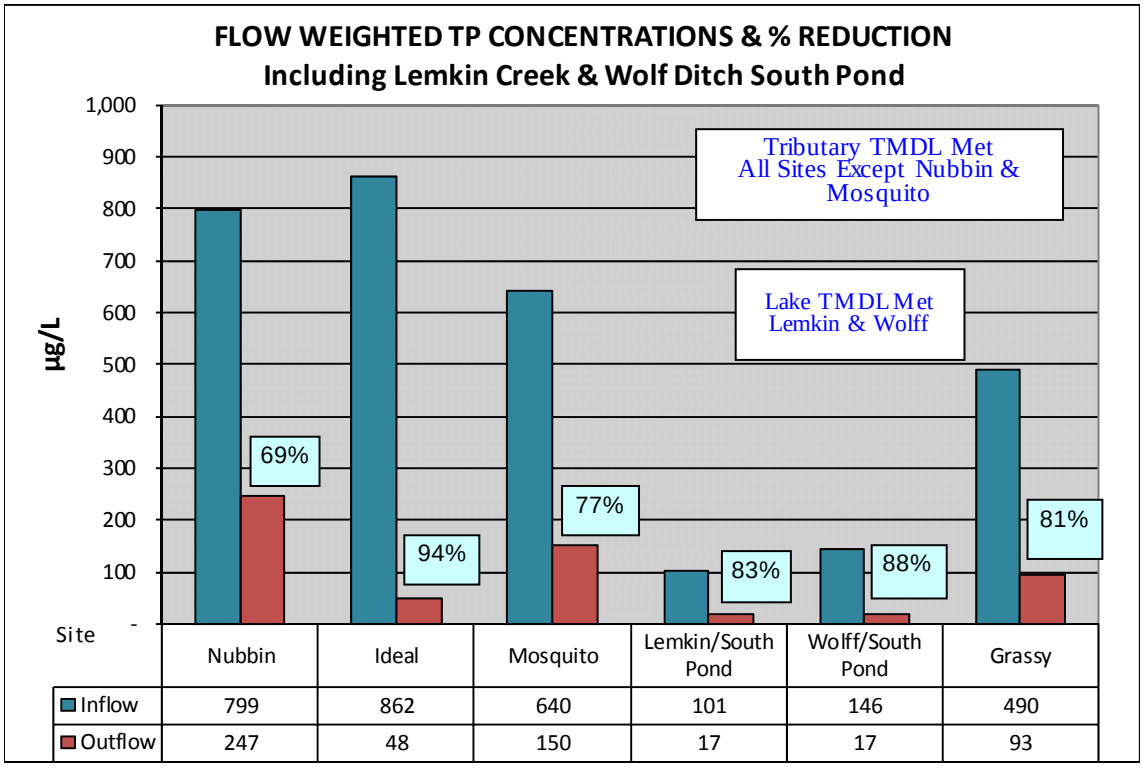


Figure 7. Flow-weighted TP Concentrations and % Reduction by Site including South Pond at Lemkin Creek and Wolff Ditch.

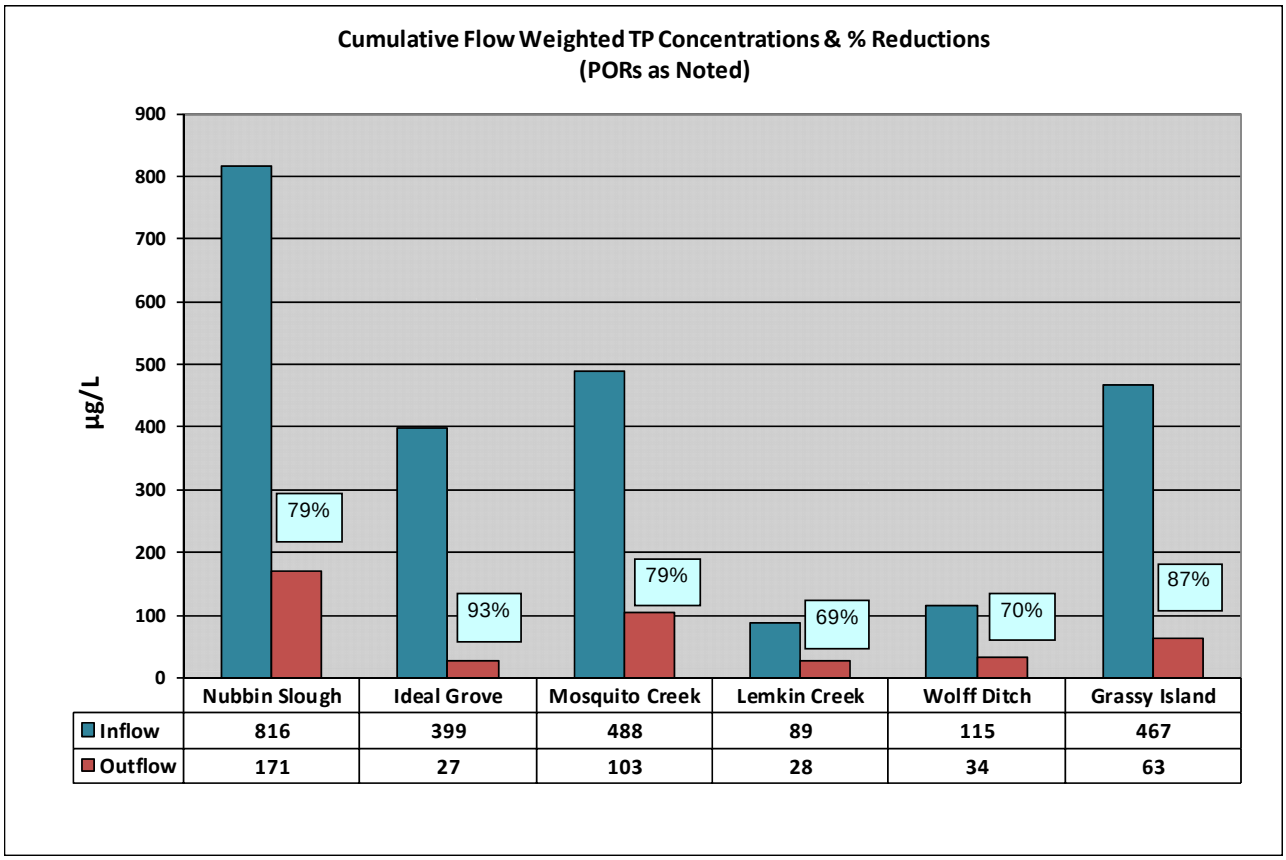


Figure 8. Cumulative Flow Weighted TP Concentrations and % Reductions by Site with PORs as noted. See text for assumptions.

POR: Start date corresponds to commencement of HWTT operations or optimization:

11/21/08 – 06/30/14 Nubbin Slough, Ideal Grove & Mosquito Creek
03/09/10 – 06/30/14 Lemkin Creek & Wolff Ditch
07/11/11 – 06/30/14 Grassy Island (Off-Line for Construction 03/15/12 - 07/01/12 & 05/13)

Capacity Utilization & Flow Availability

Capacity utilization ranged from a low of 8% (Wolff Ditch) to a high of 43% (Grassy Island) during the period (Figure 9). Flows were generally available at all sites for the period. Although low water levels may allow for system operations, they are sufficiently below plant treatment capacities. Flows are depicted graphically in Figure 10 (daily in cubic feet per second {cfs}) and Figure 11 (total). The values represent inflow measurements to the HWTT facilities, which are not necessarily indicative of flow levels in the treated water bodies. Grassy Island and Lemkin Creek presented the highest flows for the six systems, followed by the Wolff Ditch and Mosquito Creek facilities. Daily average flows compared to each site's capacity are shown in the Site Specific Section of this Chapter II.

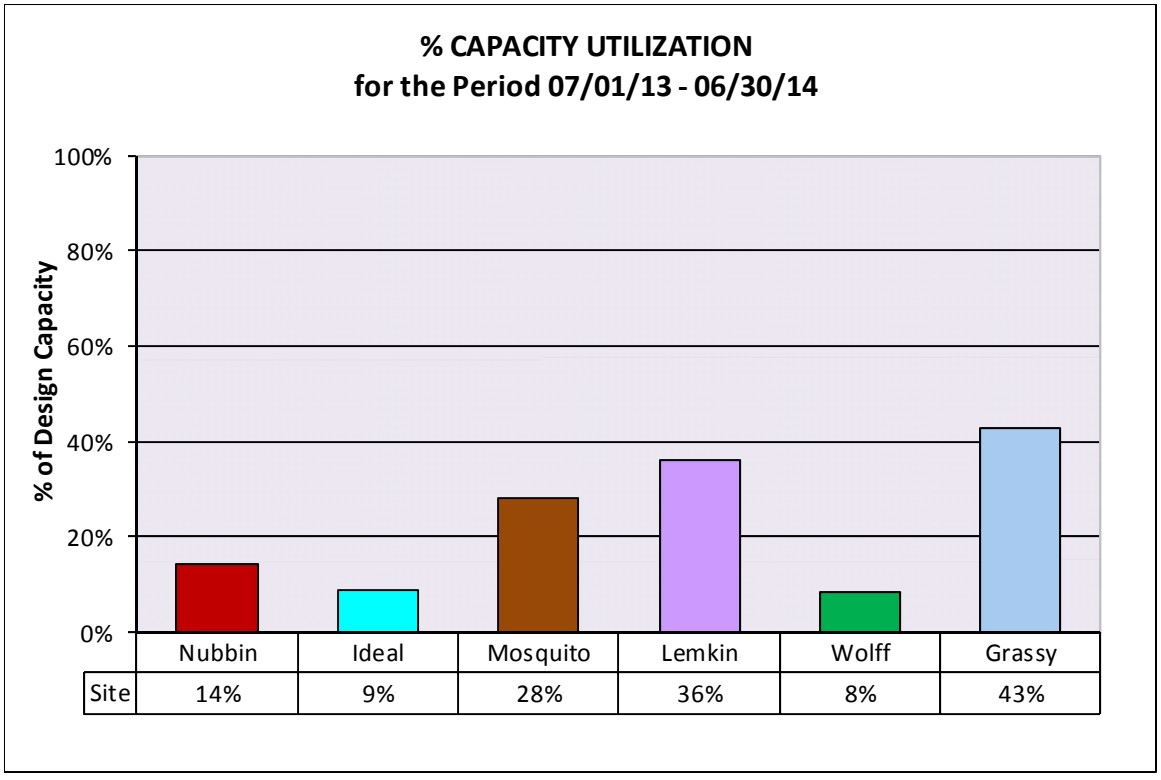


Figure 9. Utilization of facility capacity by Site.

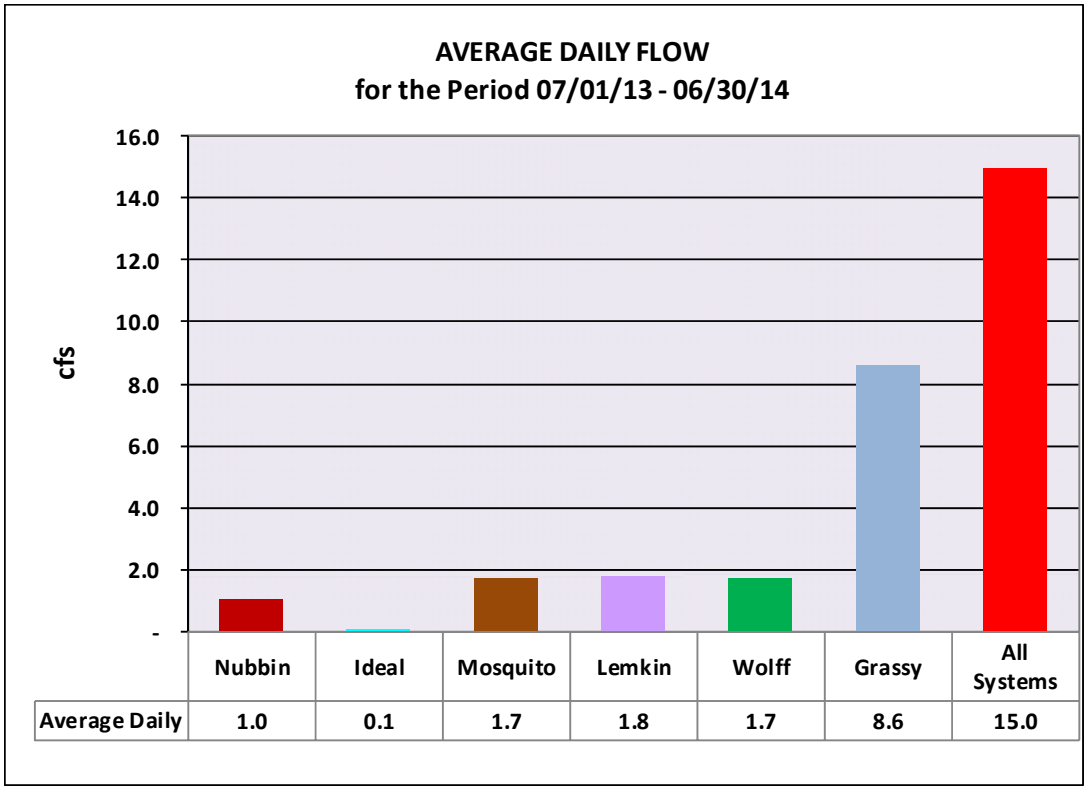


Figure 10. Average daily flow by Site and total daily all HWTT systems.

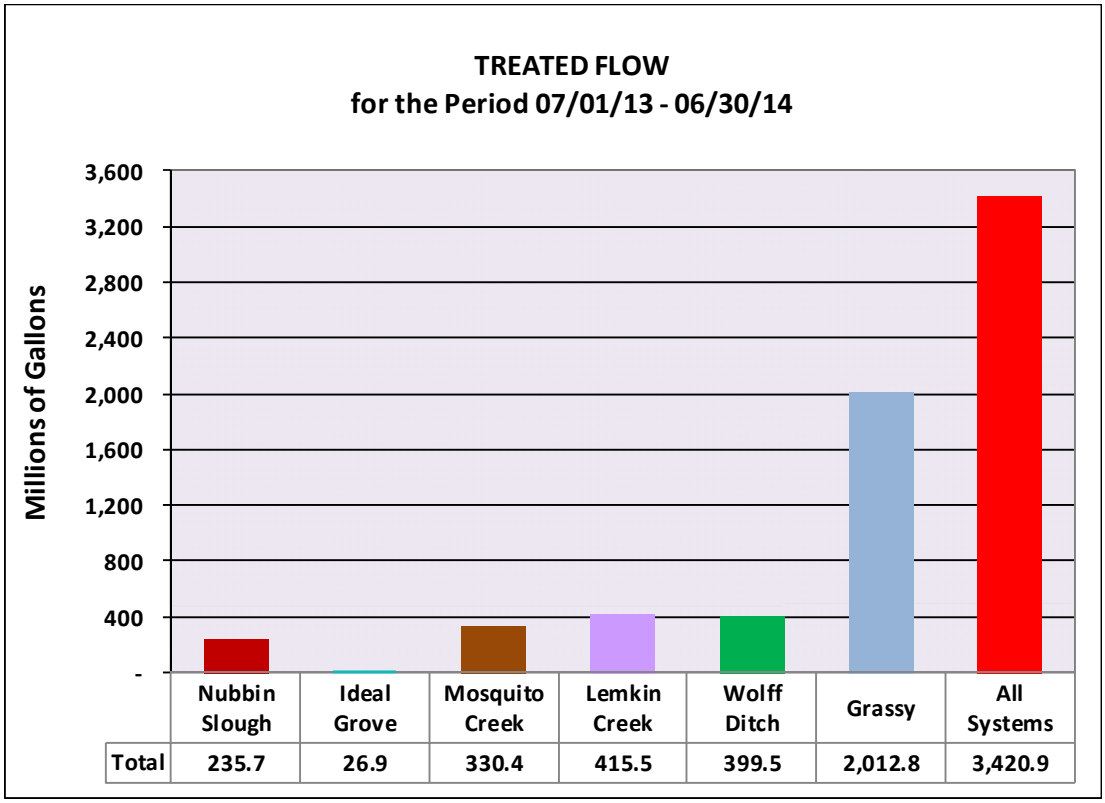


Figure 11. Total treated flow by Site and total all HWTT systems.

Comparisons Periods 1 - 6

Nubbin Slough, Ideal Grove and Mosquito Creek facilities have operated for more than a six year period. The first operational contract spanned the period from November 21, 2008 through November 20, 2009 (Period 1 – construction is considered to be Period 0); the second contract encompassed the time from March 9, 2010 through March 8, 2011 (Period 2); the third POR was March 9, 2011 through September 30, 2011 (Period 3); the fourth POR covered October 1, 2011 through June 30, 2012 for Systems 1-3, 5-6 and November 13, 2011 through June 30, 2012 for System 7 (Period 4); the fifth POR was July 1, 2012 through June 30, 2013; and the current POR is July 1, 2013 through June 30, 2014. Lemkin Creek and Wolff Ditch commenced operational status at the beginning of Period 2. Optimization and Monitoring was conducted at the Grassy Island facility during Period 3 and operations began during Period 4. Grassy Island was also off-line from March 15, 2012 through June 30, 2012 for construction activities and again in May 2013. Comparisons are relevant but are limited by changes in flow paths/configurations during Period 1, capital additions during Period 2 - 5 and, most importantly, truncated time for both Periods 3 and 4. Data related to varying lengths of time will likely be skewed for purposes of comparisons with earlier analyses, particularly depending upon inclusion or exclusion of the wet season. The statistics presented do not include all the operational results related to the intervening time between contracts, specifically, from November 21, 2009 through March 8, 2010.

Figure 12 and Figure 18 compare interpolated TP mass inflow to outflow in lbs. per day and percent reduction rates for the six operating periods for the six sites, as applicable, and indicate sustained TP removal performance. Each site requires separate review, as various factors, both controllable and non-controllable, affect TP percentage removal rates. For example, Nubbin Slough TP percentage removal was 70%, 91%, 86%, 72%, 78% and 69% respectively for the six periods. The data shows that the TP mass inflow levels were elevated in Period 3 (8.16 lbs. per day), lowest in Period 2 (2.13 lbs. per day) and relatively mid-range in Periods 1, 4, 5 and 6 (5.79, 6.54, 4.63 and 4.56). The greatest percent reduction rates occurred in the highest and lowest mass inflow rates. The configuration of Nubbin Slough is a factor in the relative TP performance rates. Ideal Grove percentage TP

reduction rate remained high during the current period at 94%, (45%, 94%, 86%. 96% and 96% for the previous five periods), while TP mass inflow was 0.40, 0.35, 0.36, 0.28, .36 lbs. per day for Periods 1 – 5 with a substantial increase in Period 6 to .53 lbs. per day. Mosquito Creek percentage removal performance remained relatively consistent, as inflow levels increased. Lemkin Creek percentage removal rate similarly remained stable, while TP inflow levels increased during the POR. The percentage reduction improved from 67% to 83% for Wolff Ditch as average TP mass inflow decreased (1.98 versus 1.33). Grassy Island TP removal performance declined in the current period (89% versus 81%), while average mass inflow increased by 41% from 16.13 to 22.74 lbs. per day.

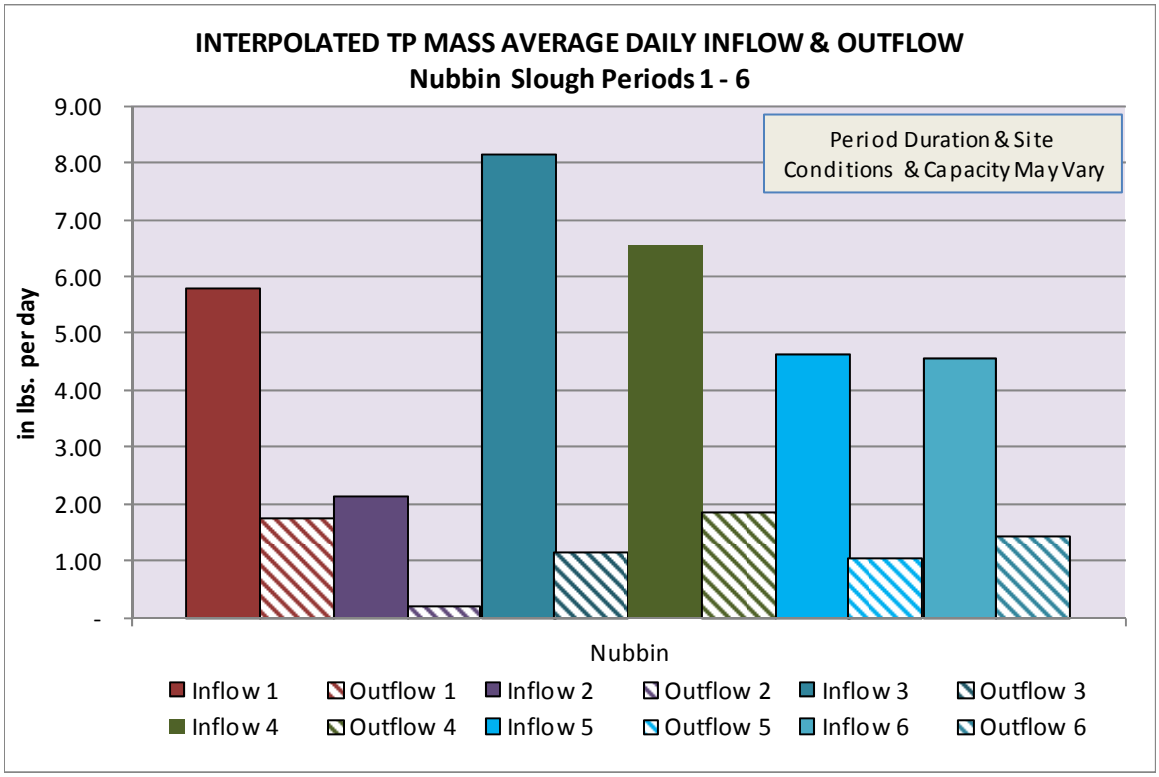


Figure 12. Interpolated TP Mass Inflow vs. Outflow Periods 1-6 Nubbin Slough.

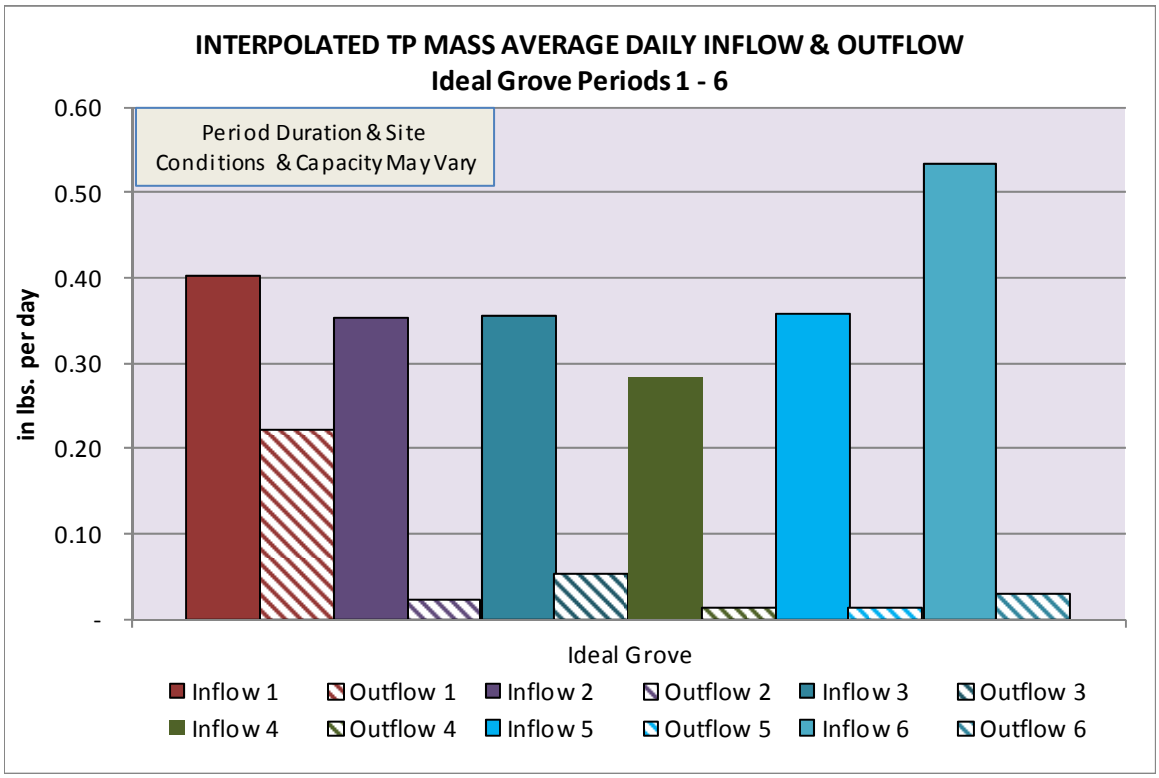


Figure 13. Interpolated TP Mass Inflow vs. Outflow Periods 1-6 Ideal Grove.

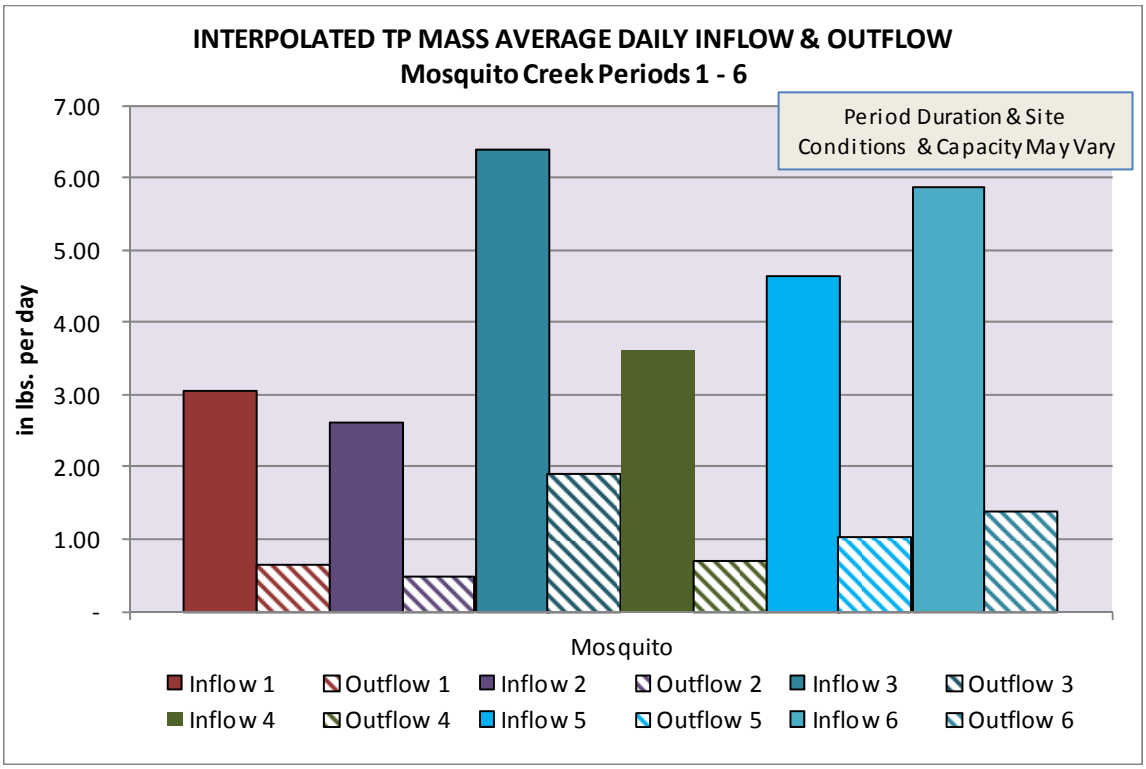


Figure 14. Interpolated TP Mass Inflow vs. Outflow Periods 1-6 Mosquito Creek.

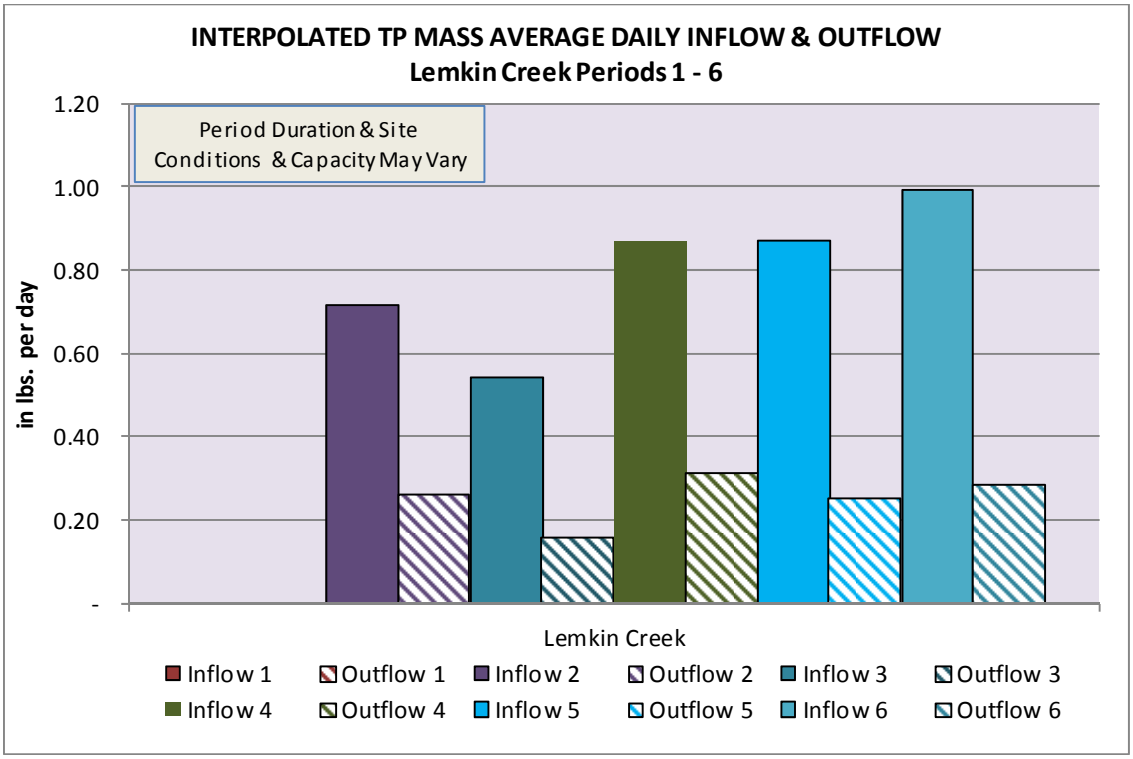


Figure 15. Interpolated TP mass Inflow vs. Outflow Periods 1-6 Lemkin Creek.

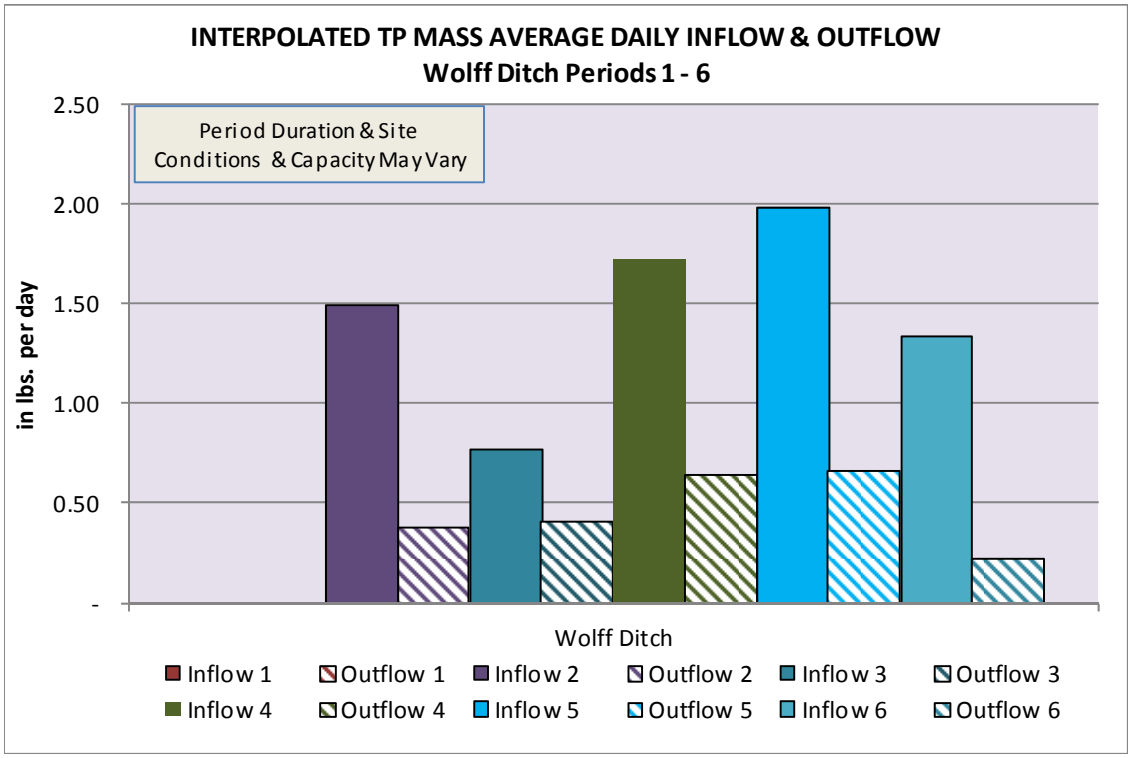


Figure 16. Interpolated TP mass Inflow vs. Outflow Periods 1-6 Wolff Ditch.

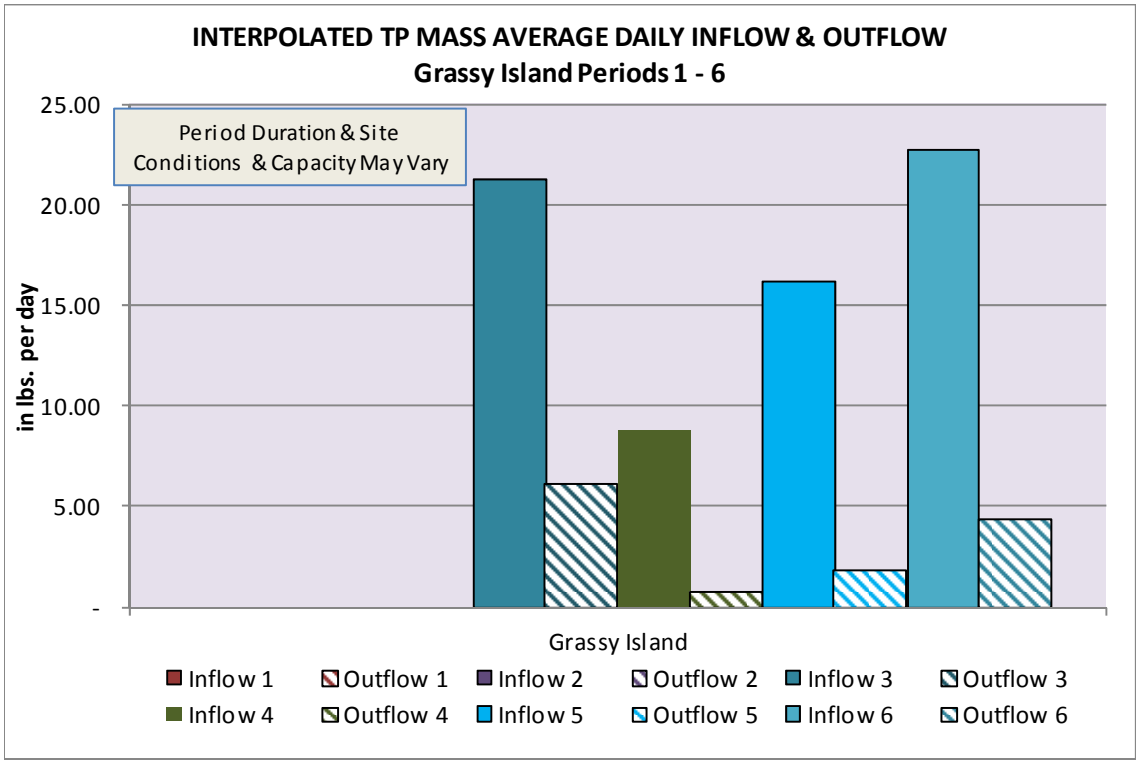
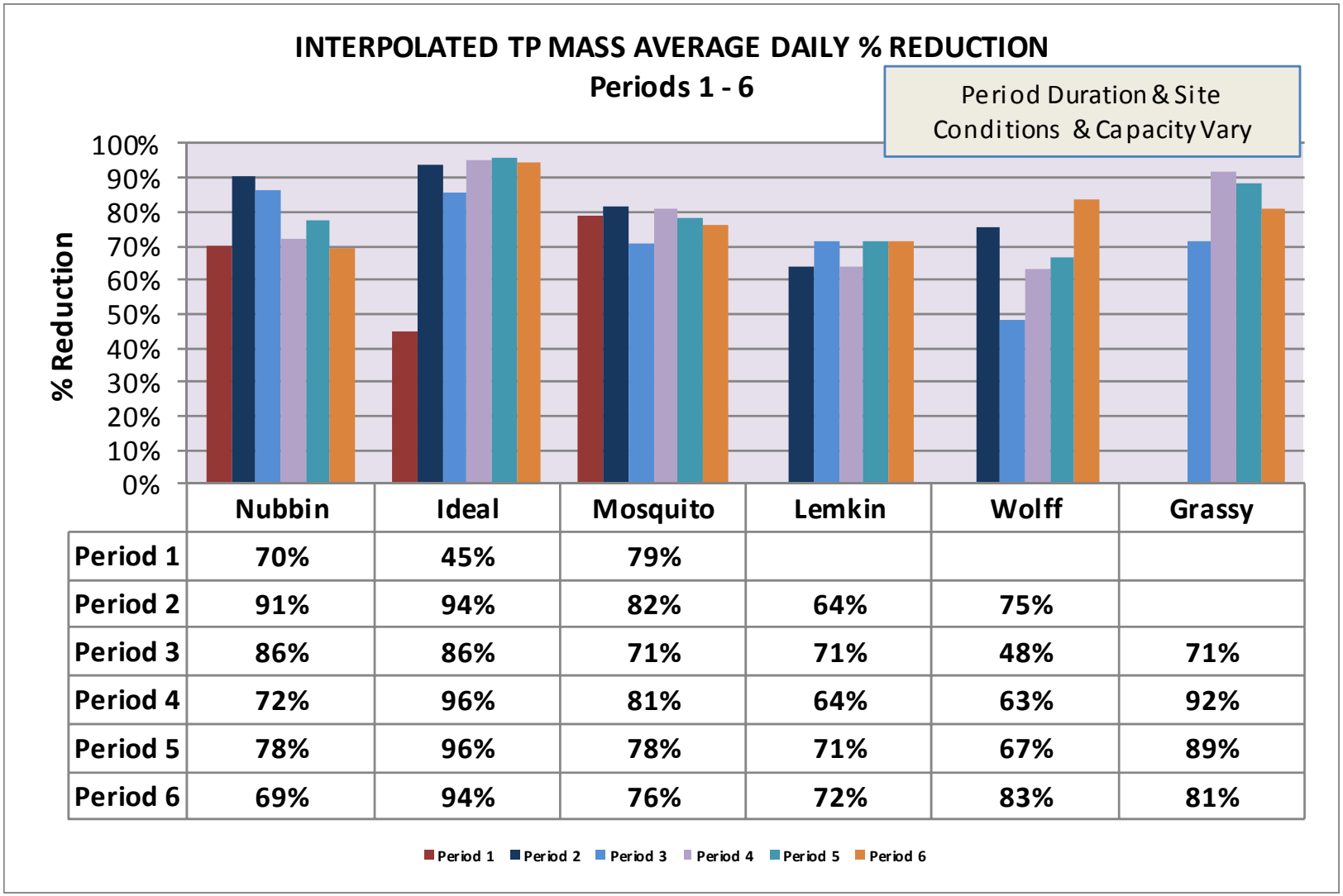


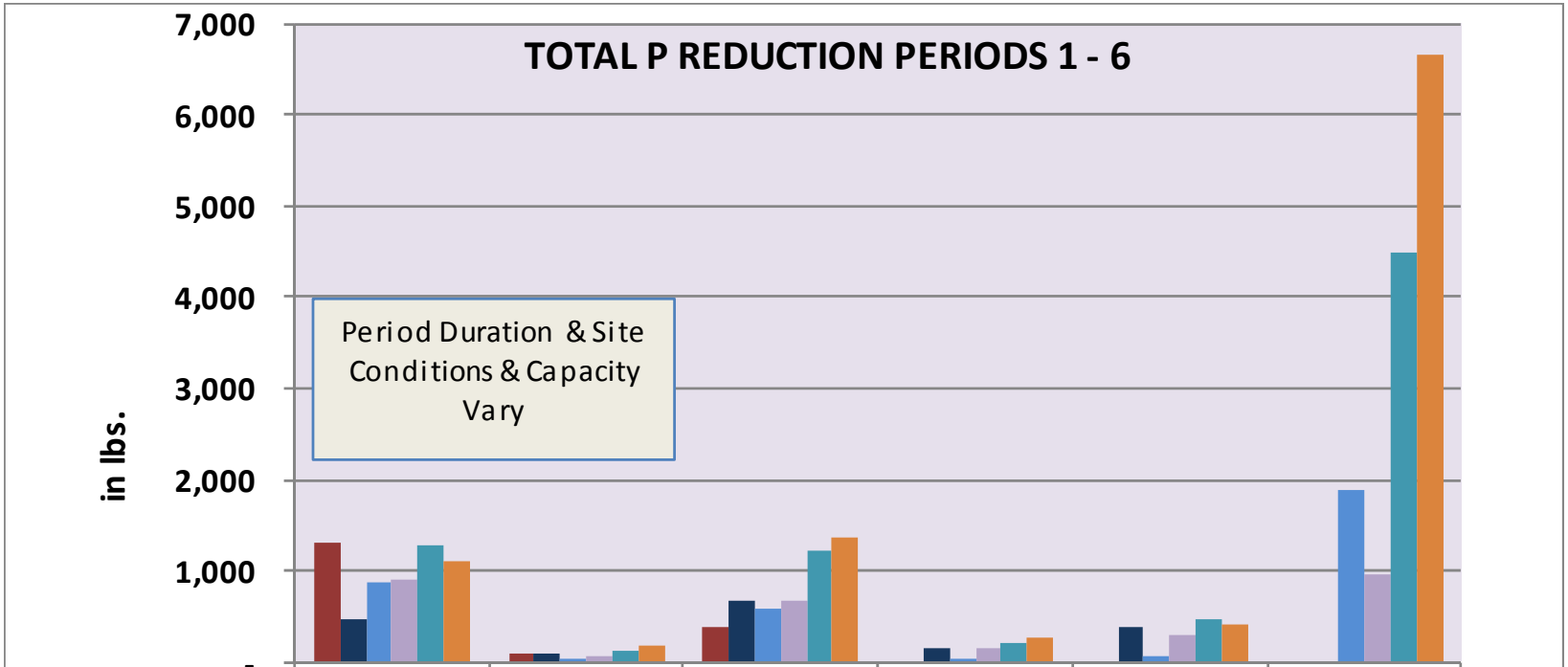
Figure 17. Interpolated TP mass Inflow vs. Outflow Periods 1-6 Grassy Island.



	Nubbin	Ideal	Mosquito	Lemkin	Wolff	Grassy
Period 1	70%	45%	79%			
Period 2	91%	94%	82%	64%	75%	
Period 3	86%	86%	71%	71%	48%	71%
Period 4	72%	96%	81%	64%	63%	92%
Period 5	78%	96%	78%	71%	67%	89%
Period 6	69%	94%	76%	72%	83%	81%

Figure 18. Interpolated TP Mass Average Daily % Reduction Periods 1-6.

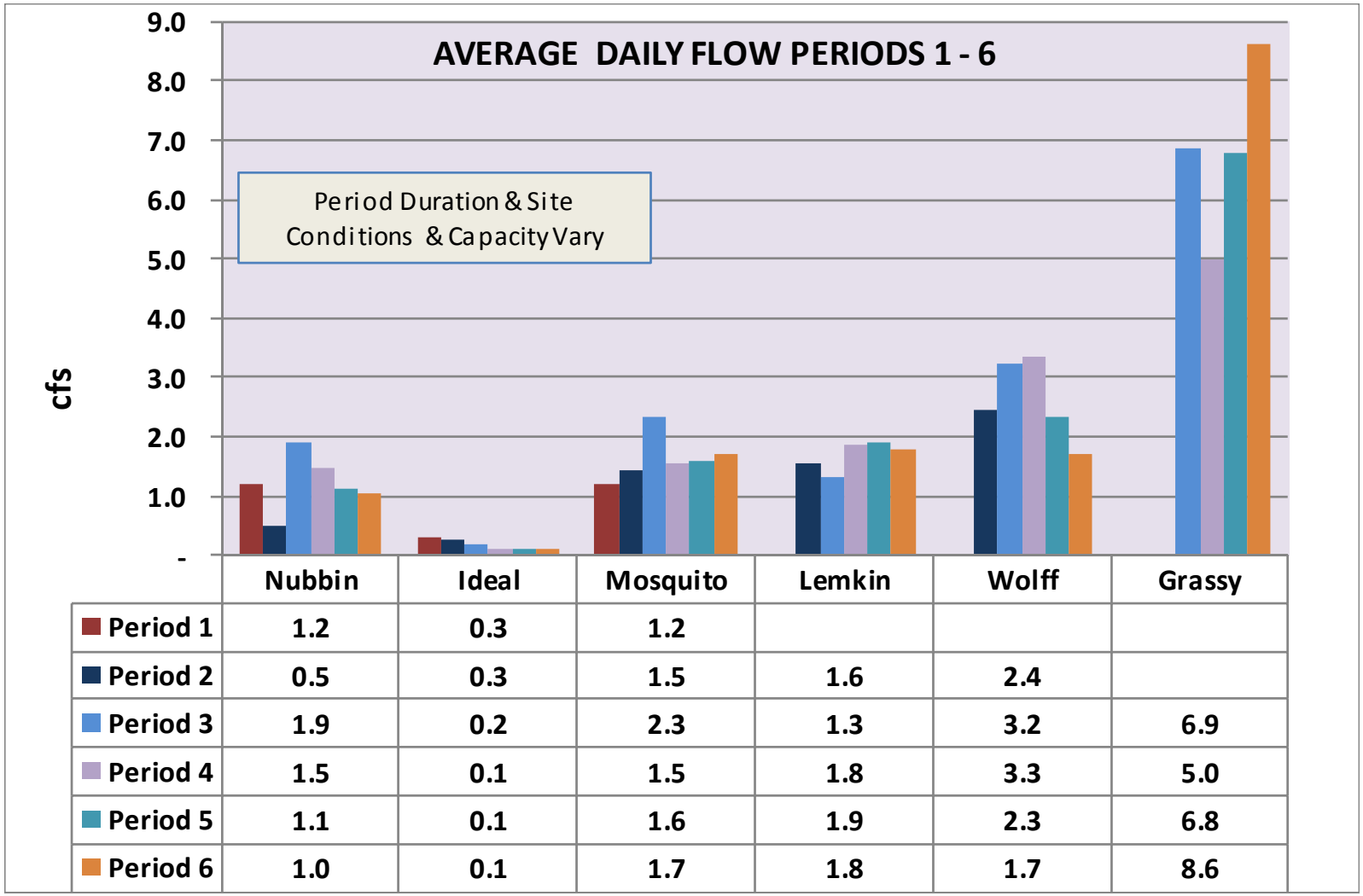
Figure 19 depicts the TP removal during each of the six operational periods, calculated from interpolated samples. P reduction during the shorter time frames in the third and fourth periods cannot be compared from a performance basis to the prior 365 day periods. Deployment of additional capacity at Grassy Island is also an important factor affecting TP comparisons. Extrapolations of removal performance are also not necessarily valid due to the uncertainty of the availability of flow.



	Nubbin	Ideal	Mosquito	Lemkin	Wolff	Grassy
Per. 1-365 days	1,299	83	373			
Per. 2-365 days	466	84	664	155	393	
Per. 3-206 days	879	45	591	50	57	1,897
Per. 4-274 days	914	71	669	149	285	971
Per. 5-365 Days	1,280	117	1,214	223	472	4,493
Per. 6-365 Days	1,097	183	1,357	254	405	6,670

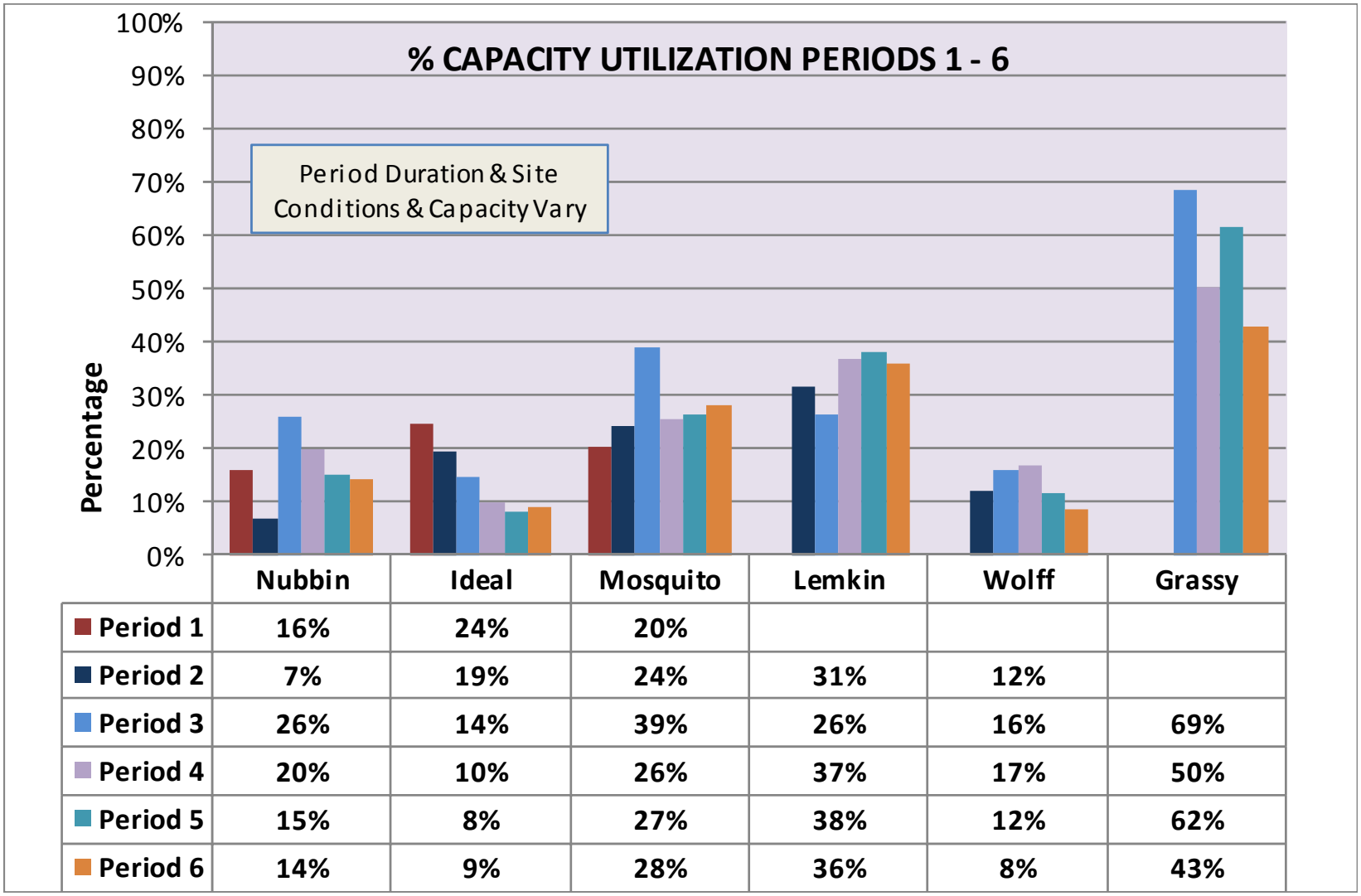
Figure 19. Total P Reduction by Site Periods 1-6.

Figure 20 and Figure 21 are comparative graphs showing average daily flow and percent capacity utilization for periods 1 – 6, respectively. All systems were available for treatment virtually the entire period (Table 3) with the exception of Mosquito Creek at 88% due primarily to down-time for floc removal. Average daily flow is highest for Grassy Island, across time and systems.



	Nubbin	Ideal	Mosquito	Lemkin	Wolff	Grassy
Period 1	1.2	0.3	1.2			
Period 2	0.5	0.3	1.5	1.6	2.4	
Period 3	1.9	0.2	2.3	1.3	3.2	6.9
Period 4	1.5	0.1	1.5	1.8	3.3	5.0
Period 5	1.1	0.1	1.6	1.9	2.3	6.8
Period 6	1.0	0.1	1.7	1.8	1.7	8.6

Figure 20. Average Daily Flow by Site Periods 1-6.



	Nubbin	Ideal	Mosquito	Lemkin	Wolff	Grassy
Period 1	16%	24%	20%			
Period 2	7%	19%	24%	31%	12%	
Period 3	26%	14%	39%	26%	16%	69%
Period 4	20%	10%	26%	37%	17%	50%
Period 5	15%	8%	27%	38%	12%	62%
Period 6	14%	9%	28%	36%	8%	43%

Figure 21. % Capacity Utilization by Site Periods 1- 6.

Site Specific Data

Detailed performance and operating conditions are maintained for the individual HWTT facilities. The following discussion highlights significant factors during the (POR) including specific operating factors, effective dosing of alum, vegetation status, TP performance and site specific graphs.

TP mass removal, TP mass inflow versus outflow and TP concentrations are based upon sample points and linearly interpolated data. For those days in which the HWTT systems are off-line and/or for no-flow days, daily TP concentrations are shown as gaps in the line plot to clarify that the TP concentrations are not zero. TP mass removal remains plotted as "0" values, however, as no P is removed when flow is zero or the system is not operating.

Nubbin Slough (Site 1)

Nubbin HWTT was retrofitted from a prior conventional chemical treatment system and consists of a uniformly deep pond. The lack of a shallow vegetated zone at the Nubbin HWTT system impairs particulate phosphorus (PP) filtration/settling downstream of the contact zone, thereby resulting in relatively higher outflow TP levels. At the Nubbin site, HWTT mesocosms (2008 – 2010) equipped with a shallow vegetated region were able to reduce settling zone outflow TP levels of 114 μg/L down to a final discharge concentration of 30 μg/L.

Nubbin Slough operated mostly continuously during the POR. The system experienced relatively higher flows through the first three to four months and lower flows during November and December. Flows improved through March, were sporadic during April and May and subsequently increased in June. Site 1 had the second highest interpolated flow-weighted inflow TP concentrations (799 μg/L) of the six HWTT facilities. The interpolated flow-weighted average outflow was 247 μg/L, a 69% reduction for the period. The effective dosing of alum ranged from 13.0 to 20.0 milligrams (mg)/L, and the average effective dosing of alum was 15.6 mg/L as Al for the period. The effective dose was selected to accommodate pH, alkalinity and color characteristics of the inflow slough waters and other site conditions. TP levels are interpolated from approximately weekly samples.

In the first months of the POR, a visual assessment of the amounts (and depths) of residual dried floc in the facility's drying beds was conducted in preparation for wet floc application. An examination of the beds showed sufficient floc storage capacity. During Period 2, we performed troubleshooting on the inflow pump controls, at which time we found a problem with one of the float switch settings, and the issue was corrected. While the Nubbin HWTT system flow meter has provided robust performance for several years, high particulate matter and debris levels in the inflow waters during Period 3 caused repeated fouling and failure of the device. As a result of the meter issue, there was a multi-month period during which un-optimized chemical dosing occurred. An investigation was initiated of alternative

flow meter technologies for Nubbin Slough and several of the other HWTT sites. In Period 4, activities included maintenance associated with the wet season and a continued investigation of the possibility of flow meter replacement. As a result of troubleshooting efforts, the existing flow meter was successfully reconfigured and to date has again been providing reliable flow readings.

We conducted laboratory trials to determine the ability of various lime rocks to raise the pH and alkalinity of Nubbin Slough waters, and we replaced some of the original, undersized culverts that connect the two floc drying beds during November.

In Period 6, the facility operations were curtailed for improvements, allowing us to pump wet floc from the Nubbin contact/settling pond into the facility's drying beds. During that time, the Nubbin HWTT system limerock bed was rehabilitated; the effort included turning some of the rock to dislodge particulate matter previously imported into the bed from the slough, as well as replacement of a portion of the rock in the bed.

The Nubbin Slough system ran continuously during Periods 7, 8, and 9. During Period 7, we performed optimization trials with the new mixing chamber discharge pipe that was installed during the Period 6 floc removal process. The site's water levels were quite low during Period 8, which provided us an opportunity to clear the system intake region of vegetation and debris. In Period 9, repairs were made to one of the HWTT system water pump auto/off/hand switches.

In Period 10, the drying beds were surveyed to assess the degree of floc drydown/compaction since the time of the recent wet floc application. During Period 11, inflow pumps were set on a timer to operate intermittently, a protocol that gave time for the slough region near the inflow structure to recharge with water during the prevailing low flow conditions.

In Period 12, debris (primarily grassy vegetation) was cleaned from the system inflow works. This material had been swept downstream Nubbin Slough during the initial high flows of the wet season, partially clogging the system intake and overflow/bypass plumbing.

Interpolated TP mass removal over time is depicted graphically in Figure 22 together with percent daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 23. Interpolated inflow and outflow TP concentration levels for the period are shown in Figure 24. Daily average flows in cfs are shown in Figure 25 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 26. Detailed operating data is contained within Appendix II.

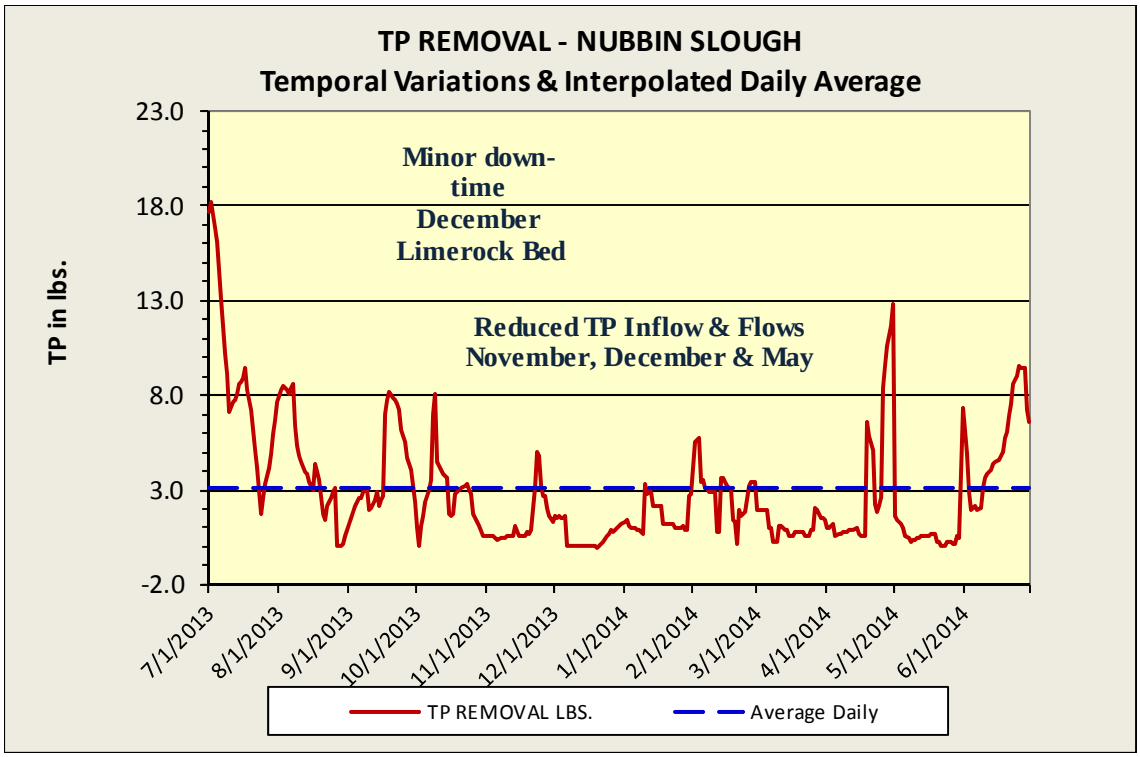


Figure 22. Interpolated TP Removal Temporal Variations & Daily Average Nubbin Slough.

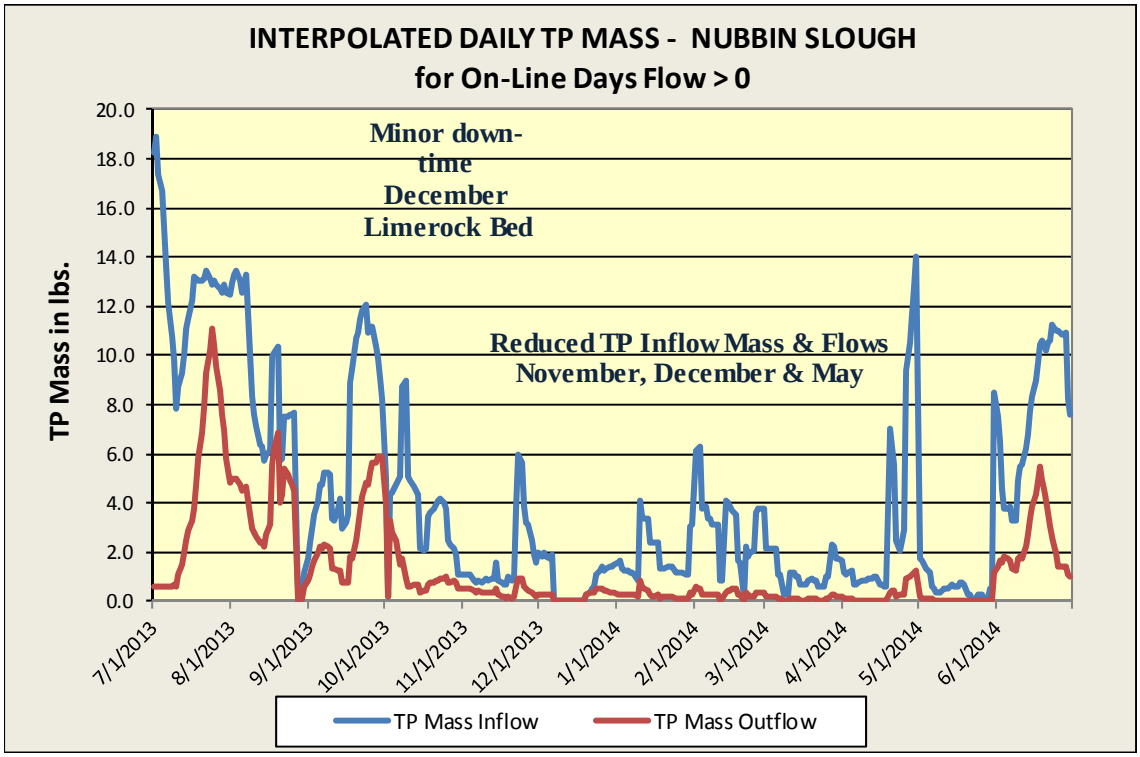


Figure 23. Interpolated Daily TP Mass Inflow versus Outflow Nubbin Slough.

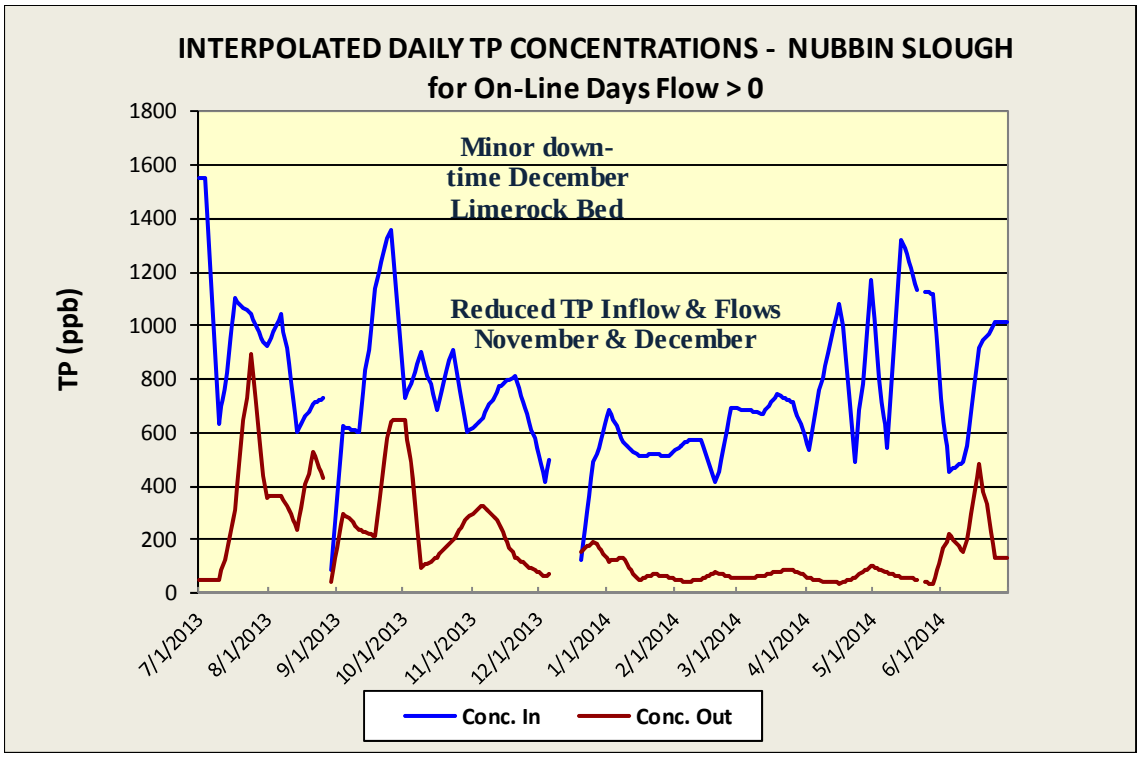


Figure 24. Interpolated Daily TP Concentrations Inflow versus Outflow Nubbin Slough.

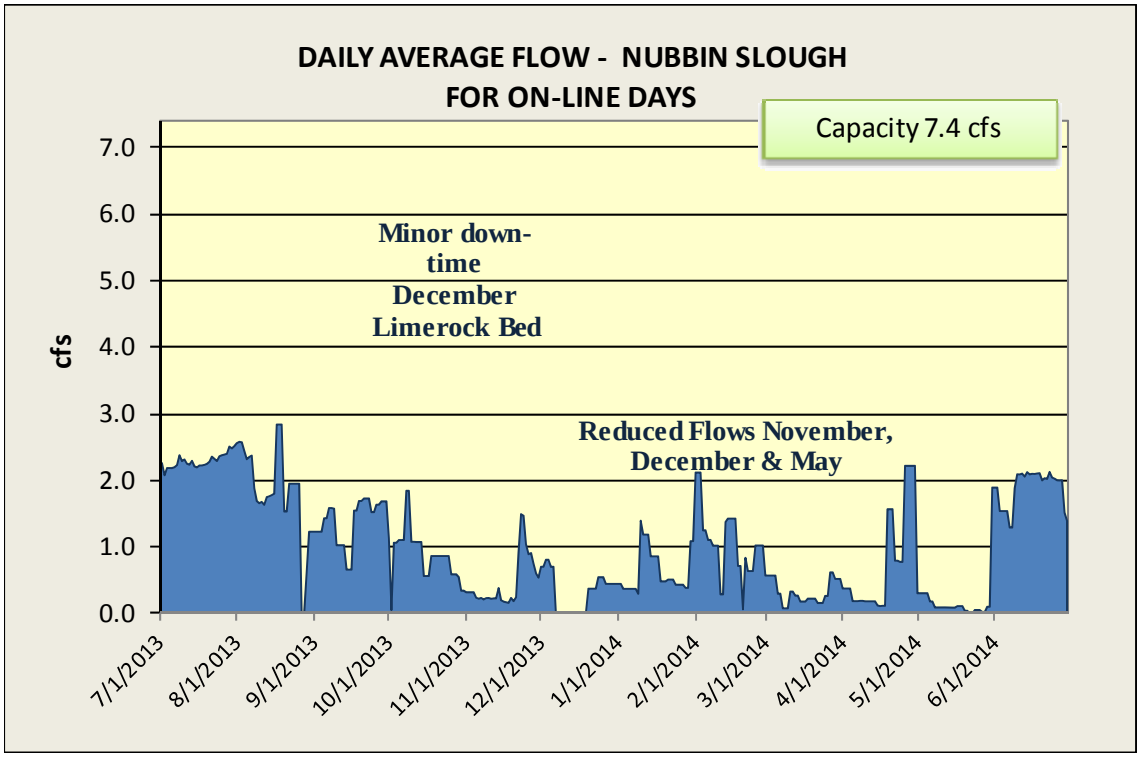


Figure 25. Daily Average Flows versus Capacity Nubbin Slough.

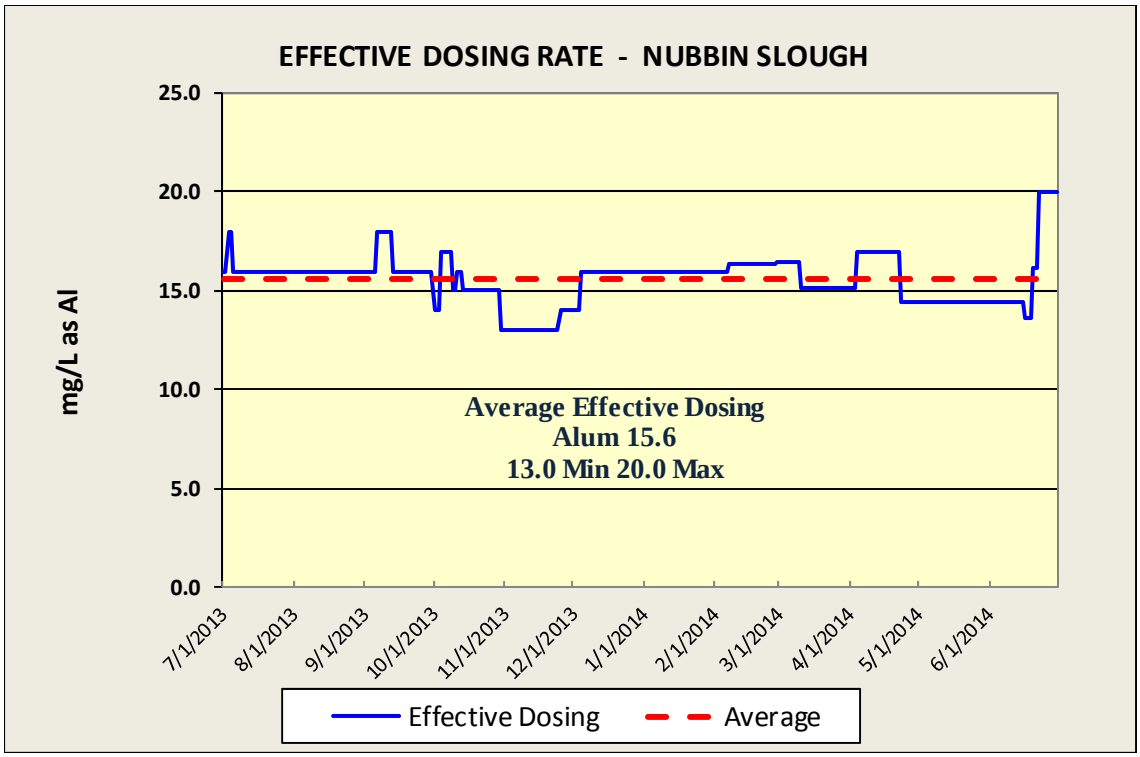


Figure 26. Daily Effective Dosing Rate and Average for the POR Nubbin Slough.

Ideal Grove (Site 2)

Ideal Grove operated continuously during the POR. Flows were below capacity but sustained. Site 2 had the highest interpolated flow-weighted inflow TP concentrations (862 μg/L) of the six HWTT facilities. The average interpolated flow-weighted outflow concentration was 48 μg/L for the period, which represents the highest TP removal rate of 94%. The average effective dosing of alum was 14.9 with a range of 6.0 (during August) to 30.0 mg/L (in October) as Al. The increased dosing was necessary to accommodate changes in system inflow water chemistry. TP levels are interpolated from approximately weekly samples.

During Period 1, filamentous algae proliferated within the inflow region of the Ideal HWTT system, presumably in response to elevated nutrient levels in the inflow waters. We were able to conclude that the macrophytes (both floating aquatic vegetation {FAV} and SAV) were effectively out-competing the algae for residual nutrients at the back end of the system. In August, we performed maintenance and calibration on the electromagnetic influent flow meter. In Period 3, a floc depth survey was initiated of the inflow (contact/settling) region of the Ideal HWTT facility, which was completed during Period 4. High inflow TP concentrations were recorded in September through early October. It is suspected that cumulative rainfall amounts reached the point that the runoff mobilized relic fertilizer nutrients from the grove soils into the farm canals. Grove operations (water management) may also have contributed, but we noticed no unusual activities (e.g., excessively high canal stages) at that time. Also during October, the external plumbing for the three chemical storage tanks was upgraded. In Period 5, a bloom of filamentous algae arose mixed with floating floc, which spread through most of the system inflow region. As has been noted in previous winter seasons, the floating plants declined in stature during Period 6, and the back-end of the floating plant mat in the shallow zone receded. This open region was subsequently colonized by submerged vegetation.

A portion of the shallow zone floating plants, primarily the tall plants near the inflow of this region, exhibited freeze damage during Period 7. In February we reconditioned the site's chemical dosing pump, which is the original dosing pump installed several years ago during

facility construction. Emergent vegetation (primarily cattail) was cleared from the system outflow culverts during March.

In April, the screen for the Ideal HWTT system inflow pump canal intake was cleaned. During May, mats of water fern (*Salvinia rotundifolia*) were inadvertently inoculated into the Ideal HWTT system from the farm canal during Period 11 via the pump intake.

The Ideal HWTT system pump intake consists of a slotted and screened pipe, completely submerged in the farm canal. During Period 12, in anticipation of higher wet season flows, the intake was pulled from the farm canal and the screen was retrofitted.

Interpolated TP mass removal over time is depicted graphically in Figure 27 together with the daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 28. Interpolated inflow and outflow TP concentration levels for the period are shown in Figure 29. Daily average flows are shown in Figure 30 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 31. Detailed operating data is contained within Appendix III.

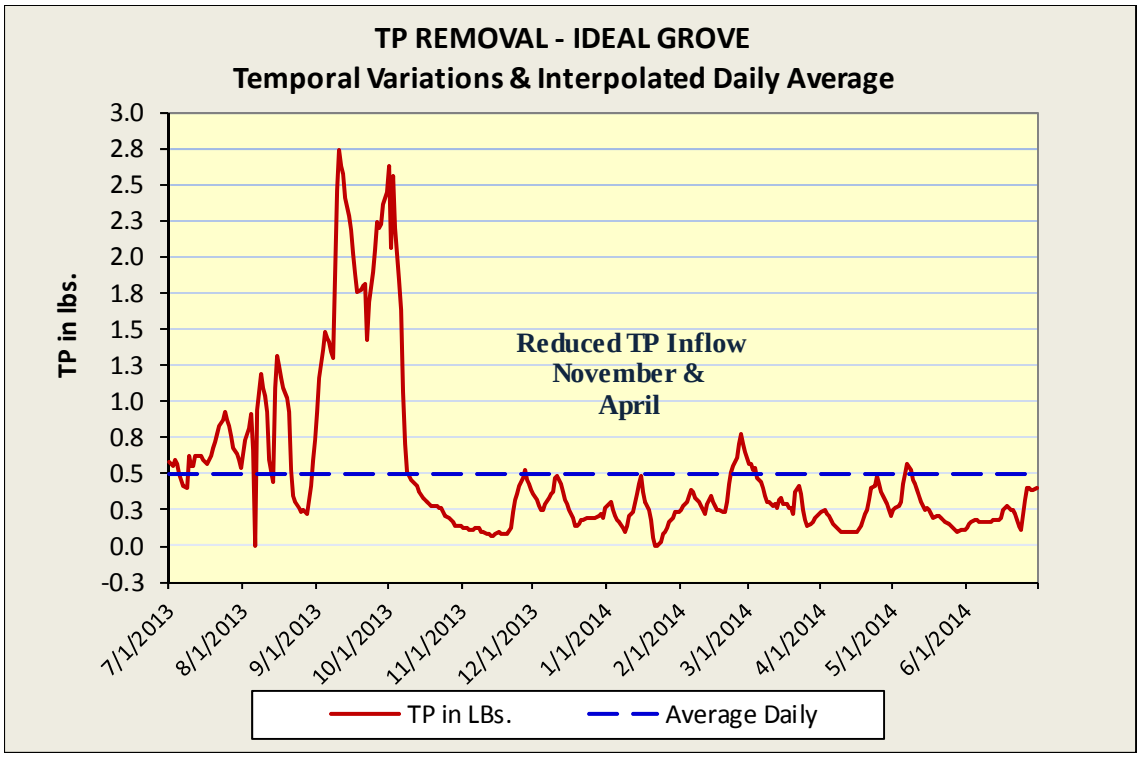


Figure 27. Interpolated TP Removal Temporal Variations & Daily Average Ideal Grove.

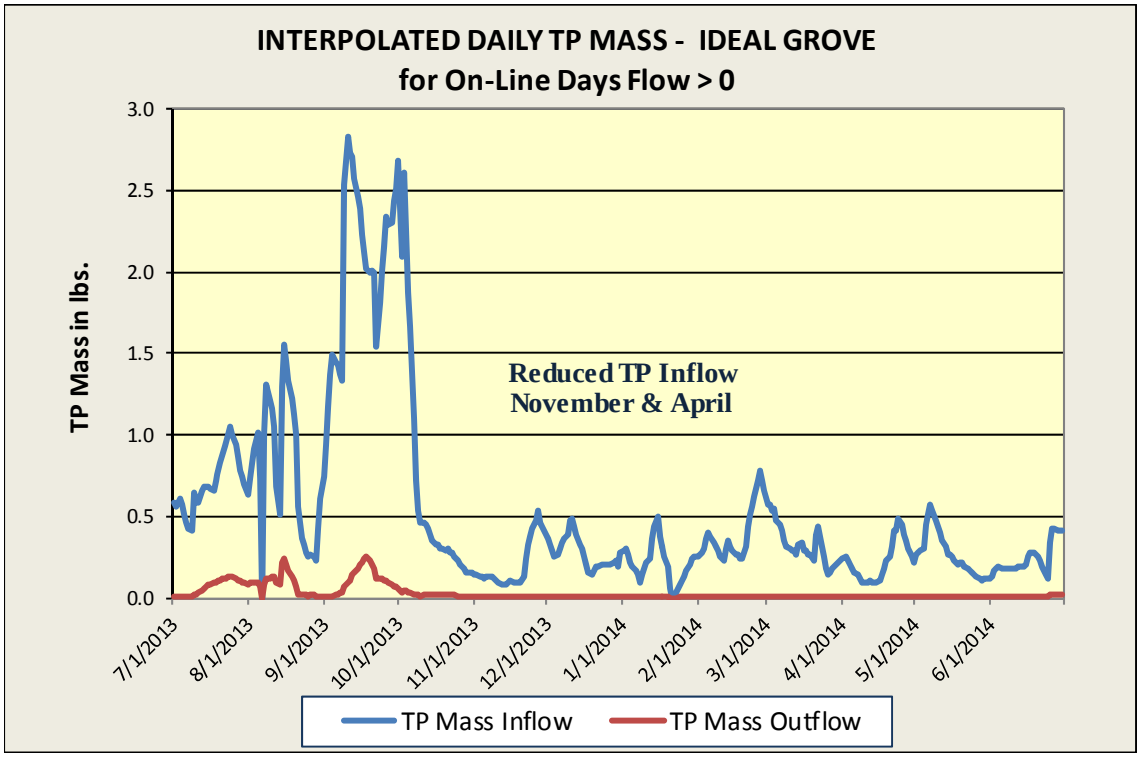


Figure 28. Interpolated Daily TP Mass Inflow versus Outflow Ideal Grove.

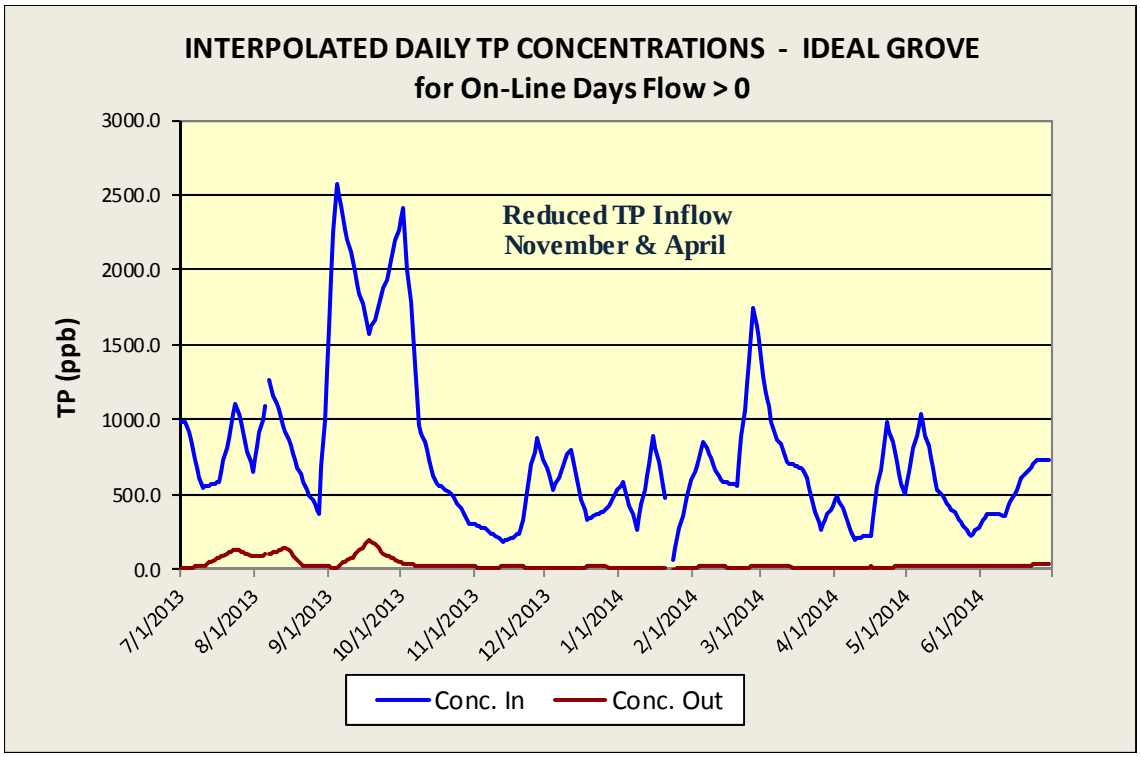


Figure 29. Interpolated Daily TP Concentrations Inflow versus Outflow Ideal Grove.

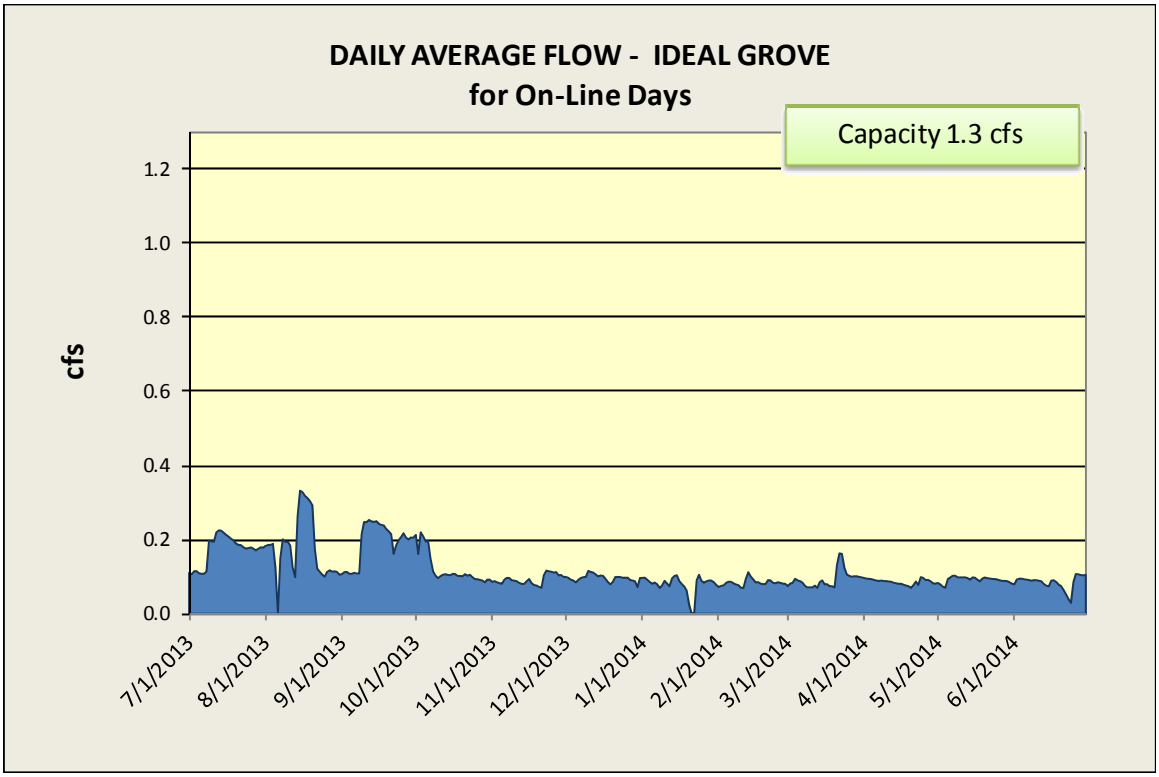


Figure 30. Daily Average Flows versus Capacity Ideal Grove.

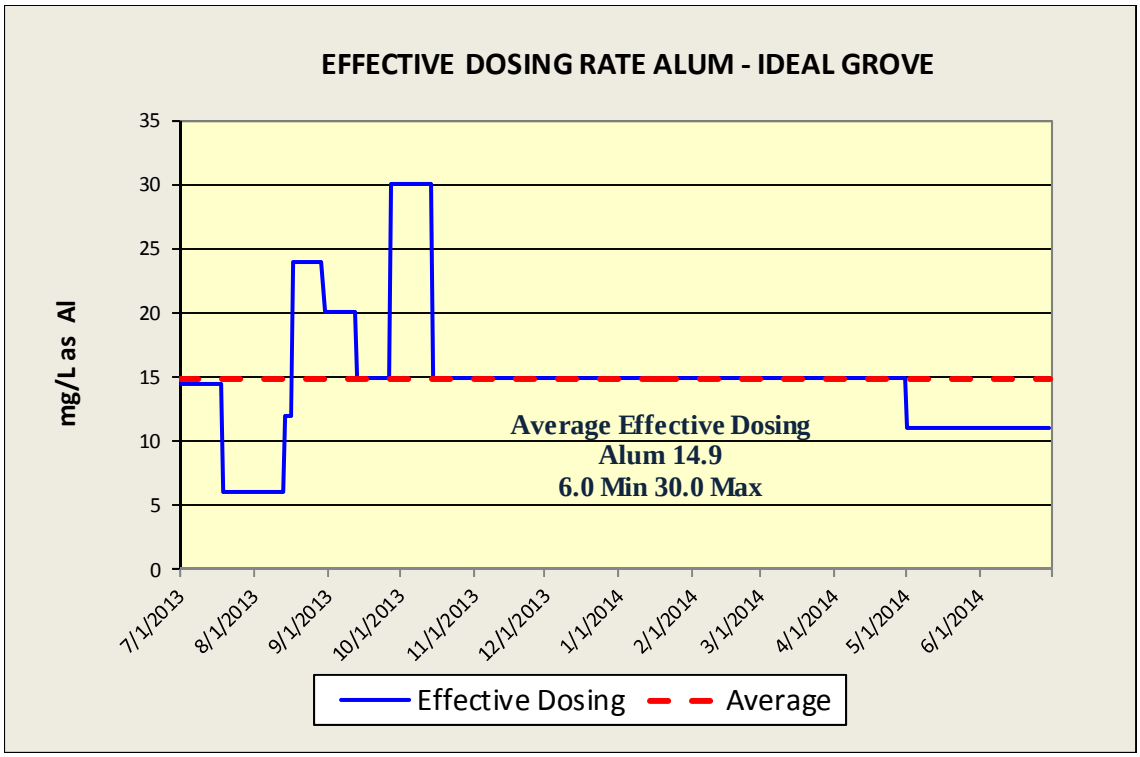


Figure 31. Daily Effective Dosing Rate and Average for the POR Ideal Grove.

Mosquito Creek (Site 3)

Mosquito Creek operated continuously during the POR; however, the system was taken off-line for flow meter enhancements and floc removal/tilling. The system experienced relatively higher flows through December and relatively reduced flows through March. Floc removal was conducted in April/May with increased flows occurring as the system came back on-line in June. Site 3 had the third highest interpolated flow-weighted inflow TP concentrations (640 μg/L) of the six HWTT facilities. The interpolated flow-weighted outflow was 150 μg/L, a 77% average removal for the period. The effective dosing of alum ranged from 2.0 to 19.2 mg/L, and the average was 11.0 mg/L as Al for the period. Polyaluminum chloride (PAC) was utilized for 53 days from July 1 through August 22. The effective dosing of PAC ranged from 7.0 to 14.0 mg/L during use, and the average was 11.5 mg/L as Al. The effective dosing of PAC for the entire POR ranged from 0.0 to 14.0 mg/L, and the average was 1.7 mg/L as Al. Dosing adjustments were made as necessary based upon on-site conditions. TP levels are interpolated from approximately weekly samples.

During Period 1 at Mosquito Creek, a flexible "chamber" previously utilized to assess floc characteristics of the alum and PAC coagulants was removed from the inflow region, and the inflow application piping was restored to its original location at the Northwest corner of the pond. Debris conveyed down Mosquito Creek fouled the influent flow meter on several occasions during Period 2, which sparked an investigation into approaches for minimizing debris impacts to the mechanical flow measurement device at this site. In response to extremely high color levels in the inflow creek water, intermittent dosing of alum was initiated in September. We increased the frequency of flow meter maintenance during Period 4, and continued our search for alternative flow measurement devices for both the Mosquito and Nubbin HWTT facilities. The accuracy of our coagulant dosing was compromised due to intermittent flow meter failure. During Period 5, we installed a new flow meter and initiated calibration efforts. In Period 6, a terrestrial vine colonized a large portion of the floating mat in the shallow zone. We will track this vine's progress in coming months to assess whether it adversely affects the floating plants, and whether or not it dies back during the winter months.

Periods 7, 8, and 9 saw continuous operation at Mosquito Creek. To improve the precision of alum dosing, we installed a reconditioned chemical pump in January. During Period 8, we assessed the level of floc buildup in the inflow region settling zone. To prepare for floc removal efforts in Period 10, we installed a temporary pump at the system inflow in March.

The system operated intermittently in Period 10 due to drydown/floc management efforts. Mosquito Creek was pumped down in April to facilitate floc removal and tilling of floc/vegetation into the shallow zone. The system was operated intermittently during May resulting from completion of drydown and floc/vegetation management efforts and low flow conditions in Mosquito Creek. During Period 11, we initiated the refilling of the Mosquito HWTT system (following drydown) with creek waters, but these efforts were constrained by upstream construction in Mosquito Creek, which reduced water supply at our inflow pump intake. In Period 12, improvements were made to a gravel trench that is used to drain rainwater from the inflow flow meter sump.

Interpolated TP mass removal over time is depicted graphically in Figure 32 together with the daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 33. Interpolated concentration inflow and outflow levels for the period are shown in Figure 34. Daily average flows are shown in Figure 35 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 36. Detailed operating data is contained within Appendix IV.

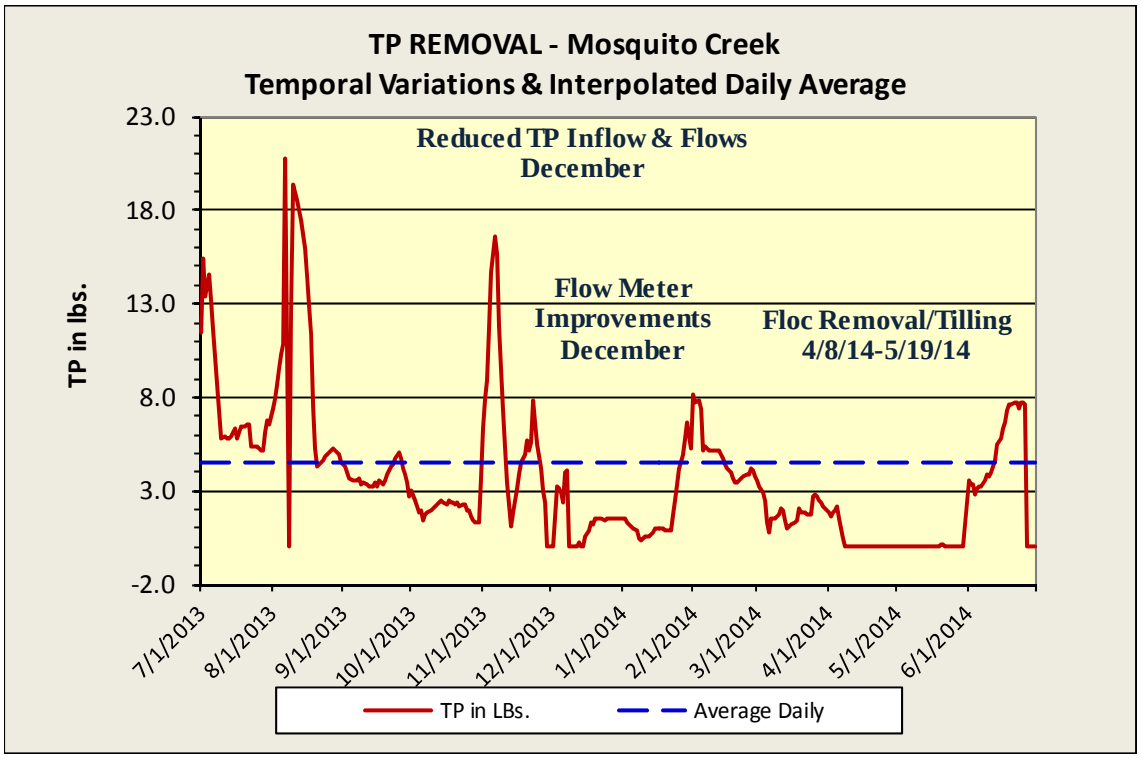


Figure 32. Interpolated TP Removal Temporal Variations & Daily Average Mosquito Creek.

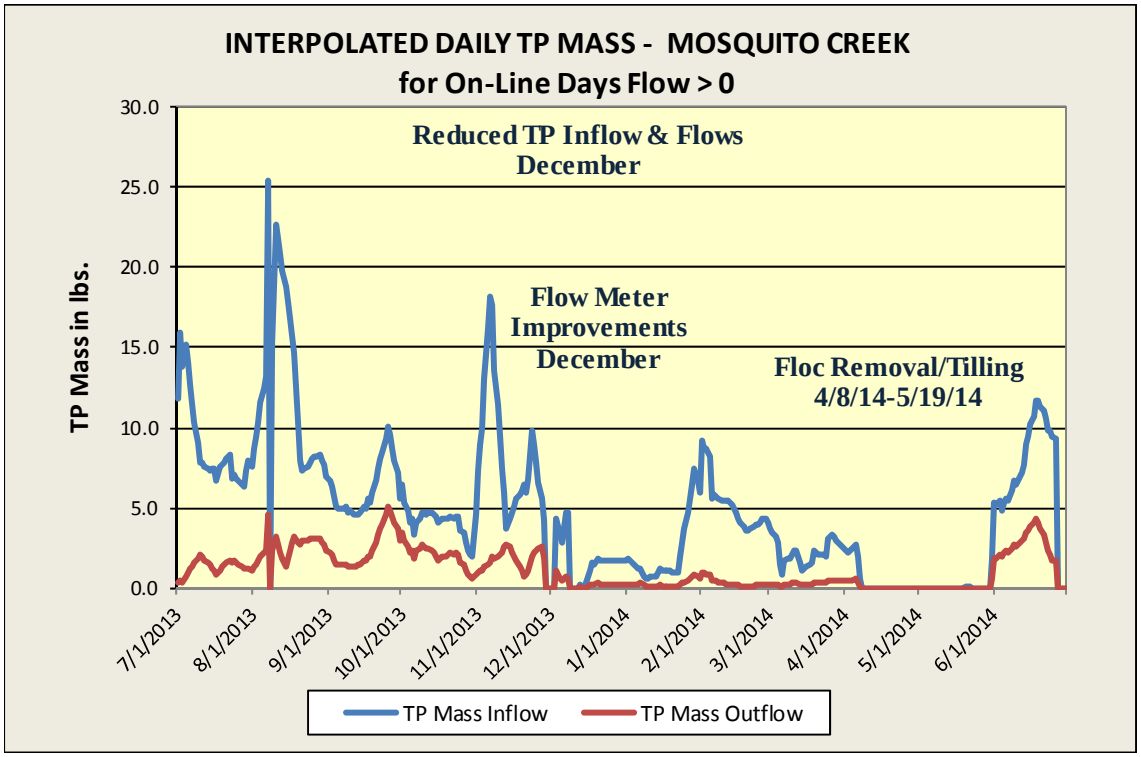


Figure 33. Interpolated Daily TP Mass Inflow versus Outflow Mosquito Creek.

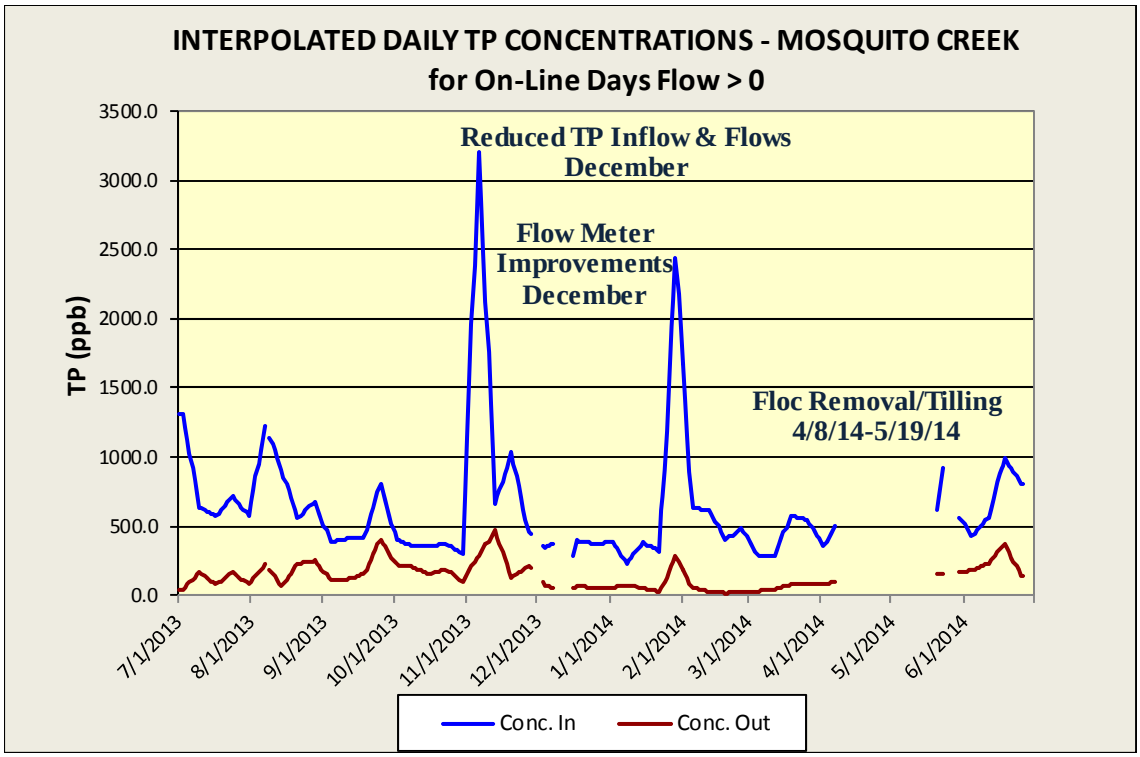


Figure 34. Interpolated Daily TP Concentrations Inflow versus Outflow Mosquito Creek.

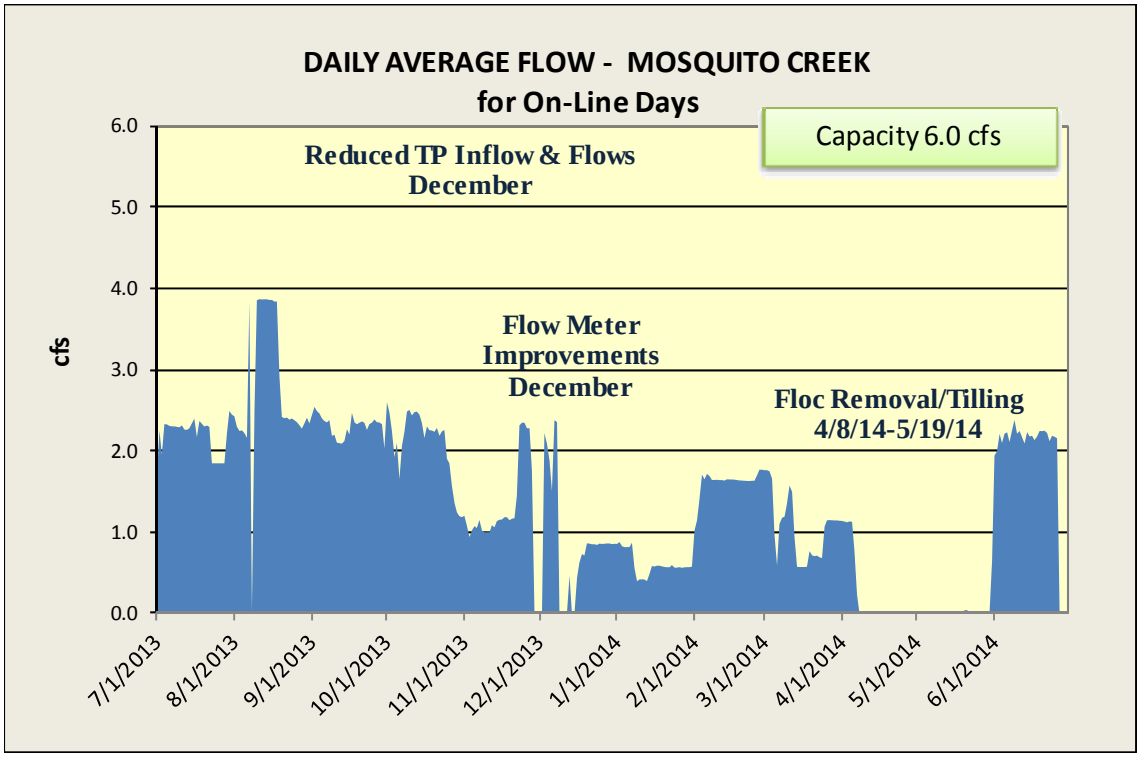


Figure 35. Daily Average Flows versus Capacity Mosquito Creek.

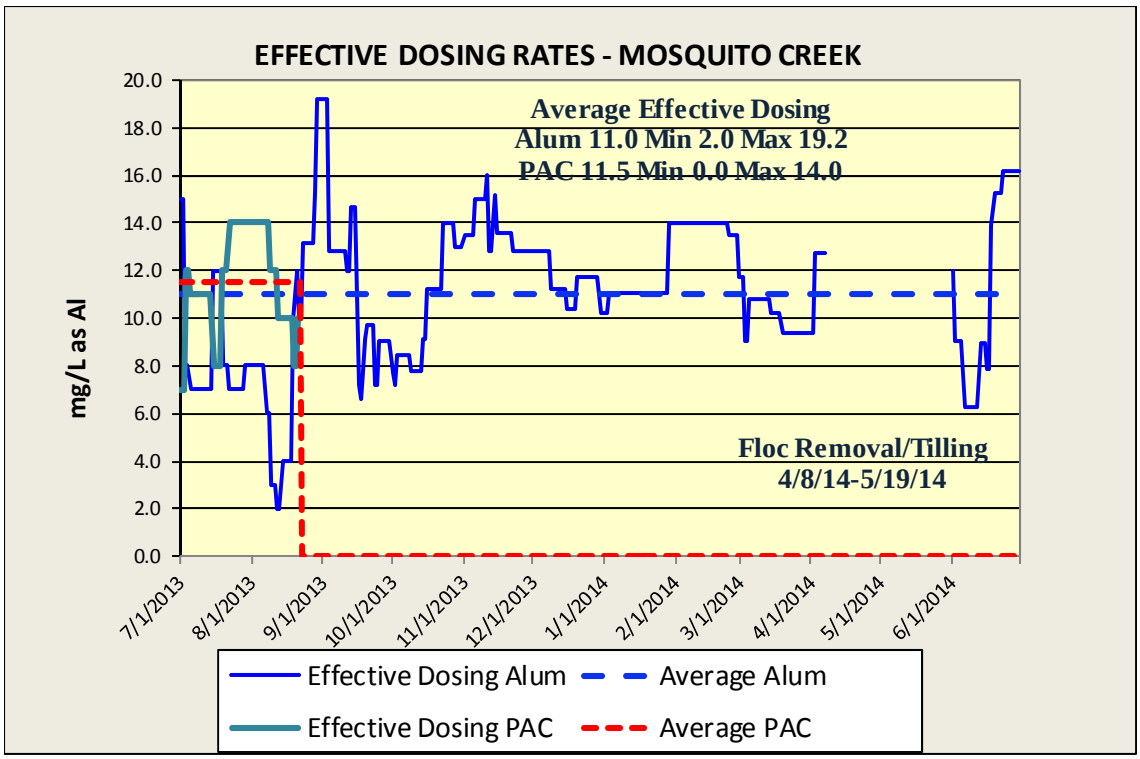


Figure 36. Daily Effective Dosing Rate and Average for the POR Mosquito Creek (excluding PAC).

Lemkin Creek (Site 5)

Lemkin Creek operated continuously during the POR and flow was stable except for minor down-time due to a mechanical pump failure. Site 5 had the lowest interpolated flow-weighted inflow TP concentrations (101 μg/L) of the six HWTT facilities during the period. The interpolated flow-weighted outflow was 29 μg/L, a 71% average reduction. The average effective dosing of alum was 3.4 mg/L as Al for the period with a minimum dosing of 2.5 and maximum of 4.7 mg/L as Al. The dosing was reduced slightly in November and December as TP inflow levels dropped. TP levels are interpolated from approximately weekly samples.

In Period 1, an emergent aquatic weed, Cuban bulrush (*Scirpus cubensis*), established virtually complete coverage within Lemkin Creek. This plant also became inoculated into the HWTT facility, with small stands occurring adjacent to the inflow mixing chamber. The infestation was controlled by spot herbicide applications.

During August, the air pump that re-suspends floc in the contact zone failed. Several components on the pump were replaced, and it was placed back in operation. In Period 3, the floating macrophyte (FAV) standing crop, which had been sparse and declining during most of the summer, began to recover and expand in response to an imposed, temporary regime of reduced coagulant dosing. We performed a floc depth survey during Period 4 in the contact and settling zones of the HWTT facility. In Period 5 we rebuilt the air mixing system for the contact/settling region to improve its performance. Modifications were also made to the inflow piping at the Lemkin HWTT system during Period 6 to improve the reliability of the flow meters.

During Period 7, solidified floc material that had accumulated over time was cleaned from the mixing chamber and inflow piping discharge point. The Lemkin Creek HWTT system was operated intermittently during Period 8 to accommodate maintenance activities. Due to evidence of corrosion, we replaced steel fittings on portions of the HWTT facility inflow plumbing. Operations returned to normal during Period 9 and ran continuously. Additional

electronic components were added in March to facilitate remote water pump monitoring/control.

A visual survey of vegetation was conducted during April in the downstream "isolated wetland". The wetland continues to support *calcareous periphyton* mats, which are characteristic of pristine (low P) conditions. During Period 11, Brazilian Pepper trees that had colonized the northern contact/settling pond berm were removed. The standing crop of FAV was sparse throughout the winter and spring of 2014. Early in Period 12, we reduced the coagulant dosing frequency, which should facilitate expansion of the FAV in the contact/settling zone.

Interpolated TP mass removal over time is depicted graphically in Figure 37 together with the daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 38. Interpolated TP concentration inflow and outflow levels for the period are shown in Figure 39. Daily average flows are shown in Figure 40 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 41. Detailed operating data is contained within Appendix V.

Infrastructure Modifications

There were no infrastructure modifications at Lemkin Creek for the POR.

Design Modifications

There were no design modifications at Lemkin Creek for the POR.

TP Mass Inflow and Outflow

As reported in Appendix V, the TP mass inflow for the POR was 355 lbs., and the outflow was 101 lbs. The total mass reduction was 254 lbs. or 72%.

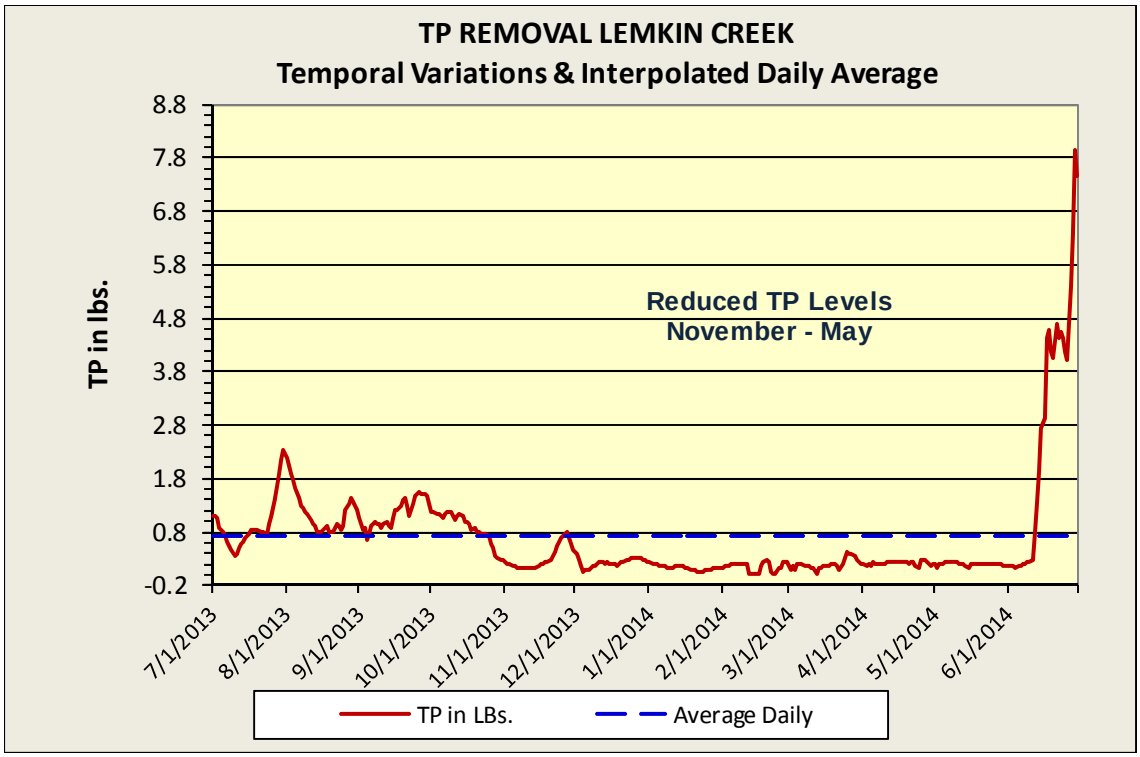


Figure 37. Interpolated TP Removal Temporal Variations & Daily Average Lemkin Creek.

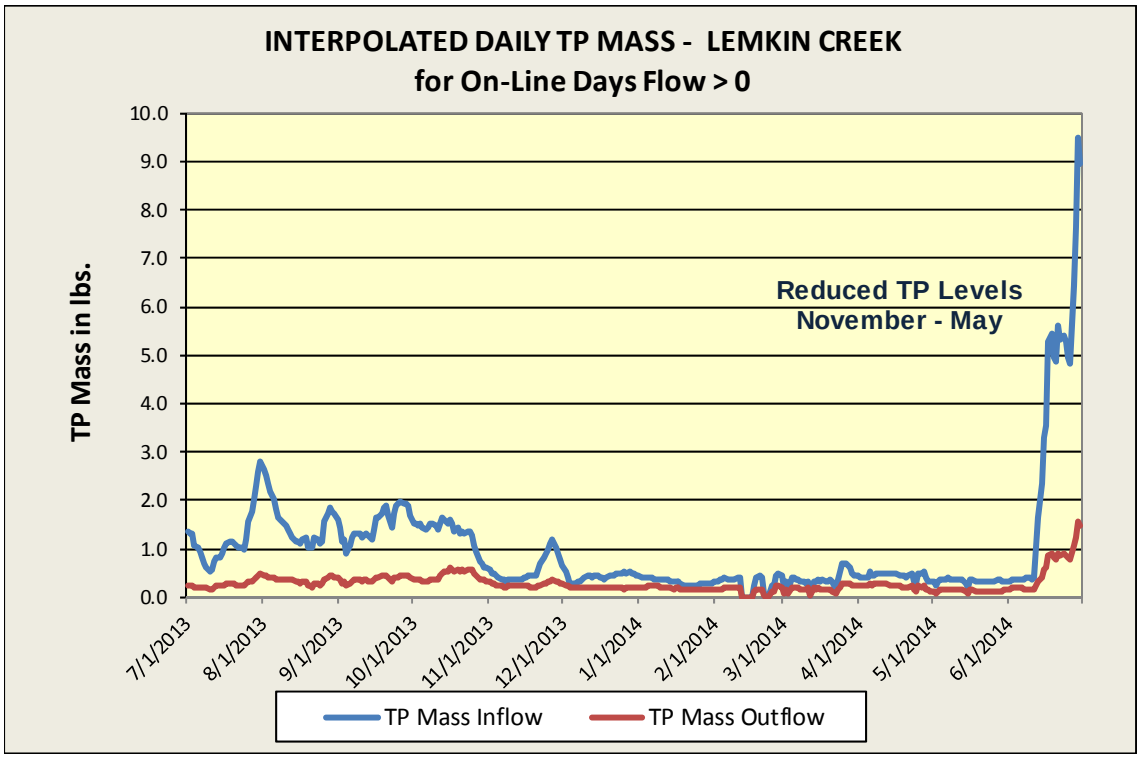


Figure 38. Interpolated Daily TP Mass Inflow versus Outflow Lemkin Creek.

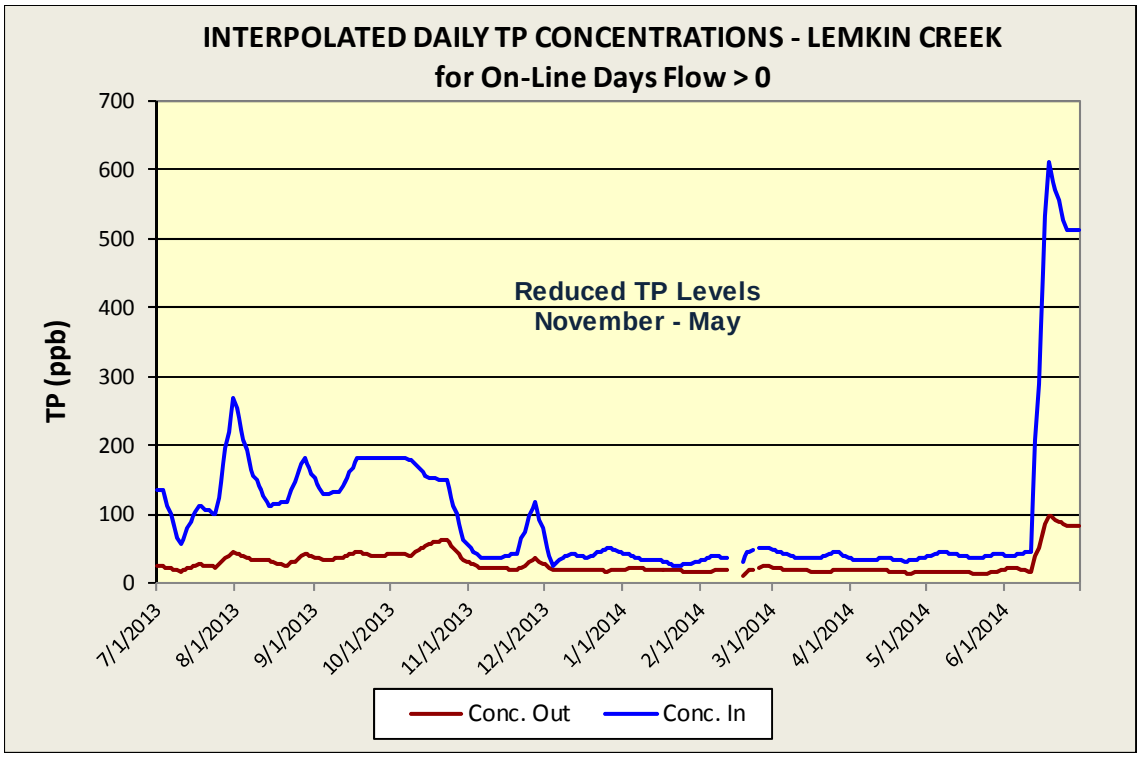


Figure 39. Interpolated Daily TP Concentrations Inflow versus Outflow Lemkin Creek.

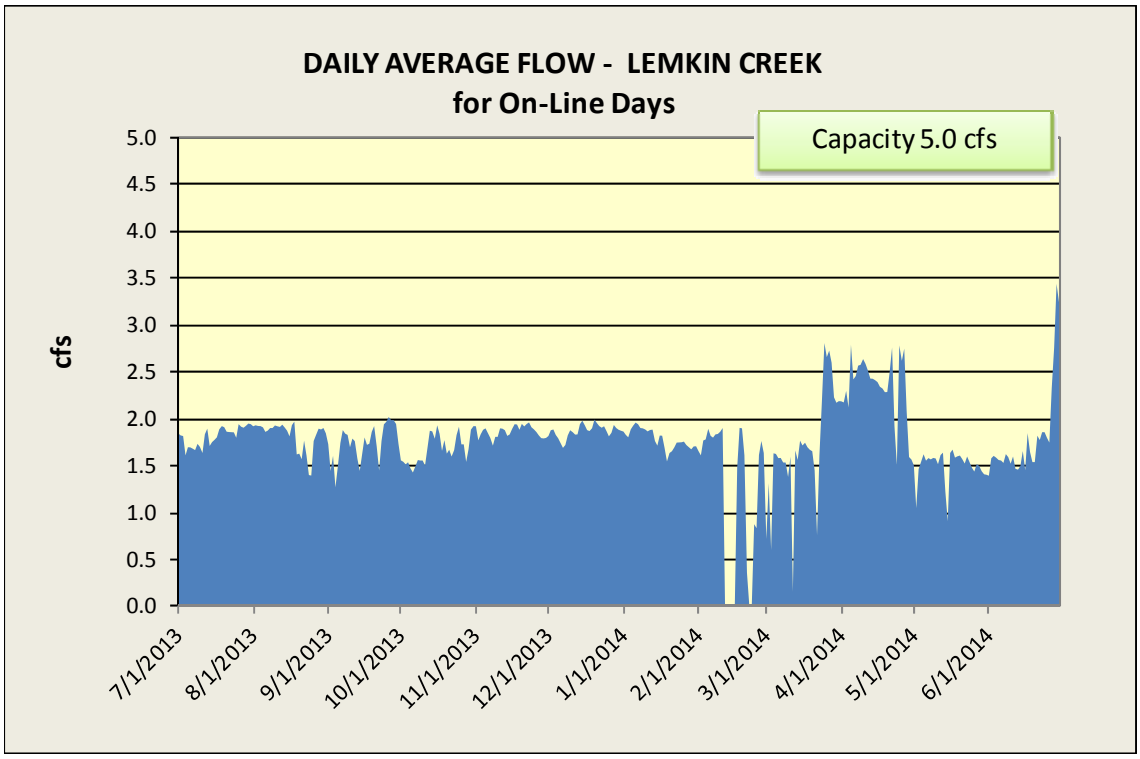


Figure 40. Daily Average Flows versus Capacity Lemkin Creek.

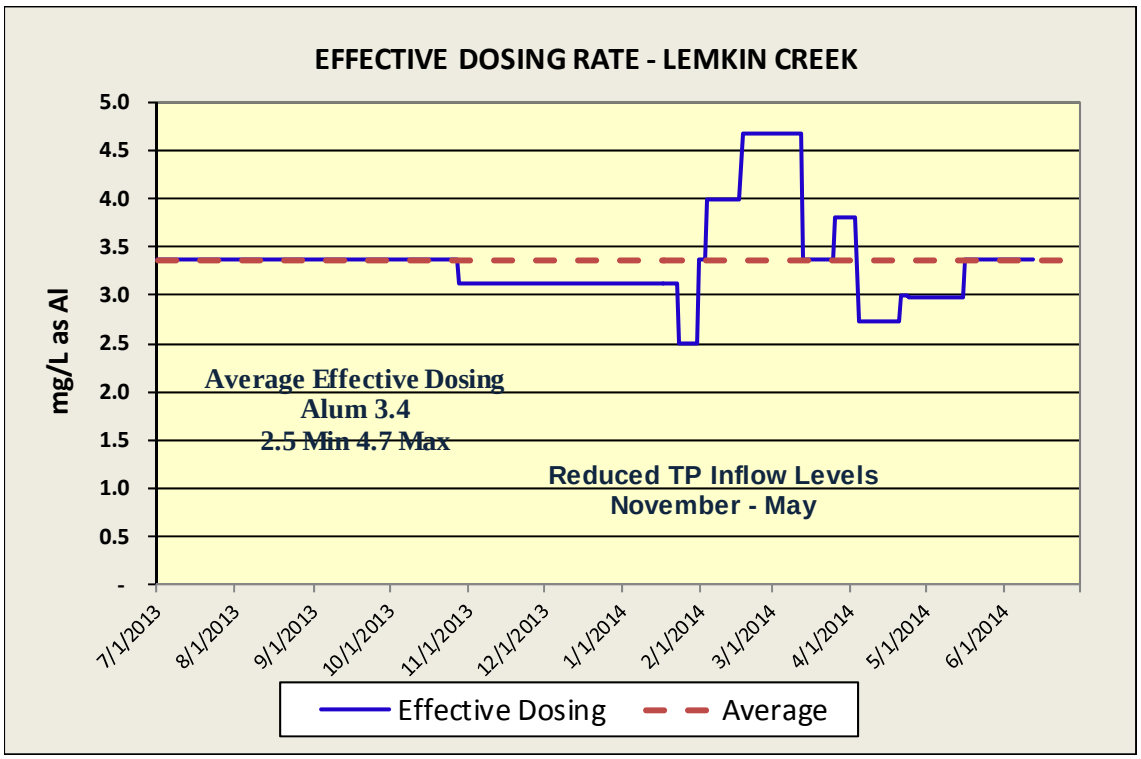


Figure 41. Daily Effective Dosing Rate and Average for the POR Lemkin Creek.

Wolff Ditch (Site 6)

Wolff Ditch operated continuously during the POR with one off-line day due to a power outage. Flow levels were stable for the majority of the period but increased significantly at the end of June. Site 6 had the second lowest flow-weighted inflow TP concentrations (146 µg/L) of the six HWTT facilities. The interpolated flow-weighted outflow was 24 µg/L, which represents an 83% average reduction for the period. The effective dosing of alum ranged from 3.9 to 6.5 mg/L, and the average effective dosing of alum was 4.6 mg/L as Al for the period, with dosing adjustments made during the period as necessary. TP levels are interpolated from approximately weekly samples.

As was noted for Lemkin Creek, *Scirpus cubensis* was found adjacent to the HWTT inflow structure in Wolff Ditch and was subsequently eliminated using herbicide applications. Maintenance activities were performed on the large (20 cfs) inflow water pump and motor, including grease application and alignment and tensioning of the drive belts in August. During Period 3, stands of water lily (a floating leaved, rooted plant) began to encroach on the contact pond floc re-suspension infrastructure. In Period 4 we made improvements to the chemical dosing plumbing in the coagulant storage building. During Period 5, a floc depth survey was performed due to the accumulation of floc between the mixing chamber and contact/settling zones within the inflow region of the Wolff HWTT facility. On several dates during Period 6, mats of floating floc appeared in the immediate inflow region of the system. As noted at other HWTT facilities, the floating plant zone served as an effective filter, preventing the downstream export of floc to the polishing pond.

During Period 7, operations ran continuously and mats of vegetation were cleared from the intake zone of the Wolff system inflow pump. In February, we noticed that the metal grating that protects the inflow pump well was missing, which was subsequently replaced in March. During Period 10, repairs were made to one of the HWTT system's chemical dosing pump controllers. In May, the pump intake sump was cleaned of solids that had settled in this region during the dry season.

Earthwork and vegetation clearing was performed by others at the outflow of the isolated wetland prior to June. During Period 12, we inspected the integrity of the system discharge, and noted that the amount of outflow weir rock armoring appeared to have been reduced. Because this potentially may cause erosion (depending on water stages in Lemkin Creek), we will continue to inspect this site on a biweekly basis throughout the wet season.

Interpolated TP mass removal over time is depicted graphically in Figure 42 together with the daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 43. Interpolated TP concentration inflow and outflow levels for the period are shown in Figure 44. Daily average flows are shown in Figure 45 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 46. Detailed operating data is contained within Appendix VI.

Infrastructure Modifications

There were no infrastructure modifications at Wolff Ditch for the POR.

Design Modifications

There were no design modifications at Wolff Ditch for the POR.

TP Mass Inflow and Outflow

As reported in Appendix VI, the TP mass inflow for the POR was 485 lbs., and the outflow was 80 lbs. The total mass reduction was 405 lbs. or 83%.

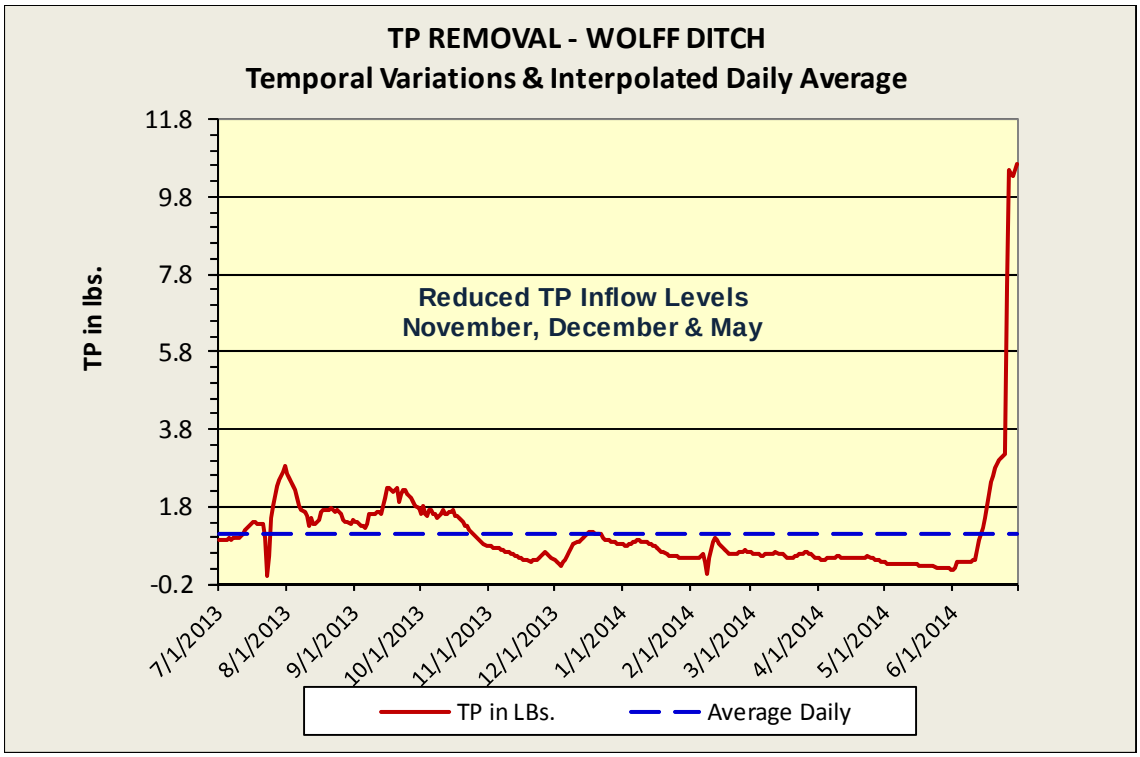


Figure 42. Interpolated TP Removal Temporal Variations & Daily Average Wolff Ditch.

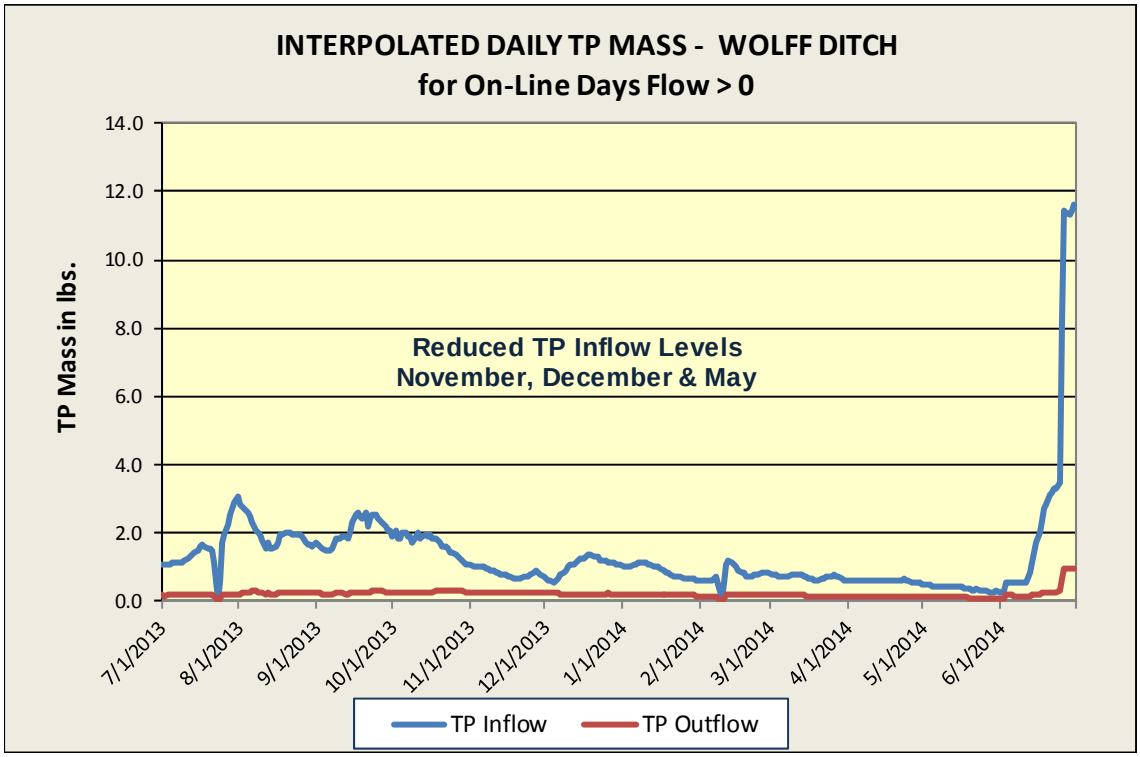


Figure 43. Interpolated Daily TP Mass Inflow versus Outflow Wolff Ditch.

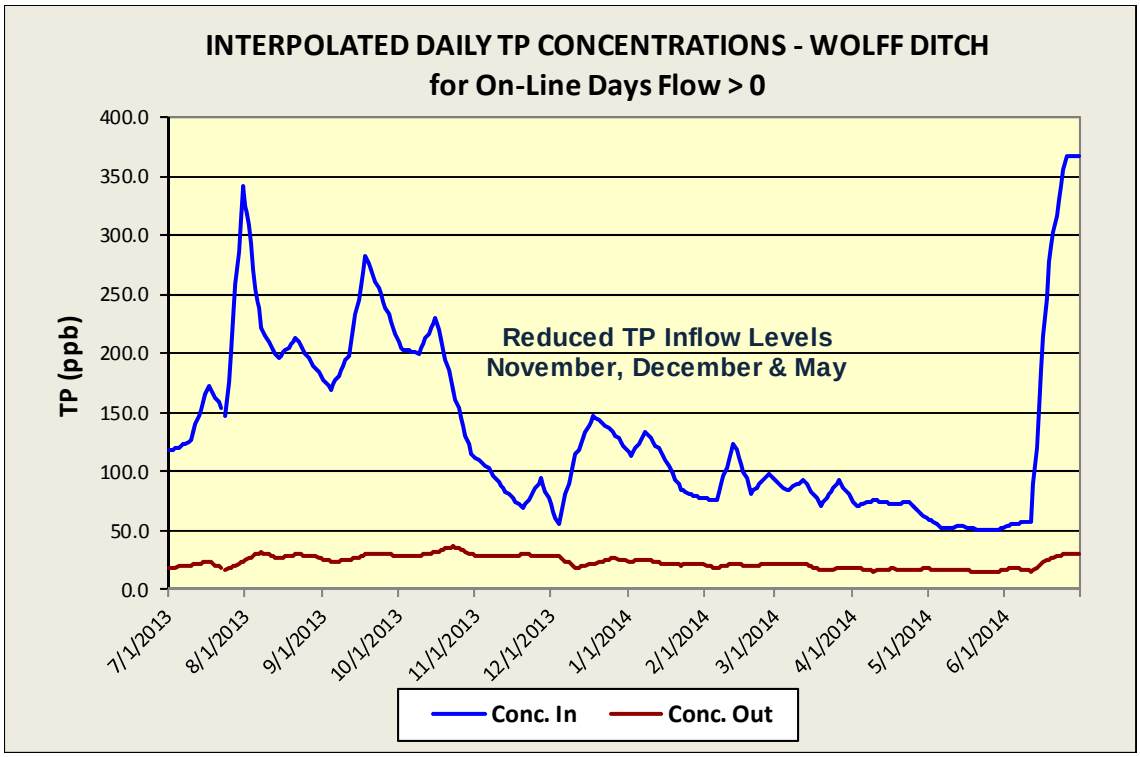


Figure 44. Interpolated Daily TP Concentrations Inflow versus Outflow Wolff Ditch.

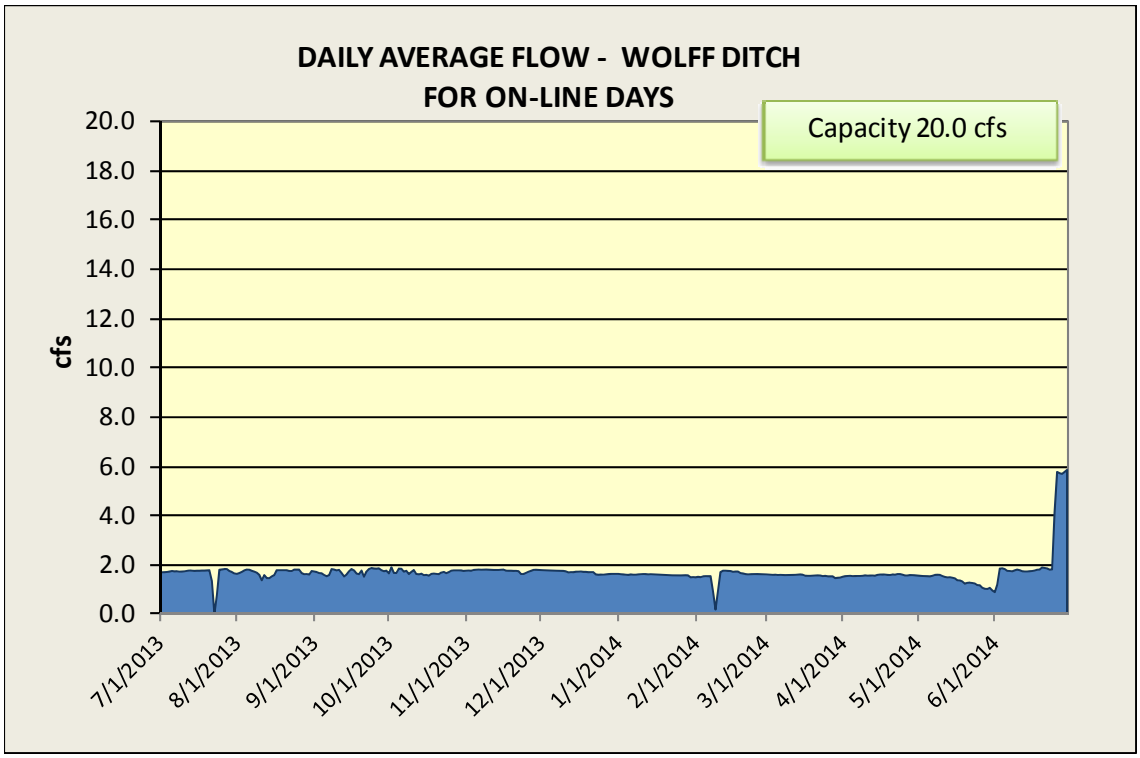


Figure 45. Daily Average Flows versus Capacity Wolff Ditch.

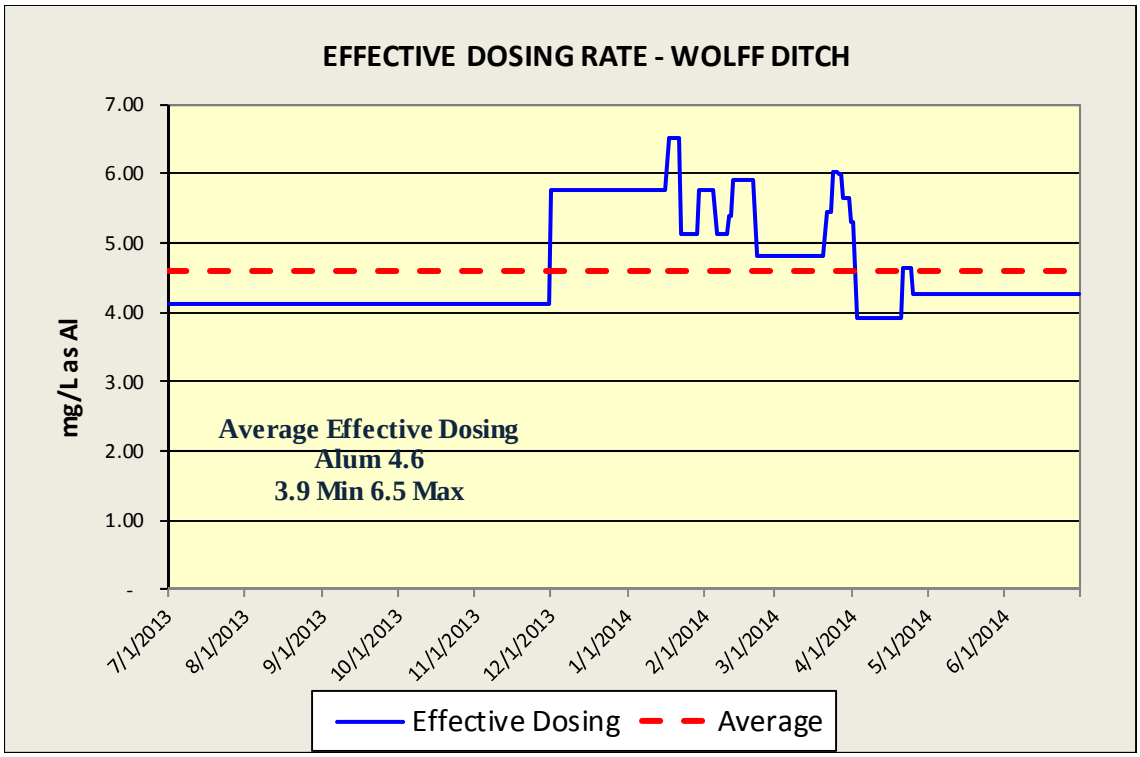


Figure 46. Daily Effective Dosing Rate and Average for the POR Wolff Ditch.

Grassy Island (Site 7)

Grassy Island operated continuously during the POR with 3 days down-time. Flow levels were highest from July through October and then maintained a significantly lower level from November through May. Flows subsequently increased during June. Site 7 had the fourth highest interpolated flow-weighted inflow TP concentrations (490 μg/L) of the six HWTT facilities. The interpolated flow-weighted TP outflow was 93 μg/L, an 81% average reduction for the period. The effective dosing of alum ranged from 3.9 to 18.0 mg/L, and the average was 11.3 mg/L as Al for the period. PAC was utilized for 265 days from October 9 through June 30. The effective dosing of PAC ranged from 0.5 to 6.0 mg/L during use, and the average was 1.9 mg/L as Al. The effective dosing of PAC for the entire POR ranged from 0.0 to 6.0 mg/L, and the average was 1.4 mg/L as Al. Dosing adjustments were made as necessary based upon on-site conditions. TP levels are interpolated from approximately weekly samples.

We initiated calibration and optimization of the pump station variable frequency drives (VFDs) and alarm systems during Period 1. Additional laboratory jar testing of Taylor Creek waters and calibration of outflow weirs and stage measurement devices for the eastern and western flow paths were also performed during July. By August, modest levels of fine particles in the HWTT facility outflow were observed, indicating a possible export of PP and total Al. We performed additional laboratory analyses to evaluate the utility of PAC and alum coagulant blends under high color/low alkalinity conditions, which suggested that the combination of coagulants will sharply reduce PP levels in the system outflow. Approval from the Florida Department of Environmental Protection (FDEP) for the use of the PAC coagulant in the system was subsequently received. PAC dosing infrastructure has since been incorporated into the facility, and various blends of PAC and alum likely will be utilized in future operations. We performed wet floc pumping trials on both the eastern and western flow paths during Period 2 and initiated control of undesirable emergent weeds that had colonized the western SAV pond during construction.

During Period 3, an upper bearing cover on one of the large (150 horsepower {hp}) inflow pumps began to fail. Its repair required a temporary shutdown (one day) of inflow

pumping at the facility. Because inflow alkalinity levels typically were low during Period 3, modest levels of alum dosing were maintained, which resulted in incomplete removal of the inflow color (and likely, an export of some PP and total Al). Approval to incorporate the PAC coagulant was received from FDEP subsequent to Period 3 on October 4. The use of PAC should improve performance under low inflow alkalinity conditions. In Period 4, a seal on one of the large water pumps failed, necessitating its removal for inspection/troubleshooting of both the pump and motor. The pump removal required a temporary shutdown (one day) of inflow pumping at the facility. One of the seams in the original Algal Turf Scrubber (ATS) system plastic liner failed, which caused the undermining of one of the limerock bed outflow weir structures. Once Taylor Creek flows declined during Period 4, we were able to divert flow from this location and repair both the liner and weir structure.

Floc originating from the combined use of the coagulants alum and PAC was collected from several settling chambers in the western flow path in Period 5. These samples were transported to the laboratory, where they were subjected to a synthetic precipitation leaching procedure (SPLP), which assesses adsorption-desorption potential of constituents (e.g. heavy metals) that could potentially impact groundwaters. The results of these tests were favorable and were submitted to FDEP during Period 6. At the request of the South Florida Water Management District (SFWMD) land management personnel, during Period 5 we initiated mowing and woody vegetation removal from outlying portions of the facility that typically are not maintained. The western flow path FAV pond booms that had been dislodged during previous thunderstorm-related high wind events were adjusted and re-anchored in Period 5 as well. To provide baseline capacity information prior to the onset of the 2014 wet season, we measured the depth of accrued dry floc at several locations in the eastern drying bed complex during Period 6. In the 2013 dry season, we observed that Taylor Creek flowed "backwards" (upstream) on several occasions, a phenomenon that caused our discharge waters to mingle with system inflow waters. To assist in identifying periods of "backwards" flow, an electronic flow direction sensor was installed in Taylor Creek during Period 6. In late 2013, the original paint on the system piping at the pump

station began to peel off. In December, we therefore repainted the large system pump station discharge pipes.

During Periods 7, 8, and 9 lower flow conditions prevailed in Taylor Creek. Troubleshooting during Period 7 of one of the large system inflow water pumps revealed that many of the steel balls in the upper bearing had sheared in half, which we began repairing and completed during Period 8. In February, herbicides were applied to weeds that had colonized the facility's limerock beds during the low flow conditions of the dry season. Floc settling trials were performed in the eastern contact pond complex during Period 8, to characterize settling performance during periods when they are approximately 50% - 70% "full" of wet floc. Following floc settling trials, wet floc stored in the three eastern contact ponds was pumped to the two nearby floc drying beds. During this time, flow was diverted for treatment to the western flow path. In March, supplemental stocking of an SAV species (*Najas guadalupensis*) was performed in the western SAV pond. An additional flow "splitter box" was installed into the western contact/settling pond during Period 9. During Period 9, the "floc camera" in the eastern flow path was upgraded to a new model with improved optical characteristics.

Low flow conditions continued to prevail during April and May. During Period 10, supplemental stocking of a second SAV species (*Potamogeton illinoensis*) was performed in the western SAV pond. Both the *Potamogeton*, and the previously stocked *Najas*, were starting to proliferate throughout the pond. The belt tension of one of the 150 hp inflow water pumps was measured during Period 10 to ensure that the pump bearings are not being subjected to excessive stress. Also during this Period, accumulated wet floc was pumped from the eastern contact ponds to the nearby drying beds. As a result of belt tension testing, during Period 11 the width of the belt on the 150 hp inflow pump was cut down to improve longevity of the pump bearings. Because flows in Taylor Creek continued to intermittently change direction in May, improvements were made to the creek "flow direction" monitor during Period 11. Following floc removal during Period 10, repairs were made to the eastern contact pond liners at the culvert penetrations.

By Period 12, normal flow conditions had returned. Since we previously noted some scouring of the vegetation at the inflow of the eastern SAV pond during high flow operations, in June we initiated deployment of a rock baffle to reduce flow velocities near the inflow culvert pipe. Herbicide was applied to undesirable vegetation during Period 12, both in the limerock bed windrows and along the eastern SAV pond shoreline.

Interpolated TP mass removal over time is depicted graphically in Figure 47 together with the daily average reduction. Temporal variations in interpolated TP mass inflow versus TP mass outflow are presented in Figure 48. Interpolated TP concentration inflow and outflow levels for the period are shown in Figure 49. Daily average flows are shown in Figure 50 compared to system capacity. The effective dosing of alum and the average for the POR is depicted in Figure 51. Detailed operating data is contained within Appendix VII.

Infrastructure Modifications

There were no infrastructure modifications at Grassy Island for the POR.

Design Modifications

One project design modification was implemented at the Grassy Island HWTT facility during the reporting period, which relates to the use of a new supplementary chemical coagulant (PAC). During the week of August 25, 2013, FDEP suggested that use of the PAC chemical coagulant be included during operations at 20cfs prior to applying for the 30cfs operations permit. FDEP had informally reviewed data in support of a request to use the PAC, and a signed application was submitted to FDEP on August 30, 2013. FDEP authorized the PAC request on October 4, 2013 by issuing permit No. 0259591-006, and PAC use was initiated in mid-October. PAC dosing infrastructure has since been incorporated into the facility, and various blends of PAC and alum likely will be utilized in future operations when the combination of raw creek water chemistry and limerock bed alkalinity production is not providing adequate buffering capacity needed for optimal floc production using alum.

TP Mass Inflow and Outflow

As reported in Appendix VII, the TP mass inflow for the POR was 8,233 lbs., and the outflow was 1,563 lbs. The total mass reduction was 6,670 lbs. or 81%.

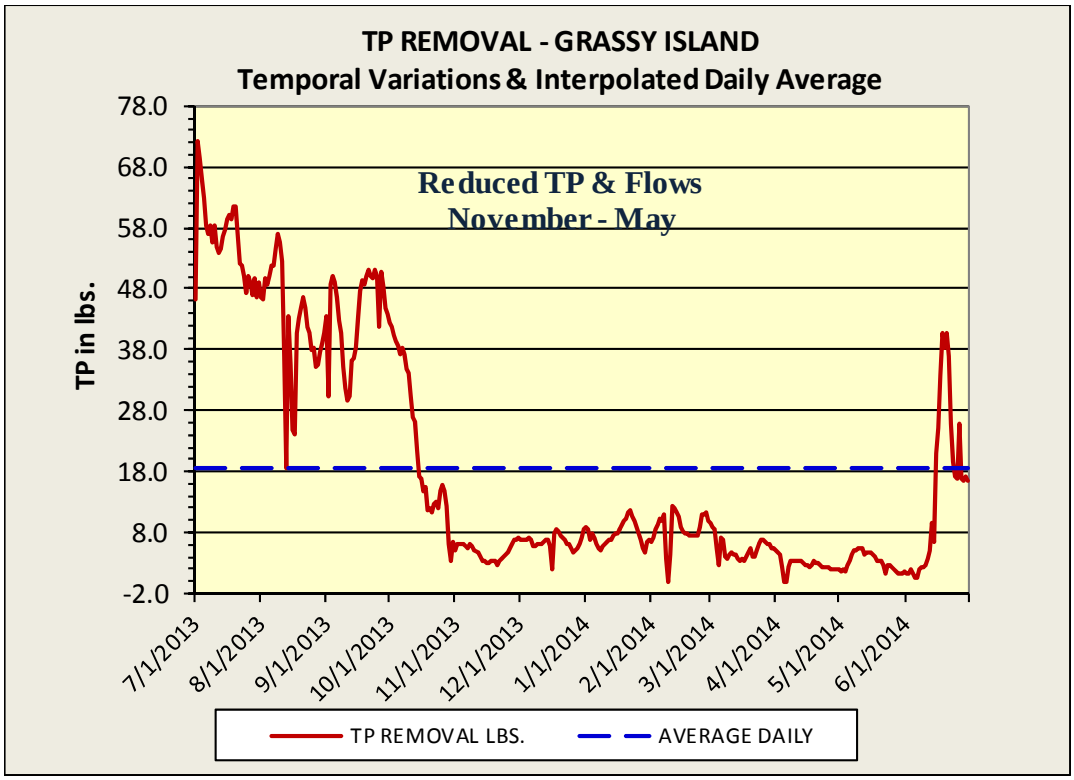


Figure 47. Interpolated TP Removal Temporal Variations & Daily Average Grassy Island.

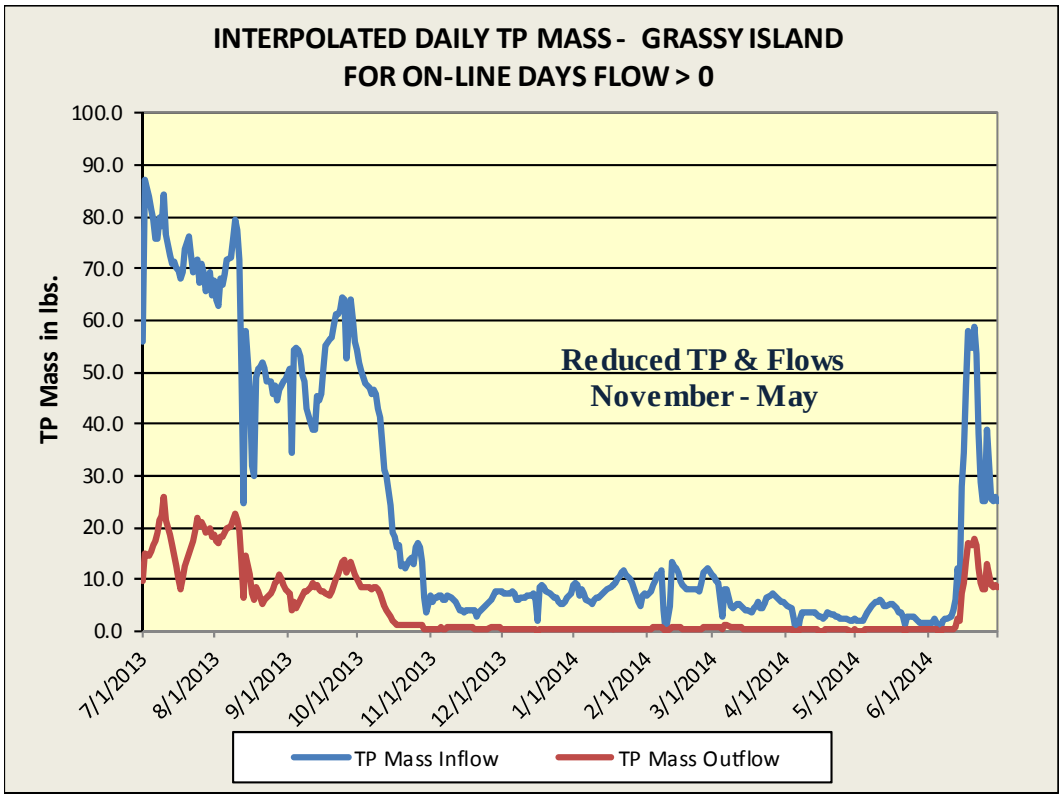


Figure 48. Interpolated Daily TP Mass Inflow versus Outflow Grassy Island.

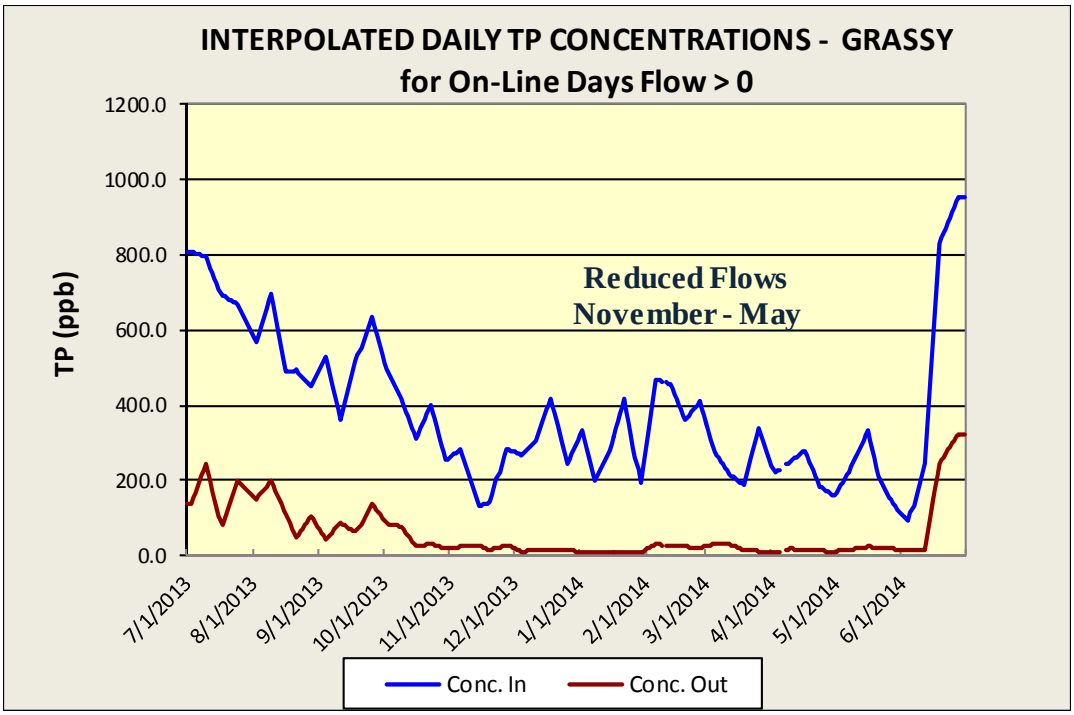


Figure 49. Interpolated Daily TP Concentrations Inflow versus Outflow Grassy Island.

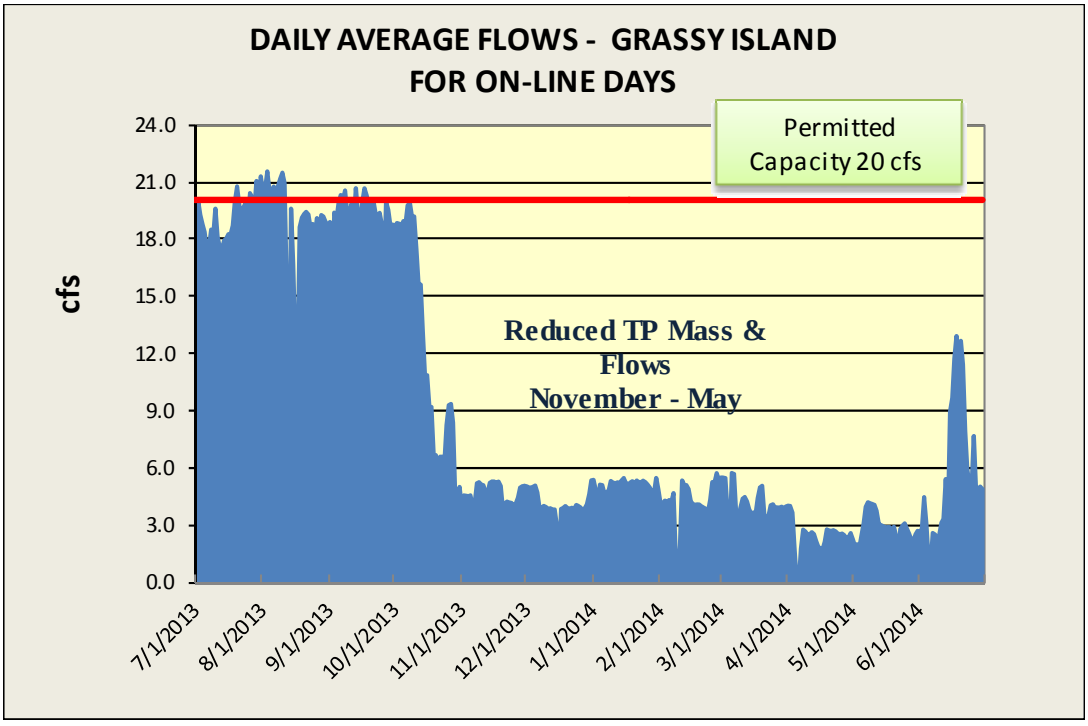


Figure 50. Daily Average Flows Grassy Island.

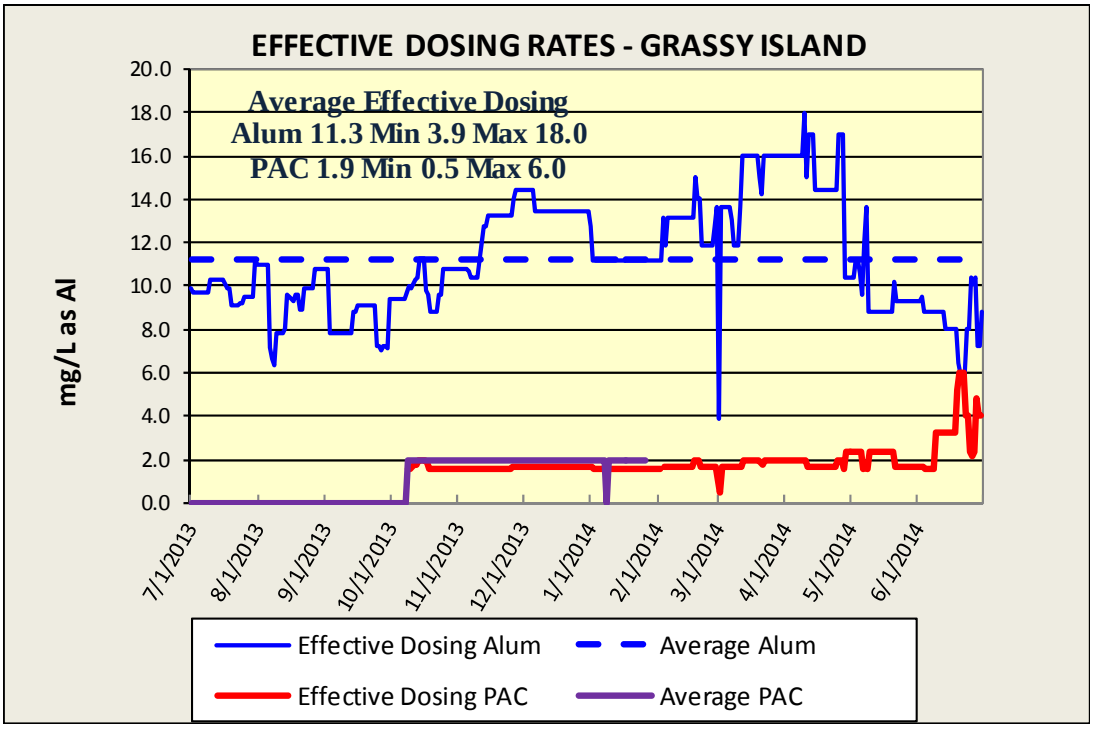


Figure 51. Daily Effective Dosing Rate and Average for the POR Grassy Island.

Economic Analyses

The background of issues concerning cost/benefit calculations, assumptions and methodologies employed in this Report are discussed in the following sections. Detailed expenditures by site are presented for both infrastructure and current O&M, together with total forecasted 50 year projections. Cost/benefit values are computed under the various methodologies presented in previous studies together with detailed operating data. Finally, factors affecting cost benefit values are explored.

Summary of Issues

Over the past several years, various reports demonstrating cost/benefit analysis for P removal have been prepared, for example, Brown & Caldwell, 1996; Sano et al., 2004; SFWMD, 2009. These analyses, however, often utilize different methods for comparison; include dissimilar items in the calculations; contain disparate basic assumptions; and present varying units of measurement. For example, Brown & Caldwell projected results under the Present Worth methodology over 50 years, whereas the Davie Dairy Edge of Farm (EOF) cost/benefit analysis (SFWMD, 2009) utilized a different approach using current year expenses plus capital cost amortized over 15 years. Conversely, the Sano Report included other economic cost offsets such as water and recreation benefits. Perhaps most importantly, much of the available cost/benefit data is based largely upon desktop evaluations rather than actual costs and performance observed under real world conditions. Ideally, all benefits, both tangible and intangible, should be considered and weighed against treatment alternatives whenever practicable and/or feasible. Full costs should be considered and projects should be compared using identical methodologies.

Maximizing Cost/Benefit

Several conditions have proven to be paramount in maximizing the cost/benefit of specific projects as follows:

1. Sufficient and consistent flow approximating design capacity.
2. Relatively high P levels available for treatment.

3. Reasonable levels of certain water quality parameters that have a significant influence on treatment, for example, low color and high alkalinity.

4. Minimization of retrofitting and/or pre-existing constraints of original sites that can add significantly to costs and degrade the performance of a technology.

All of the aforementioned issues are relevant at some or all of the HWTT operational sites, and consequently have negatively impacted performance. Site selection therefore becomes a key component of maximizing productivity and efficiency; some of the HWTT locations were chosen to accomplish important goals not directly related to maximum P removal, but nonetheless, the attendant costs impact cost/benefit. A discussion of some of these indirect objectives is included under Environmental and Ancillary Benefits. To adequately compare and assess technologies, the inherent social goals and monetary benefits should be included.

Calculation Methodologies

The standard template for a cost benefit analysis projects the present worth of the project over the expected life, considering both capital and annual costs. As noted in the Summary of Issues above, other calculation methods have been utilized for determining the cost/benefit for removal of P. Additionally, problems that occur when moving from a "desktop" evaluation to an active project must also be taken into consideration. *Accordingly, several alternative calculations are presented to provide information that can be used for comparison with the different methods previously utilized.*

First, two basic scenarios were employed to account for differences due to lack of flow available for treatment and off-line periods during trial modes (see discussions in Chapter I Technical Report for explanation). The first presents actual costs and the second scenario provides additional managerial information for total long-term projected costs and benefits under maximum facility utilization.

A. Scenario #1 Partial Capacity Utilization: Actual full costs are utilized in calculating cost benefit. This method distorts the true cost of a project if there is unused capacity (for example, lack of flow due to drought or downtime for

trials/demonstrations), thereby greatly overstating per unit costs and understating potential removal of P. Cost/benefit values are higher as fixed costs are distributed over fewer P removal "benefit" units. Values produced would be inconsistent with previously referenced desktop studies and would have scant value to management in projecting future costs for planning purposes. Capacity utilization by operational facility for the six periods is depicted graphically in Figure 21. Utilization for the current POR was 14%, 9%, 28%, 36%, 8% and 43% for Nubbin Slough, Ideal Grove, Mosquito Creek, Lemkin Creek, Wolff Ditch and Grassy Island, respectively.

B. Scenario #2 Full Capacity Utilization: Full costs are utilized as above; however, variable and semi-fixed costs are extrapolated to project total costs at full capacity. TP removed is also projected based upon actual per day performance during the current period to compute the long-term cost/benefit. Projected total costs and projected P removal are demonstrated for a system that is operating close to 100% of design flow capacity; which is more comparable to desktop studies. Semi-fixed costs refer to those expenses that would change in a step-like function as capacity utilization increased, for example, certain personnel time. Economies of scale (for water treatment capacity) are realized.

Second, for each of the above scenarios, cost/benefit was calculated based on the two separate approaches that have been discussed, included in previous reports and/or requested by the Funding Agency. Each contract is analyzed as a stand-alone period for O&M and life cycle. Prior expenses are not adjusted to current year dollars. The two approaches are as follows:

A. Amortized Loan: An alternative calculation of Projected Cost/Benefit values which considers non-recurring costs as loan payments. Capital Improvement costs are adjusted for the time value of money by considering the non-recurring costs as loan payments. The interest rate and life are 4% annual interest and a 50 year life. The adjusted capital expenditures are added to current year O&M costs. [Note – this approach replaces the previous "Amortized Capital + O&M" wherein infrastructure was amortized over the projected life of the project and added to current year O&M

costs to determine the current year cost/benefit (referred to as "Amortized Capital + O&M"). The Amortized Loan calculations are presented for the current and the previous contract in this Chapter II. Presentation of cost/benefit for any prior periods utilizes the "Amortized Capital + O&M" methodology.] 50 year life references are: Evaluation Methodology (SFWMD, 2002); Desktop Evaluation (Brown and Caldwell, 1996); and Economic Analysis (Sano et al., 2004).

B. Present Value: The present value (PV) of O&M with an assumed *net* discount rate of 4% (rate used in Desktop Evaluation (Brown and Caldwell, 1996) and 50 year life is added to infrastructure costs to determine the net PV of total costs and cost/benefit. Only the current year O&M costs are used in the analysis. No inflation adjustment is made for capital; infrastructure is therefore stated in original dollars for all sites. (Rate used in the Evaluation Methodology (SFWMD, 2002) was 3.375 %.)

Other Basic Assumptions

The following represent the major assumptions used in calculating cost/benefit values. Changes in any assumption will impact the cost/benefit calculations. A sensitivity analysis was beyond the scope of this contract and accordingly has not been performed.

1. For the five existing sites (#1-3, 5-6) only 50% of Optimization & Monitoring costs during construction have been excluded based on the estimated time that the systems were operational during construction. As noted above, infrastructure is assumed to be in current dollars. Exclusion of up to 100% of first year operations in calculating cost/benefit data is a reasonable assumption. Construction of the Grassy Island facility began under the 2010 contract, and modifications were completed under the previous period to allow for sustained operations at 10 cfs. All construction and optimization and monitoring expenses have been capitalized, as compared to only 50% of these expenditures that were added to infrastructure for the other five facilities. Grassy Island was on-line July 11, 2011, and full-scale optimization and monitoring commenced. The following 125 day period through November 12, 2011 was shown as de facto O&M, and the corresponding TP data

was tabulated to present a cost benefit calculation during this start-up optimization period in the prior contract.

During the previous POR, Grassy Island was permitted at 10 cfs through November 29, 2012 and increased to 20 cfs through June 30, 2013 for an average of 15.8 cfs. Although construction for expansion to 30 cfs was completed June 13, 2013, permitting is limited to 20 cfs until approved completion of a required FDEP operating period. Only capital costs related to an average approximate capacity of 20 cfs are therefore included in the cost benefit calculation for Partial Capacity Utilization. Conversely, all infrastructure expenditures are included in the Full Capacity Utilization calculations, since the facility is assumed to be operating at 30 cfs at full capacity.

2. Variable O&M costs include those costs primarily flow related including chemicals, utilities, drydown, tilling, and floc management, but *do not* include any associated personnel time.

3. Outstanding expenses as of the Report date are estimated and included in the calculations.

4. Land costs are excluded from the analysis due to lack of availability of data; estimation is beyond the scope of the project. Although the land has been made available at the various sites and hence a purchase price is not identified, the costs should be included in an economic analysis. These costs are relatively minor, however, for HWTT due to the smaller footprint than *some* alternative treatment methodologies.

5. Per day amounts are used to standardize for the differences in the expense period and the sampling period. The operating costs cover the contract period plus projected outstanding expenses as of the contract end date. Operational data are noted for each site in the detailed operating reports shown as appendices. As noted above, the POR is July 1, 2013 through June 30, 2014 for all sites (Period 6).

6. Social and other economic benefits are excluded from the calculations. These amounts can materially change the analysis, but were beyond the scope of this project. For example, these positive benefits had a significant favorable impact on cost/benefit values calculated in Economic Analysis (Sano et al., 2004).

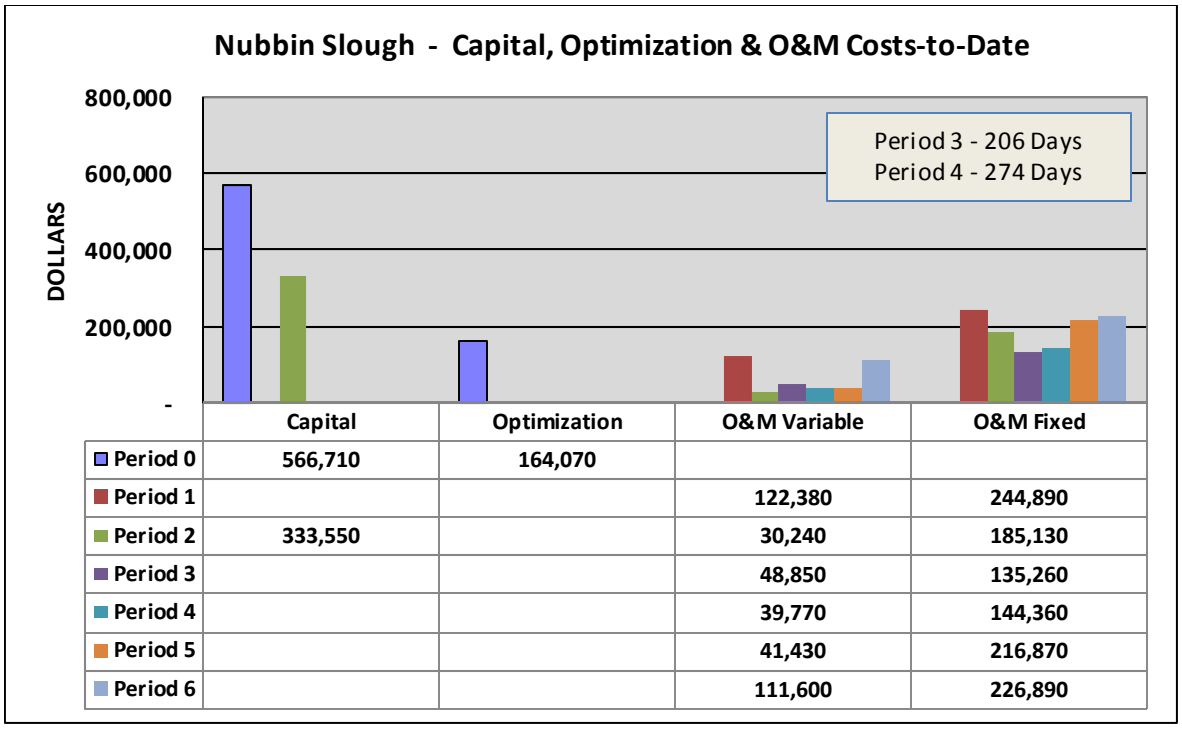
7. Rough Order of Magnitude projected replacement costs and an accompanying sensitivity analysis were prepared as part of the previous contract, upon request, and are included as Appendix IX. The analysis has been updated. Replacement costs and salvage values are beyond the scope of this project and are not considered in the 50 year projection.

8. The Contracts do not all represent 365 days; therefore, the terms are labeled as "Periods". Period 0 is the initial building of Sites 1-3. Sites 5 and 6 were constructed in Period 1, and Grassy Island (Site 7) was in varying degrees of construction for Periods 2 through 5.

Expenditures – Current and Projected

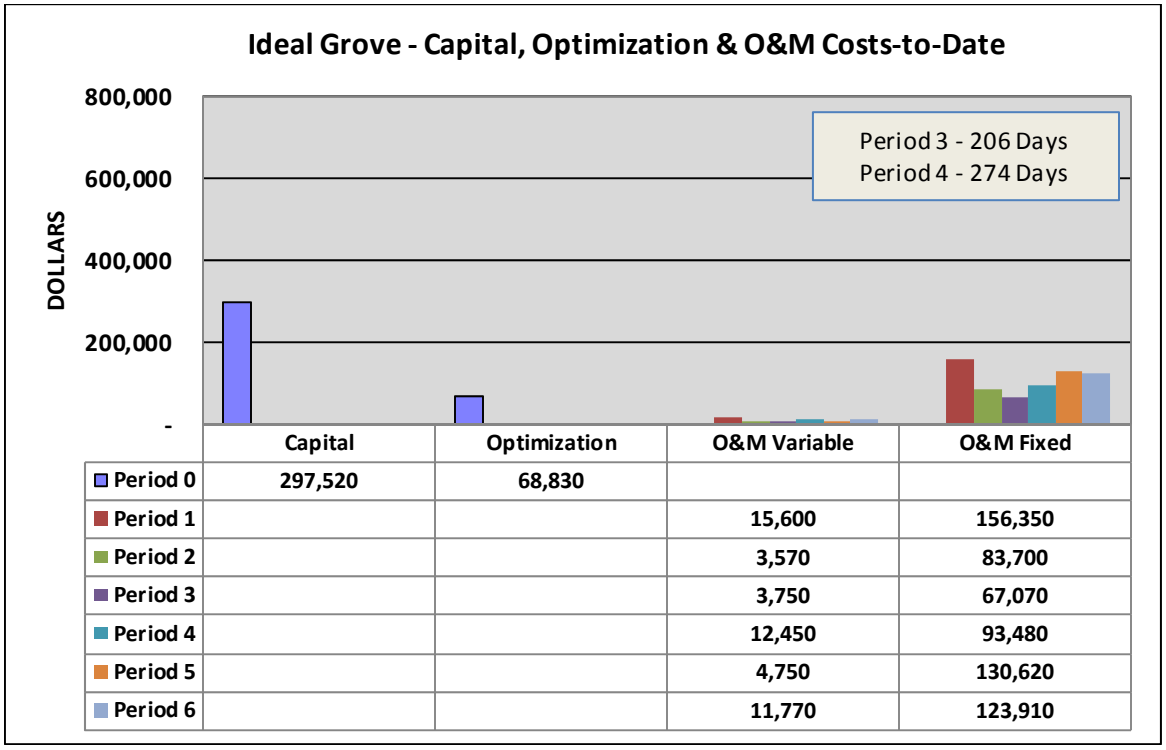
Expenditures are tracked by major expense category for each project site including capital costs and both variable and fixed O&M. Costs represent total expenditures associated with implementation, which equal contract price. As noted earlier, significant differences exist in pre-existing conditions at each site that result in cost/benefit issues, for example, infrastructure, site restrictions, water quality, and land and power availability. Accurate analysis is not completely reliable in the early stages of a project due to start-up costs and optimization of performance parameters; both controllable and non-controllable variations in water quality can further distort costs and performance. Projected costs are based upon current year operations.

Figure 52 through Figure 57 represent projected expenditures to date by site and type, including Capital and 50% of Optimization & Monitoring costs, as well as O&M expenses. Grassy amounts, as noted above, include 100% of Optimization expenditures. Totals are not shown as infrastructure and optimization benefits accrue over the life of the project. The dollar amounts are not adjusted for inflation. The Y-axis scales have been standardized at $800,000, except for Grassy Island, to facilitate a visual relative comparison among the sites. (Infrastructure costs exceed the maximum at some sites as noted on the figures.) Period 0 corresponds to the initial contract during which Sites 1-3 were constructed and optimized. Period 1 refers to the second contract, which includes the first year of operations for the first 3 sites and construction and optimization of Sites 5 and 6. During this period, changes were made to flow pathways and configurations at Nubbin Slough, Ideal Grove and Mosquito Creek. Nubbin Slough and Mosquito Creek have capital expenditures in Year 2 for limerock bed installation and/or pump additions. Period 3 relates to the previous contract encompassing 206 days that includes O&M for Sites 1-3, 5-6 and completion of the Phase I 10 cfs at Site 7. No major capital expenditures were incurred for sites 1-3, 5-6 during Period 4 (274 day period) or Period 5; approximately 10+ cfs was added at Grassy Island in Period 4 and an additional 10 cfs for Period 5.



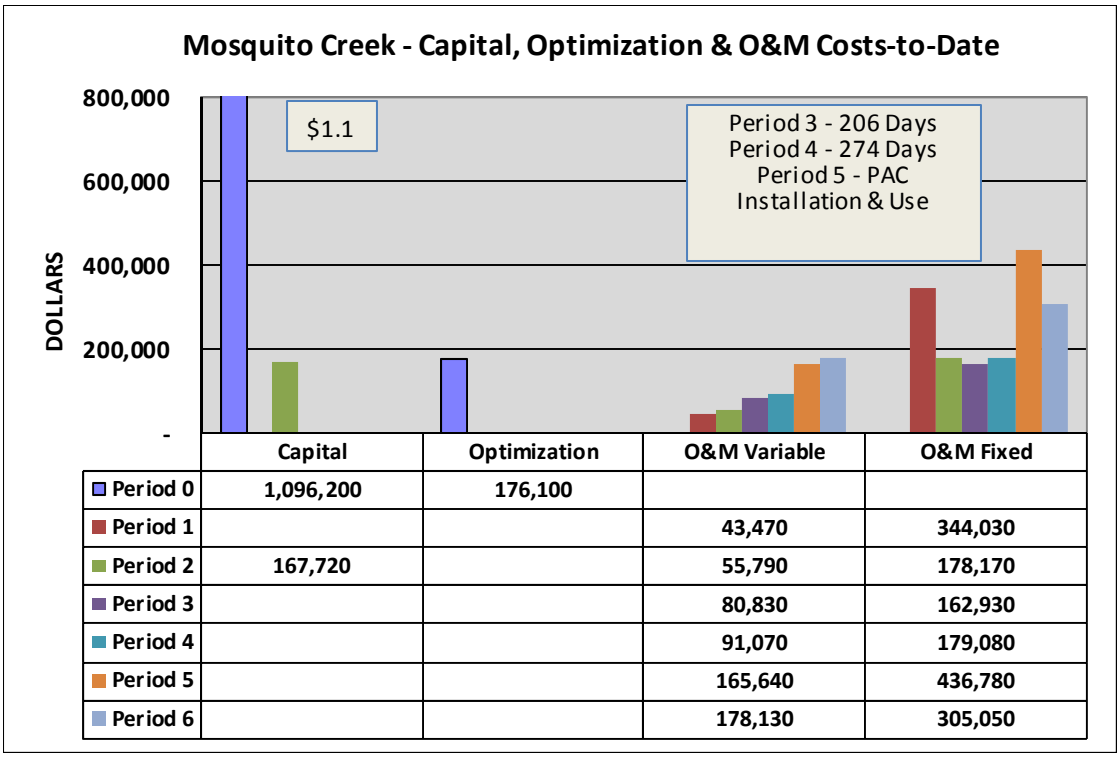
	Capital	Optimization	O&M Variable	O&M Fixed
Period 0	566,710	164,070		
Period 1			122,380	244,890
Period 2	333,550		30,240	185,130
Period 3			48,850	135,260
Period 4			39,770	144,360
Period 5			41,430	216,870
Period 6			111,600	226,890

Figure 52. Nubbin Slough Costs-to-Date by Expenditure Type.



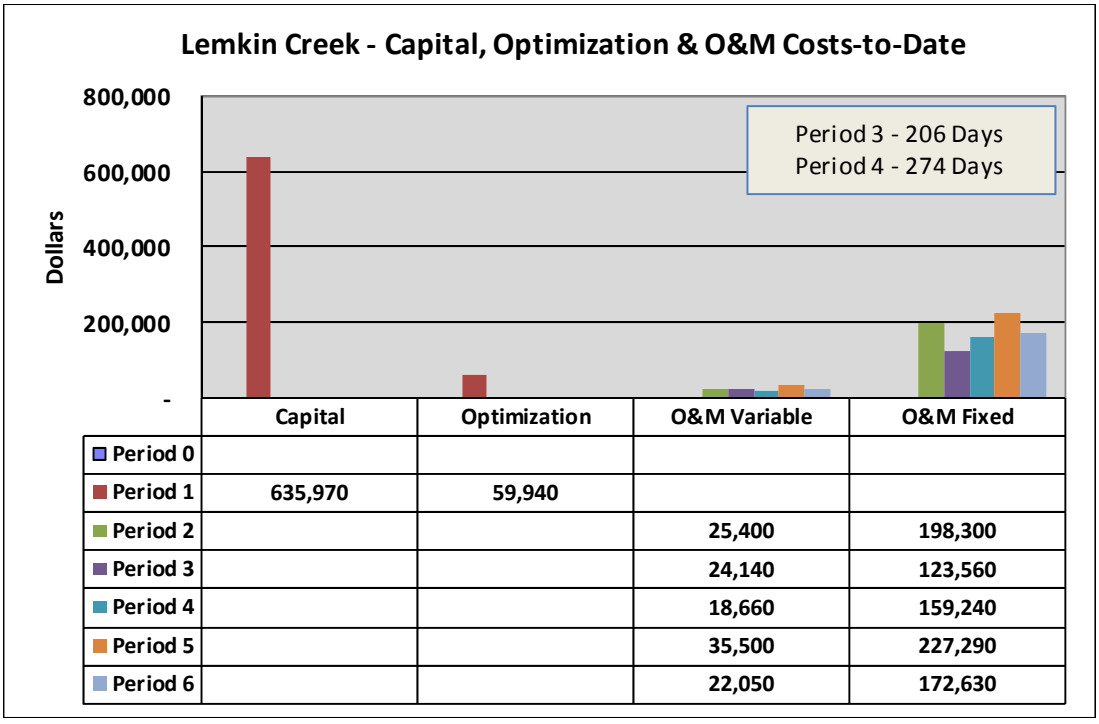
	Capital	Optimization	O&M Variable	O&M Fixed
Period 0	297,520	68,830		
Period 1			15,600	156,350
Period 2			3,570	83,700
Period 3			3,750	67,070
Period 4			12,450	93,480
Period 5			4,750	130,620
Period 6			11,770	123,910

Figure 53. Ideal Grove Costs-to-Date by Expenditure Type.



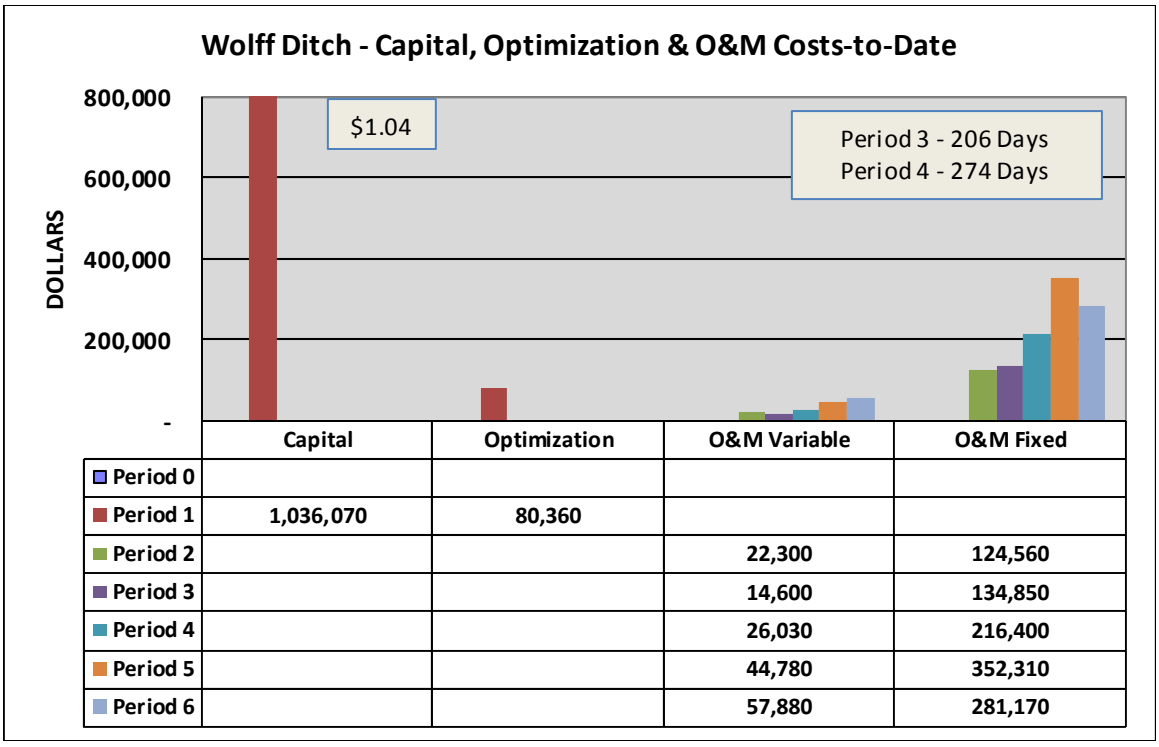
	Capital	Optimization	O&M Variable	O&M Fixed
Period 0	1,096,200	176,100		
Period 1			43,470	344,030
Period 2	167,720		55,790	178,170
Period 3			80,830	162,930
Period 4			91,070	179,080
Period 5			165,640	436,780
Period 6			178,130	305,050

Figure 54. Mosquito Creek Costs-to-Date by Expenditure Type.



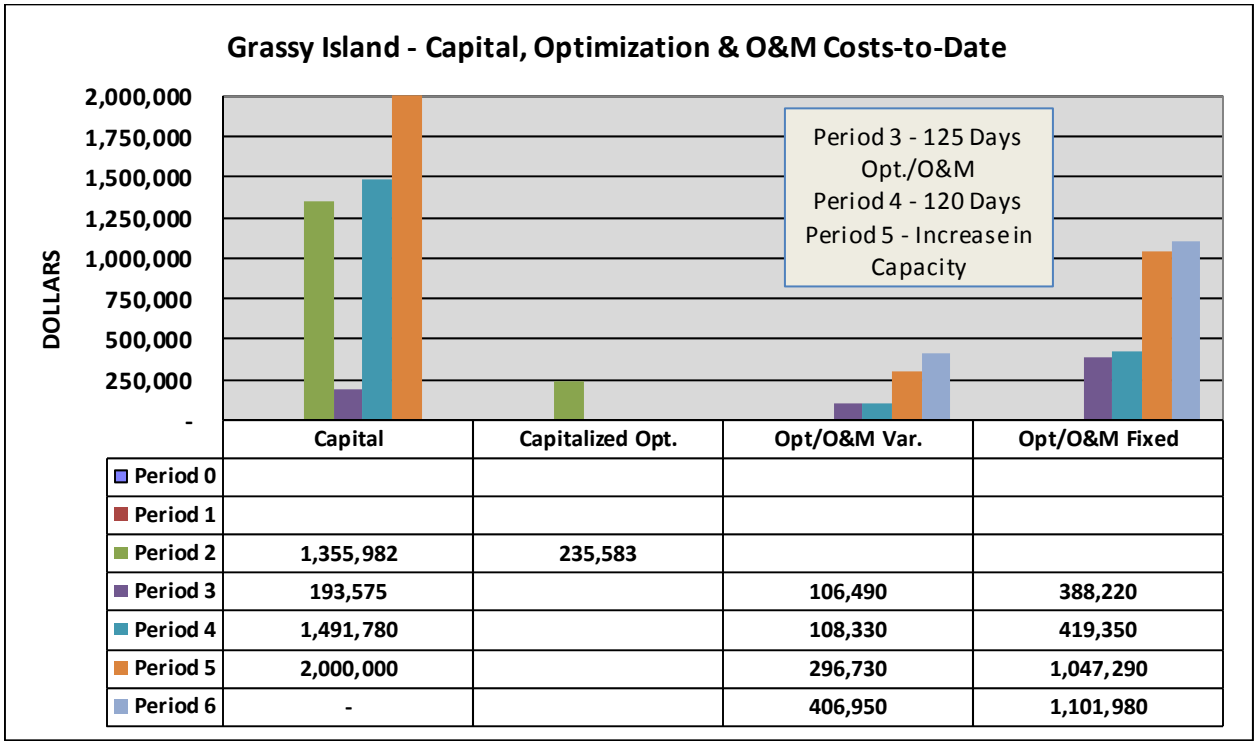
	Capital	Optimization	O&M Variable	O&M Fixed
Period 0				
Period 1	635,970	59,940		
Period 2			25,400	198,300
Period 3			24,140	123,560
Period 4			18,660	159,240
Period 5			35,500	227,290
Period 6			22,050	172,630

Figure 55. Lemkin Creek Costs-to-Date by Expenditure Type.



	Capital	Optimization	O&M Variable	O&M Fixed
Period 0				
Period 1	1,036,070	80,360		
Period 2			22,300	124,560
Period 3			14,600	134,850
Period 4			26,030	216,400
Period 5			44,780	352,310
Period 6			57,880	281,170

Figure 56. Wolff Ditch Costs-to-Date by Expenditure Type.



	Capital	Capitalized Opt.	Opt/O&M Var.	Opt/O&M Fixed
Period 0				
Period 1				
Period 2	1,355,982	235,583		
Period 3	193,575		106,490	388,220
Period 4	1,491,780		108,330	419,350
Period 5	2,000,000		296,730	1,047,290
Period 6	-		406,950	1,101,980

Figure 57. Grassy Island Costs-to-Date by Expenditure Type.

Variable Costs & Unit Processes

The breakdown of the O&M variable costs by process and total fixed costs for each site is delineated in Appendix VIII. The schematics also include the varying components deployed at the different facilities. Fixed costs generally cover all functions; time and material records are not accumulated by "process". The facilities are considered to be comparable to a wastewater treatment facility, with each HWTT site a division or department in and of itself (the treatment plant) and not subject to further cost breakdown.

Replacement Costs

The replacement costs of the various components of the HWTT system over the estimated useful life of the facility are not considered to be material; the preponderance of capital is excavation and embankment work (ponds), which does not degrade significantly over time. For example, in the SFWMD Desktop Evaluation of Alternative Technologies dated August 1996, Table 4.8-1 Basis of Design and Cost Information for STA – Chemical Treatment/Dissolved Air Flotation/Filtration, the replacement costs were calculated but related almost entirely to pump station costs. The values ranged from $3.43 million to $13.91 for capital costs ranging from $91.02 million to $198.21 (3-7%). A "rough" order of magnitude estimate of replacement costs for major items for Sites 1-3, 5-7 is shown in Appendix IX, which was prepared upon request in a prior contract period. The estimates have been updated for Grassy Island construction through Phase III. The assets contained within the analysis are the significant items subject to replacement, specifically, pumps, limerock and monitoring and control equipment. Based upon the assumptions contained in this Chapter and the Schedule, these items have a net PV of approximately $1,084,000 over a 50 year life cycle for the combined six operational systems, excluding labor and overhead ($826,100 excluding equipment). Numerous capital items have already been replaced and the cost absorbed by Watershed Technologies, such as stolen computers, broken pumps, faulty flow and water quality sensors, faulty flow meters, chemical pumps, major pump station repairs and vegetation. Other than major pump or limerock replacement, the costs are generally recaptured in O&M. Sensitivity analysis for the net discount rate indicates a range from $1,102,400 at 3% to $745,600 at 5% (Appendix IX). Calculating future values first and discounting back to the present (as opposed to a net

discount rate) results in a difference of approximately $17,000. The original costs, although incurred between 2010 and 2013, are assumed to occur within the same year for purposes of the rough estimate. Deployment of Site 8 (2014) is not covered within this Final Report.

Projected Cost Benefit Values

The Cost/Benefit calculations for all sites are summarized in Figure 58 under Full Capacity Utilization (Scenario #2) using both Amortized Loan (see Calculation Methodologies Section) plus current O&M and the PV methods. The assumption of full capacity more accurately predicts the cost/benefit of the treatment process as the facilities are operated below design capacity. The underutilization is the result of lack of flow availability, facility siting and construction activities. Detailed schedules follow (Table 7 through Table 13) which present Partial and Full Capacity scenarios, as well as current and projected capacity utilization, expenditures, TP removal and cost/benefit calculations. Detailed daily operating data for water treated, TP load inflow, TP load outflow and load reduction by site is contained in Appendix II through Appendix VII. It is important to note that the cost/benefit calculations are based upon extrapolations to project 50 year O&M costs. This projection is used to present a reference point for current year operations and does not necessarily provide a reasonable basis for annualizing expenses. Prior year capital expenditures have not been adjusted to current year dollars. The analyses include capital costs plus current period O&M only; calculations are forward looking and do not consider prior year O&M expenses. Please refer to the Assumptions and Notes contained herein.

Cost/benefit calculations using the South Pond TP samples for Lemkin Creek and Wolff Ditch outflow are presented in Figure 59. The inclusion of the South Pond demonstrates a significant improvement in all performance data. The cost/benefit decreases for both facilities, with Lemkin Creek showing the most improvement ($169 to $145 per pound under the Present Value approach and $393 to $337 per pound under the Amortized Loan calculations for full capacity utilization.) As discussed under the Phosphorus Removal Effectiveness Section above, these two facilities were sited primarily to supply needed hydration for the downstream wetland via the South Pond. During construction, Watershed Technologies made several material changes to the South Pond, including weir

relocation, elevation adjustments, piping additions and general maintenance. The SAV community from the dual HWTT facilities has expanded into the South pond shallow zone, providing additional filtration. Weekly samples are taken and laboratory analyses are prepared and tabulated, together with inflow measurements to the adjacent wetland. Detailed cost benefit calculations are shown in Table 14 and Table 15.

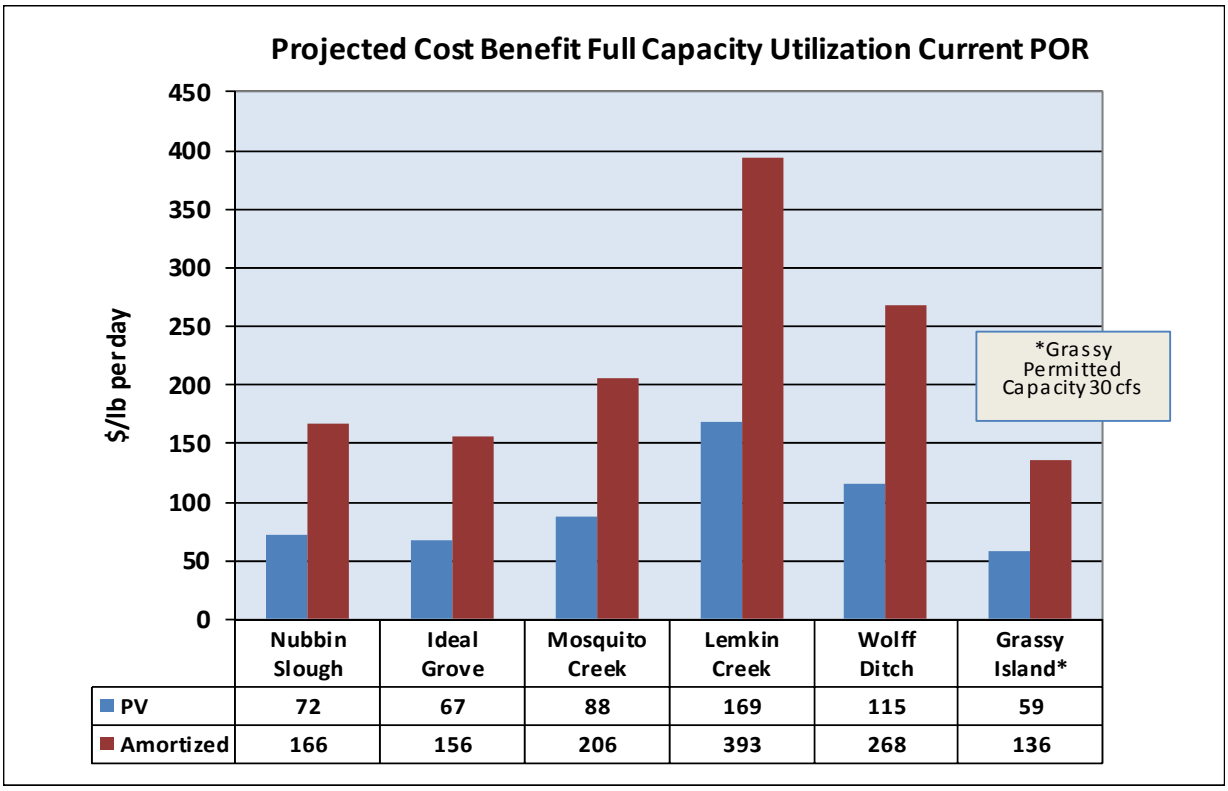


Figure 58. Projected Cost/Benefit Full Capacity Present Value & Amortized Loan.

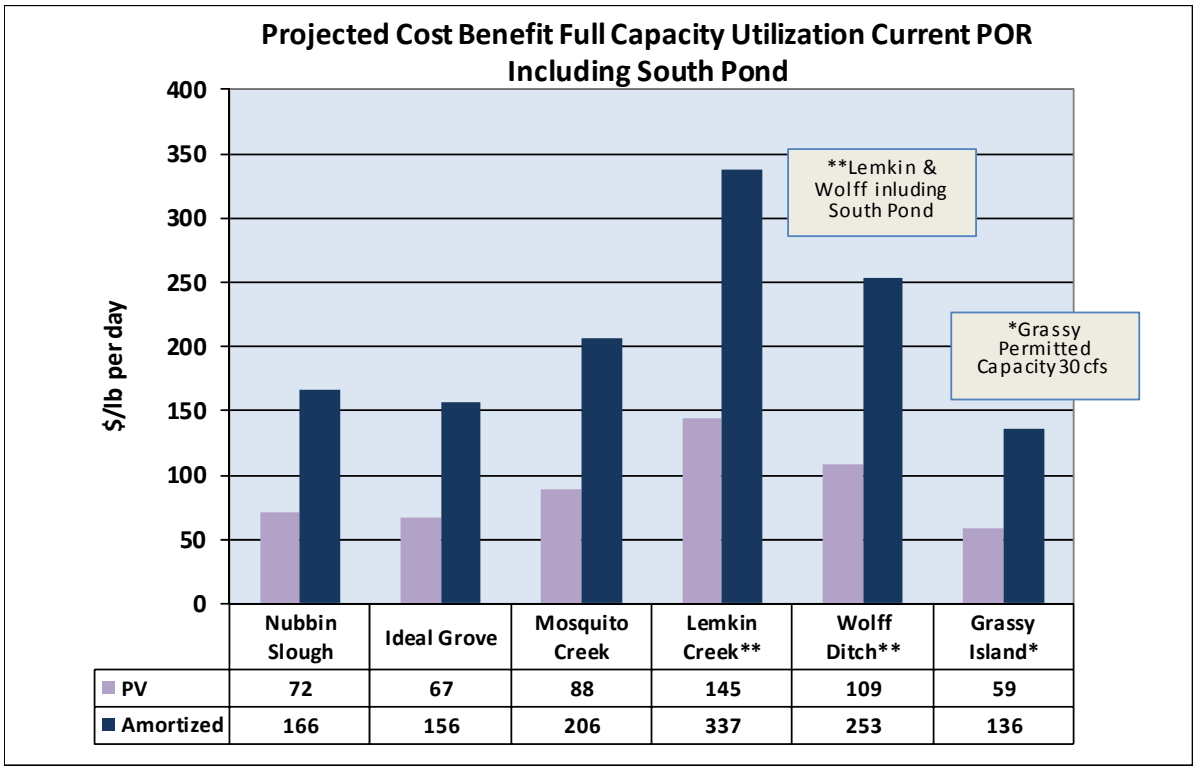


Figure 59. Projected Cost/Benefit Full Capacity Present Value & Amortized Loan South Pond Data – Lemkin & Wolff facilities.

Table 7. Cost Benefit Analysis Nubbin Slough Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Nubbin Slough Site 1						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Projectd P Removal & Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs Based on Design Flow		**All Costs Based on Design Flow**	
		Total Costs	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		470.4				
Design Capacity gpm		3321.7				
% of Design Capacity		14%				
Infrastructure (Note 7)						
Infrastructure Period 0		$ 566,707				
Optimization & Monitoring (Note 1)		164,070				
Total Allocated Capital Period 0		$ 730,778	$ 730,778	$ 730,778	$ 730,778	$ 730,778
Unallocated Costs Period 0: Optimization & Monitoring (Note 1)		164,070				
Total Period 0		$ 894,848				
Estimated Life			50	50	50	50
Amortized Capital Period 0			34,018		34,018	
Infrastructure Period 2		$ 333,554	333,554	333,554	333,554	333,554
Estimated Life			50	50	50	50
Amortized Capital Period 2			15,527		15,527	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			49,545		49,545	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 111,602	$ 111,602	$ 111,602	$ 788,139	$ 788,139
O&M Fixed Costs Actual & Projected		226,886	226,886	226,886	514,484	514,484
Total Operations & Maintenance (Note 3)		$ 338,488	$ 338,488	$ 338,488	$ 1,302,623	$ 1,302,623
Present Worth O&M (Notes 4,10 & 11)				$ 7,271,471		$ 27,983,184
Annual Costs & Present Value Actual & Projected			$ 388,033	$ 8,335,802	$ 1,352,168	$ 29,047,515
Cost per Day (Notes 5 & 8)			$ 1,063	$ 457	$ 3,705	$ 1,592
P Removal lb/day (Per Data Schedule Appendix)			3.15	3.15	22.26	22.26
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 337**	**$ 145**	**$ 166**	**$ 72**

Table 8. Cost Benefit Analysis Ideal Grove Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Ideal Grove Site 2						
O&M Costs Period:	7/1/2013	through	6/30/2014			
TP Data Period	7/1/2013	through	6/30/2014			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total	**Amortized**	**Projected Present**	**Projected Amortized**	**Projected Present**
		Costs	**Loan**	**Value**	**Loan**	**Value**
Capacity Utilization:						
Actual Average gpm		51.6				
Design Capacity gpm		583.5				
% of Design Capacity		9%				
Infrastructure (Note 7)						
Infrastructure Period 0		$ 297,523				
Optimization & Monitoring (Note 1)		68,835				
Total Allocated Capital Period 0		$ 366,358	$ 366,358	$ 366,358	$ 366,358	$ 366,358
Unallocated Costs Period 0: Optimization & Monitoring (Note 1)		68,835				
Total Period 0		$ 435,193				
Estimated Life			50	50	50	50
Amortized Capital Period 0			17,054		17,054	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			17,054		17,054	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 11,767	$ 11,767	$ 11,767	$ 133,176	$ 133,176
O&M Fixed Costs Actual & Projected		123,909	123,909	123,909	175,520	175,520
Total Operations & Maintenance (Note 3)		$ 135,675	$ 135,675	$ 135,675	$ 308,696	$ 308,696
Present Worth O&M (Notes 4,10 & 11)				$ 2,914,601		$ 6,631,463
Annual Costs & Present Value Actual & Projected			$ 152,729	$ 3,280,960	$ 325,750	$ 6,997,822
Cost per Day (Notes 5 & 8)			$ 418	$ 180	$ 892	$ 383
P Removal lb/day Total (Per Data Schedule Appendix)			0.50	0.50	5.71	5.71
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 829**	**$ 356**	**$ 156**	**$ 67**

Table 9. Cost Benefit Analysis Mosquito Creek Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Mosquito Creek Site 3						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total Costs	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		759.8				
Design Capacity gpm		2693.3				
% of Design Capacity		28%				
Infrastructure (Note 7)						
Infrastructure Period 0		$ 1,096,201				
Optimization & Monitoring (Note 1)		176,100				
Total Allocated Capital Period 0		$ 1,272,300	$ 1,272,300	$ 1,272,300	$ 1,272,300	$ 1,272,300
Unallocated Costs Period 0: Optimization & Monitoring (Note 1)		176,100				
Total Period 0		$ 1,448,400				
Estimated Life			50	50	50	50
Amortized Capital Period 0			59,226		59,226	
Infrastructure Period 2		$ 167,718	167,718	167,718	167,718	167,718
Estimated Life			50	50	50	50
Amortized Capital Period 2			7,807		7,807	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			67,033		67,033	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 178,129	$ 178,129	$ 178,129	$ 631,376	$ 631,376
O&M Fixed Costs Actual & Projected		305,047	305,047	305,047	497,724	497,724
Total Operations & Maintenance (Note 3)		$ 483,176	$ 483,176	$ 483,176	$ 1,129,100	$ 1,129,100
Present Worth O&M (Notes 4,10 & 11)				$ 10,379,678		$ 24,255,537
Annual Costs & Present Value Actual & Projected			$ 550,209	$ 11,819,697	$ 1,196,133	$ 25,695,556
Cost per Day (Notes 5 & 8)			$ 1,507	$ 648	$ 3,277	$ 1,408
P Removal lb/day Total (Per Data Schedule Appendix)			4.49	4.49	15.93	15.93
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 335**	**$ 144**	**$ 206**	**$ 88**

Table 10. Cost Benefit Analysis Lemkin Creek Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Lemkin Creek Site 5						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		806.1				
Design Capacity gpm		2244.4				
% of Design Capacity		36%				
Infrastructure (Note 7)						
Infrastructure Period 1		$ 635,973				
Optimization & Monitoring (Note 1)		59,939				
Total Allocated Capital Period 1		$ 695,911	$ 695,911	$ 695,911	$ 695,911	$ 695,911
Unallocated Costs Period 1: Optimization & Monitoring (Note 1)		59,939				
Total Period 1		$ 755,850				
Estimated Life			50	50	50	50
Amortized Capital Period 1			32,395		32,395	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			32,395		32,395	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 22,049	$ 22,049	$ 22,049	$ 61,392	$ 61,392
O&M Fixed Costs Actual & Projected		172,631	172,631	172,631	189,356	189,356
Total Operations & Maintenance (Note 3)		$ 194,680	$ 194,680	$ 194,680	$ 250,748	$ 250,748
Present Worth O&M (Notes 4,10 & 11)				$ 4,182,159		$ 5,386,623
Annual Costs & Present Value Actual & Projected			$ 227,075	$ 4,878,071	$ 283,143	$ 6,082,534
Cost per Day (Notes 5 & 8)			$ 622	$ 267	$ 776	$ 333
P Removal lb/day Total (Per Data Schedule)			0.71	0.71	1.97	1.97
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 878**	**$ 377**	**$ 393**	**$ 169**

Table 11. Cost Benefit Analysis Wolff Ditch Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Wolff Ditch Site 6						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		762.2				
Design Capacity gpm		8977.6				
% of Design Capacity		8%				
Infrastructure (Note 7)						
Infrastructure Period 1		$ 1,036,070				
Optimization & Monitoring (Note 1)		80,360				
Total Allocated Capital Period 1		$ 1,116,430	$ 1,116,430	$ 1,116,430	$ 1,116,430	$ 1,116,430
Unallocated Costs Period 1: Optimization & Monitoring (Note 1)		80,360				
Total Period 1		$ 1,196,790				
Estimated Life			50	50	50	50
Amortized Capital Period 1			51,970		51,970	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			51,970		51,970	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 57,879	$ 57,879	$ 57,879	$ 681,685	$ 681,685
O&M Fixed Costs Actual & Projected		281,167	281,167	281,167	546,349	546,349
Total Operations & Maintenance (Note 3)		$ 339,046	$ 339,046	$ 339,046	$ 1,228,034	$ 1,228,034
Present Worth O&M (Notes 4,10 & 11)				$ 7,283,439		$ 26,380,853
Annual Costs & Present Value Actual & Projected			$ 391,016	$ 8,399,870	$ 1,280,004	$ 27,497,283
Cost per Day (Notes 5 & 8)			$ 1,071	$ 460	$ 3,507	$ 1,507
P Removal lb/day Total (Per Data Schedule)			1.11	1.11	13.11	13.11
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 963**	**$ 414**	**$ 268**	**$ 115**

Table 12. Cost Benefit Analysis Grassy Island Actual & Projected.
(See Notes & Assumptions).

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Grassy Island Site 7						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Permitted Flow		**Based on Design Flow**	
				Projected	**Projected**	**Projected**
		Total	**Amortized**	**Present**	**Amortized**	**Present**
			Loan	**Value**	**Loan**	**Value**
Capacity Utilization:						
Actual Average gpm		3861.3				
Design Capacity gpm		13466.4				
% of Design Capacity		29%				
Infrastructure (Note 7)						
Infrastructure Periods 2 & 3		$ 1,549,557				
Optimization & Monitoring (Note 1)		235,583				
Total Allocated Capital Periods 2 & 3		$ 1,785,140	$ 1,785,140	$ 1,785,140	$ 1,785,140	$ 1,785,140
Unallocated Costs Period 1: Optimization & Monitoring (Note 1)		494,705				
Total Periods 2 & 3		$ 2,279,845				
Estimated Life			50	50	50	50
% Days @ Permitted Capacity			100%	100%	100%	100%
Capital Periods 2 & 3			83,099	1,785,140	83,099	1,785,140
Infrastructure Period 4		$ 1,491,780	1,491,780	1,491,780	1,491,780	1,491,780
Estimated Life			50	50	50	50
% Days @ Permitted Capacity			100%	100%	100%	100%
Capital Period 4			69,443	1,491,780	69,443	1,491,780
Infrastructure Period 5		$ 2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Estimated Life			50	50	50	50
% Days @ Permitted Capacity			0%	0%	100%	100%
Capital Period 5			0	0	93,100	2,000,000
Amortized Capital Current Period			152,541		245,642	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 406,954	$ 406,954	$ 406,954	$ 1,419,248	$ 1,419,248
O&M Fixed Costs Actual & Projected		1,101,981	1,101,981	1,101,981	1,532,311	1,532,311
Total Operations & Maintenance (Note 3)		$ 1,508,934	$ 1,508,934	$ 1,508,934	$ 2,951,558	$ 2,951,558
Present Worth O&M (Notes 4,10 & 11)				$ 32,415,205		$ 63,405,917
Annual Costs & Present Value Actual & Projected			$ 1,661,476	$ 35,692,126	$ 3,197,200	$ 68,682,838
Cost per Day (Notes 5 & 8)			$ 4,552	$ 1,956	$ 8,759	$ 3,763
P Removal lb/day Total (Per Data Schedule)			18.43	18.43	64.26	64.26
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 247**	**$ 106**	**$ 136**	**$ 59**

Table 13. Actual & Projected Costs Sites 1-3, 5-7.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Costs (See Notes)						
Total Sites 1-3, 5-7						
Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual Costs		**Projectd P Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs Based on Design Flow		**All Costs Based on Design Flow**	
		Total	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		6241.1				
Design Capacity gpm		27965.1				
% of Design Capacity		22%				
Infrastructure (Note 7)						
Infrastructure Periods 0 & 1: Sites 1-3, 5-6		$ 3,632,474				
Capitalized Optimization & Monitoring (Note 1)		549,304				
Total Allocated Capital Periods 0 & 1		$ 4,181,777	$ 4,181,777	$ 4,181,777	$ 4,181,777	$ 4,181,777
Estimated Life			50	50	50	50
Amortized Capital Periods 0 & 1			194,663		194,663	
Infrastructure & Capitalized Optimization Periods 2 & 3: Site 7 & Sites 1 & 3 Improvements		$ 2,286,413	$ 2,286,413	$ 2,286,413	$ 2,286,413	$ 2,286,413
Estimated Life			50	50	50	50
Amortized Capital Periods 2 & 3			106,433		106,433	
Infrastructure Period 4: Site 7 Phase II (Optimization Treated as O&M)		$ 1,491,780	$ 1,491,780	$ 1,491,780	$ 1,491,780	$ 1,491,780
Estimated Life			50	50	50	50
Amortized Capital Period 4			69,443		69,443	
Infrastructure Period 5: Site 7 Phase III		$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000
Estimated Life			50	50	50	50
Amortized Capital Period 5			0	0	93,100	
Amortized Capital Current Period			370,538		463,639	
Total Infrastructure & Capitalized Optimization		$ 9,959,971				
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 788,379	$ 788,379	$ 788,379	$ 3,715,015	$ 3,715,015
O&M Fixed Costs Actual & Projected		2,211,621	2,211,621	2,211,621	3,455,744	3,455,744
Total Operations & Maintenance (Note 3)		$ 3,000,000	$ 3,000,000	$ 3,000,000	$ 7,170,759	$ 7,170,759
Present Worth O&M (Notes 4,10 & 11)				$ 64,446,554		$154,043,578

Table 14. Cost Benefit Analysis Lemkin Creek South Pond Outflow Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Lemkin Creek Site 5						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		806.1				
Design Capacity gpm		2244.4				
% of Design Capacity		36%				
Infrastructure (Note 7)						
Infrastructure Period 1		$ 635,973				
Optimization & Monitoring (Note 1)		59,939				
Total Allocated Capital Period 1		$ 695,911	$ 695,911	$ 695,911	$ 695,911	$ 695,911
Unallocated Costs Period 1: Optimization & Monitoring (Note 1)		59,939				
Total Period 1		$ 755,850				
Estimated Life			50	50	50	50
Amortized Capital Period 1			32,395		32,395	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			32,395		32,395	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 22,049	$ 22,049	$ 22,049	$ 61,392	$ 61,392
O&M Fixed Costs Actual & Projected		172,631	172,631	172,631	189,356	189,356
Total Operations & Maintenance (Note 3)		$ 194,680	$ 194,680	$ 194,680	$ 250,748	$ 250,748
Present Worth O&M (Notes 4,10 & 11)				$ 4,182,159		$ 5,386,623
Annual Costs & Present Value Actual & Projected			$ 227,075	$ 4,878,071	$ 283,143	$ 6,082,534
Cost per Day (Notes 5 & 8)			$ 622	$ 267	$ 776	$ 333
P Removal lb/day Total (Per Data Schedule)			0.83	0.83	2.30	2.30
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 753**	**$ 323**	**$ 337**	**$ 145**

Table 15. Cost Benefit Analysis Wolff Ditch South Pond Outflow Actual & Projected.
(See Notes & Assumptions)

WATERSHED TECHNOLOGIES, LLC.						
Projected Cost Benefit Analysis (Note 8) Wolff Ditch Site 6						
O&M Costs Period:	**7/1/2013**	**through**	**6/30/2014**			
TP Data Period	**7/1/2013**	**through**	**6/30/2014**			
			Partial Capacity Utilization		**Full Capacity Utilization**	
			Actual P Removal & Costs		**Variable/Semi Fixed Costs**	
			Capacity & Fixed Costs		**All Costs**	
			Based on Design Flow		**Based on Design Flow**	
		Total	**Amortized Loan**	**Projected Present Value**	**Projected Amortized Loan**	**Projected Present Value**
Capacity Utilization:						
Actual Average gpm		762.2				
Design Capacity gpm		8977.6				
% of Design Capacity		8%				
Infrastructure (Note 7)						
Infrastructure Period 1		$ 1,036,070				
Optimization & Monitoring (Note 1)		80,360				
Total Allocated Capital Period 1		$ 1,116,430	$ 1,116,430	$ 1,116,430	$ 1,116,430	$ 1,116,430
Unallocated Costs Period 1: Optimization & Monitoring (Note 1)		80,360				
Total Period 1		$ 1,196,790				
Estimated Life			50	50	50	50
Amortized Capital Period 1			51,970		51,970	
% Expense Days Current Period (Note 11)			100%	100%	100%	100%
Amortized Capital Current Period			51,970		51,970	
Operations & Maintenance Current Period						
O&M Variable Costs Actual & Projected (Note 2)		$ 57,879	$ 57,879	$ 57,879	$ 681,685	$ 681,685
O&M Fixed Costs Actual & Projected		281,167	281,167	281,167	546,349	546,349
Total Operations & Maintenance (Note 3)		$ 339,046	$ 339,046	$ 339,046	$ 1,228,034	$ 1,228,034
Present Worth O&M (Notes 4,10 & 11)				$ 7,283,439		$ 26,380,853
Annual Costs & Present Value Actual & Projected			$ 391,016	$ 8,399,870	$ 1,280,004	$ 27,497,283
Cost per Day (Notes 5 & 8)			$ 1,071	$ 460	$ 3,507	$ 1,507
P Removal lb/day Total (Per Data Schedule)			1.18	1.18	13.86	13.86
Cost/Benefit $/lb. (System On-Line Flow > 0) (Note 6)			**$ 910**	**$ 391**	**$ 253**	**$ 109**

Notes (See Chapter II discussions regarding methodologies & other assumptions):

1. Optimization & Monitoring Costs have been allocated to Capital based as follows:
   System 1-3, 5-6: 50% during initial start-up
   System 7: 100% of Period 2; Period 3 Optimization treated as O&M expense
2. Variable Costs include those costs primarily related to flow including chemicals, utilities, drydown, tilling, floc management.
3. Outstanding expenses as of Report submission date estimated and included in the analysis.
4. PV Calculated at Net discount rate of 4% Life 50
5. Amortized Capital + O&M = Total Costs Actual to Date + Projected / # Days in Expense Period; Capital costs are considered to be a loan payment and therefore adjusted for the cost of money or internal rate of return; O&M are current year dollars.
   Present Value = Present Worth / Estimated Life / 365 days per year

6. Days in Period:	Nubbin Slough	Ideal Grove	Mosquito Creek	Lemkin Creek	Wolff Ditch	Grassy Island
# Days in Expense Period	365	365	365	365	365	365
# Days in Flow Period	365	365	365	365	365	365
# Days On-Line Flow > 0.0000	348	362	302	358	364	362
# Days in Period Flow > 0.0000	361	364	344	358	364	362

   See Text for explanation.

7. Excludes land costs; these costs are relatively minor for HWTT & estimates are beyond scope of project.
   Replacement costs and salvage values not included in the analysis; supplemental Appendix provided.
8. Per day amounts are used to standardize for the differences in contract days vs. operational days.
9. Excludes social and other benefits which have been included in some previous reports and can be significant.
10. Prior year Capital expenditures have not been adjusted to current year dollars. Analysis includes Capital costs plus current period O&M only; calculations are forward looking and do not consider prior year O&M costs.
11. O&M expenses have been extrapolated for a 365 day period.
12. Assumes Contract 018907 improvements for Grassy relate to 10 cfs.

* The Amortized Loan Method has been revised to reflect the cost of capital for capital improvements. (See Note 5)

Cost/Benefit Comparisons

Comparative cost/benefit calculations across periods are shown graphically in Figure 60 through Figure 63. (The Amortized Loan methodology has replaced the previous straight-line amortization commencing with Period 4.) The current period Present Value Cost/Benefit values (in dollars per pound TP removed) under Full Capacity Utilization (Scenario #2 above) for Nubbin Slough, Ideal Grove, Mosquito Creek, Lemkin Creek, Wolff Ditch and Grassy Island, respectively, are $72, $67, $88, $169, $115, and $59 (values were $34, $67, $123, $283, $105, and $61 for Period 5). The current period Amortized Loan plus current O&M are $166, $156, $206, $393, $268 and $136 (values were $80, $157, $287, $659, $245 and $142 for Period 5). The present value method is one of the standard methods of comparing projects for decision-making purposes. Lemkin Creek and Wolff Ditch commenced operations during Period 2; Grassy construction for Phase I – III occurred during Period 3 - 5.

The cost/benefit values are higher under Partial Capacity Utilization (Scenario #1 above), which does not account for the aforementioned factors contributing to lower utilization of the facilities. Desktop studies generally calculate projections under more favorable operating conditions, where greater benefits can accrue from use of the treatment process as fixed costs are "amortized" over a significantly large number of "benefit" units of TP removed. The resulting lower per unit costs are due to economies of scale wherein the treatment capacity is closer to full utilization. The current period Present Value Cost/Benefit values (in dollars per pound TP removed) under Partial Capacity Utilization for Nubbin Slough, Ideal Grove, Mosquito Creek, Lemkin Creek and Wolff Ditch, and Grassy Island, respectively, are $145, $356, $144, $377, $414 and $106 (values were $101, $523, $217, $561, $400 and $121 for Period 5). The current period Amortized Loan Cost/Benefit values are $337, $829, $335, $878, $963 and $247 (values were $234, $1,217, $506, $1,306, $931 and $281 for Period 5).

Analysis

Changes in cost/benefit calculations are a function of several variables, with the most relevant being costs, flow, capacity utilization, P removal, water quality, capital

improvements and site conditions. Although a detailed analysis must consider all of these factors and their interrelationships, certain trends can be identified. Horizontal analyses (period to period) evaluations by site are limited, however, by variances in length of the cycles as noted on the graphs. (A summary of Projected Present Value Cost/Benefit calculations under Full Capacity Utilization and other key operating parameters are included in Table 1.) The following references to cost/benefit relate to the Full Capacity Cost/Benefit Calculations under the Present Value Method (Amortized Loan commenced in Year 4). The initial year (Period 1) included trials and demonstration projects requested by the SFWMD for Sites 1-3. Ideal Grove was also segmented into two separate flow paths and Mosquito Creek was divided into large and small ponds, making a reasonable collection of data invalid.

Nubbin Slough cost/benefit values have ranged from a current year high of $72 to a low of $30. Average P removal has varied from 91% to 69%. The current year costs increased due to limerock bed maintenance. P removal was affected by flow meter problems, which resulted in non-optimized dosing during a multi-month period. Both factors have a negative impact on the cost/benefit calculations for this site.

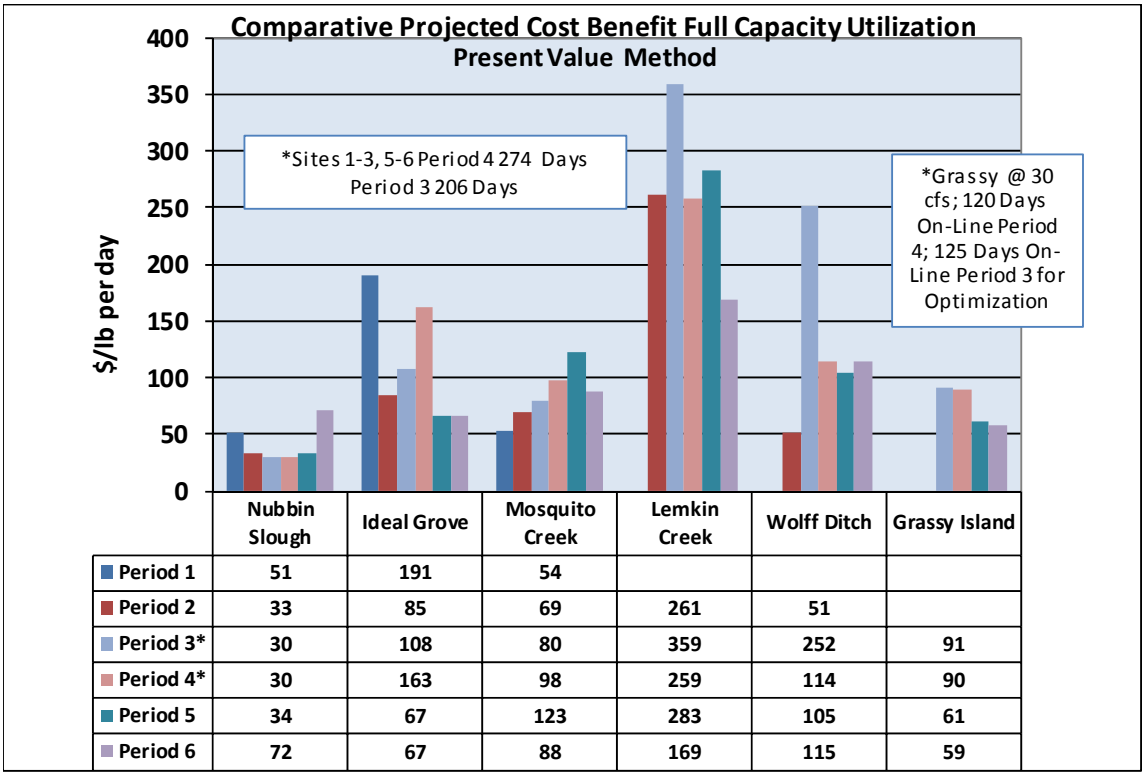
Average P reduction has been relatively consistent over the five periods at Ideal Grove, while costs/benefit values declined significantly during the current and previous periods. Flow availability at this site remains low.

Mosquito Creek exhibited a significant decrease in the cost/benefit ratio during the current POR returning to lower previous levels; costs per day declined as total P removed increased. The average flow weighted concentration inflow was the highest for all periods for Mosquito Creek at 640 μg/L, increasing from 541 μg/L in the previous term and a low of 345 μg/L in Period 1. TP removal, however, remained relatively high and consistent for the site at 77%. Mosquito was off-line for approximately 50 days during the latter part of the POR due to low flow conditions and floc removal.

Cost/benefit values improved significantly for Lemkin Creek for the POR, mainly resulting from a reduction in costs. Wolff Ditch values remained relatively stable primarily due to low flow and TP; hence, fixed costs are allocated over smaller units of capacity. The basis for the size of the two facilities was inclusion of the planned improvements by Okeechobee City to increase their stormwater drainage. The project would utilize the District's property on the eastern side of Wolff Ditch. (Watershed has no knowledge of the status of these improvements.) The additional capacity at Lemkin/Wolff was needed to accommodate treatment of the additional stormwater, per SFWMD recommendations. The capacity and design were reviewed and approved by the District, which was a proponent to capture peak flows. Wolff Ditch has operated at a maximum of 11 cfs since operation commenced. Using the South Pond outflow TP values for these two side-by-side facilities, the current cost/benefit improves significantly, particularly for Wolff Ditch.

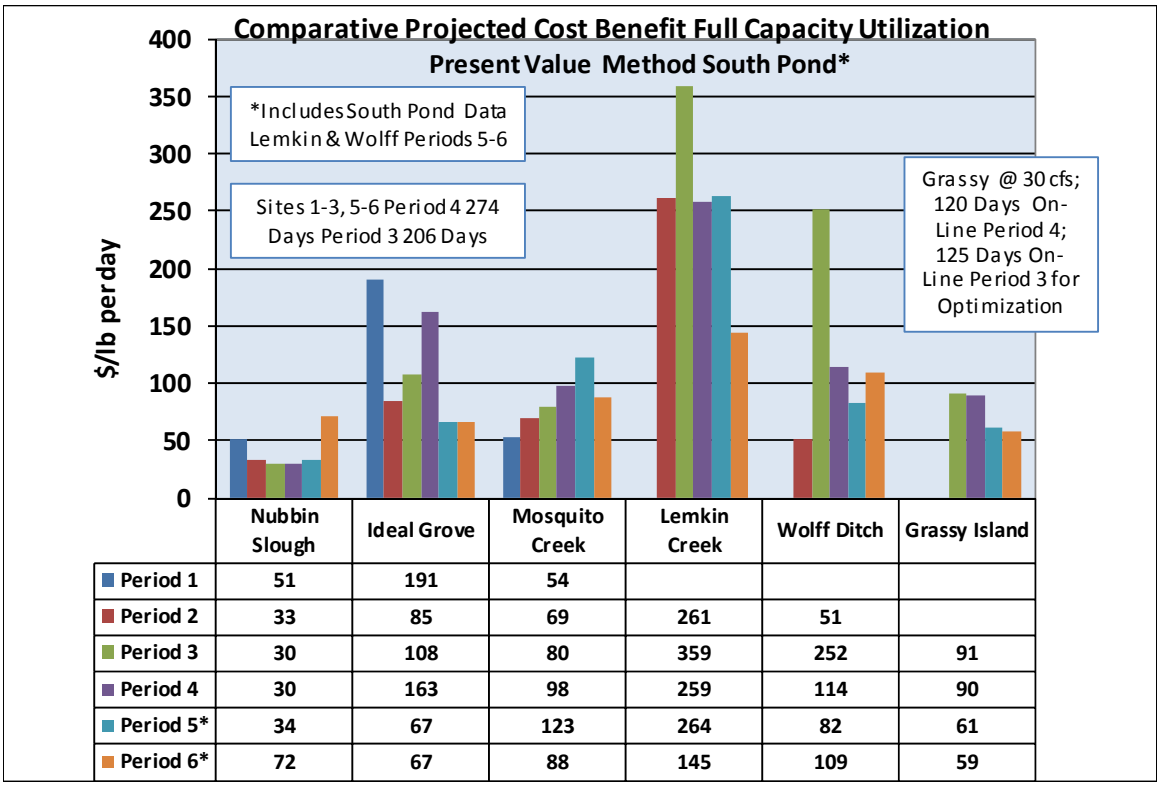
Grassy Island has the lowest cost/benefit ratio, primarily resulting from comparatively high flow (43% utilization) and moderately high TP levels. The capacity also increased at this site during the period. For all systems, both Periods 3 and 4 were partial periods, which can impact performance depending on wet and dry seasons. Construction and associated downtime also was an important factor at Grassy Island affecting availability for treatment and performance.

Cost/Benefit values under Partial Capacity utilization decreased for all sites except Nubbin Slough and Wolff Ditch for both the PV and Amortized Loan methodologies. The causative factors discussed above apply.



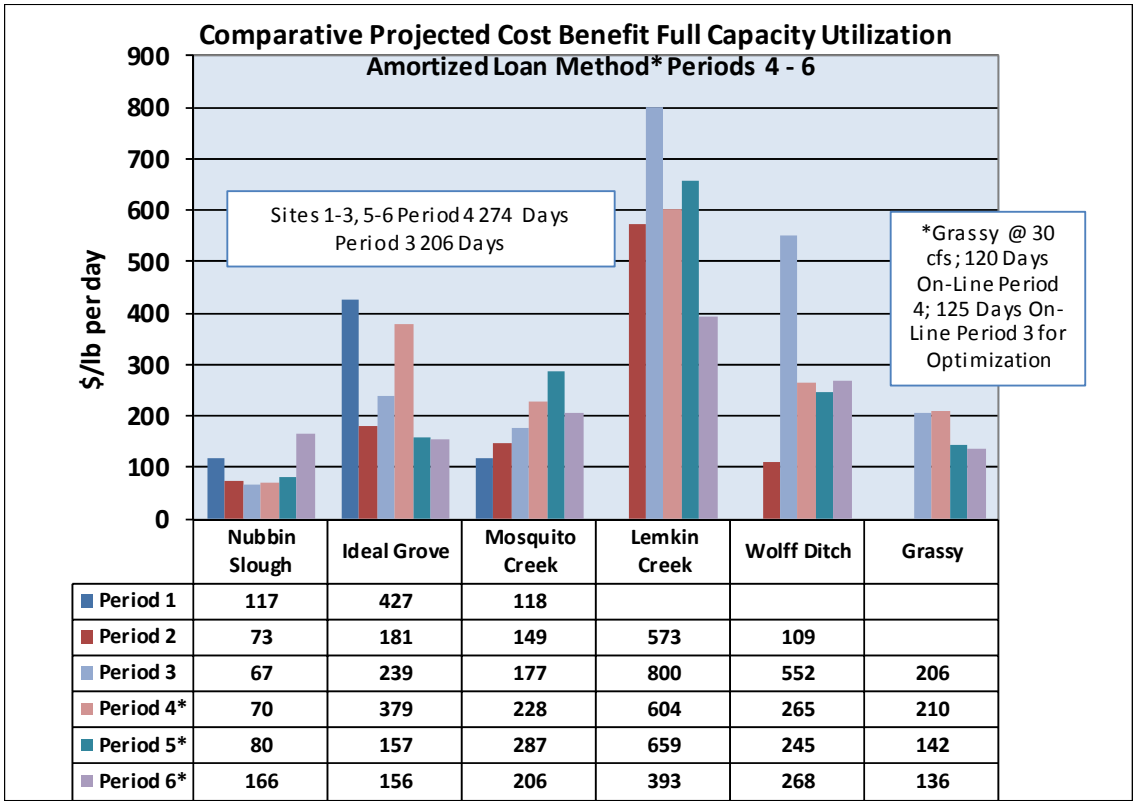
	Nubbin Slough	Ideal Grove	Mosquito Creek	Lemkin Creek	Wolff Ditch	Grassy Island
Period 1	51	191	54			
Period 2	33	85	69	261	51	
Period 3*	30	108	80	359	252	91
Period 4*	30	163	98	259	114	90
Period 5	34	67	123	283	105	61
Period 6	72	67	88	169	115	59

Figure 60. Comparative Projected Cost Benefit Full Capacity Present Value.



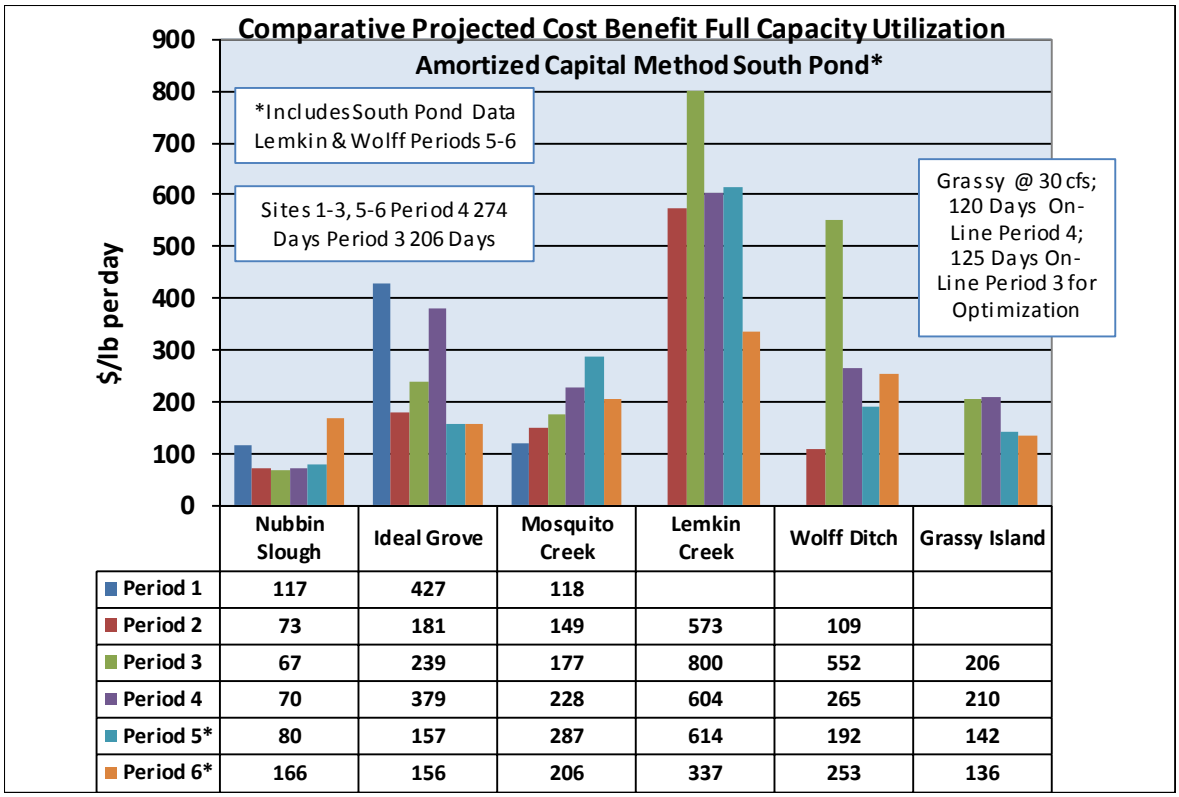
	Nubbin Slough	Ideal Grove	Mosquito Creek	Lemkin Creek	Wolff Ditch	Grassy Island
Period 1	51	191	54			
Period 2	33	85	69	261	51	
Period 3	30	108	80	359	252	91
Period 4	30	163	98	259	114	90
Period 5*	34	67	123	264	82	61
Period 6*	72	67	88	145	109	59

Figure 61. Comparative Projected Cost Benefit Full Capacity Present Value South Pond.



	Nubbin Slough	Ideal Grove	Mosquito Creek	Lemkin Creek	Wolff Ditch	Grassy
Period 1	117	427	118			
Period 2	73	181	149	573	109	
Period 3	67	239	177	800	552	206
Period 4*	70	379	228	604	265	210
Period 5*	80	157	287	659	245	142
Period 6*	166	156	206	393	268	136

Figure 62. Comparative Projected Cost Benefit Full Capacity Amortized Loan.



	Nubbin Slough	Ideal Grove	Mosquito Creek	Lemkin Creek	Wolff Ditch	Grassy Island
Period 1	117	427	118			
Period 2	73	181	149	573	109	
Period 3	67	239	177	800	552	206
Period 4	70	379	228	604	265	210
Period 5*	80	157	287	614	192	142
Period 6*	166	156	206	337	253	136

Figure 63. Comparative Projected Cost Benefit Full Capacity Amortized Loan South Pond.

Examples of the significance of key parameters and comparisons to cost/benefit values are demonstrated in Figure 64 and Figure 65. The data indicates that elevated levels of TP are generally inversely related to cost/benefit values. Additionally, as more P is available to treat, the fixed costs per unit decreases resulting in a lower cost/benefit, all other factors remaining constant.

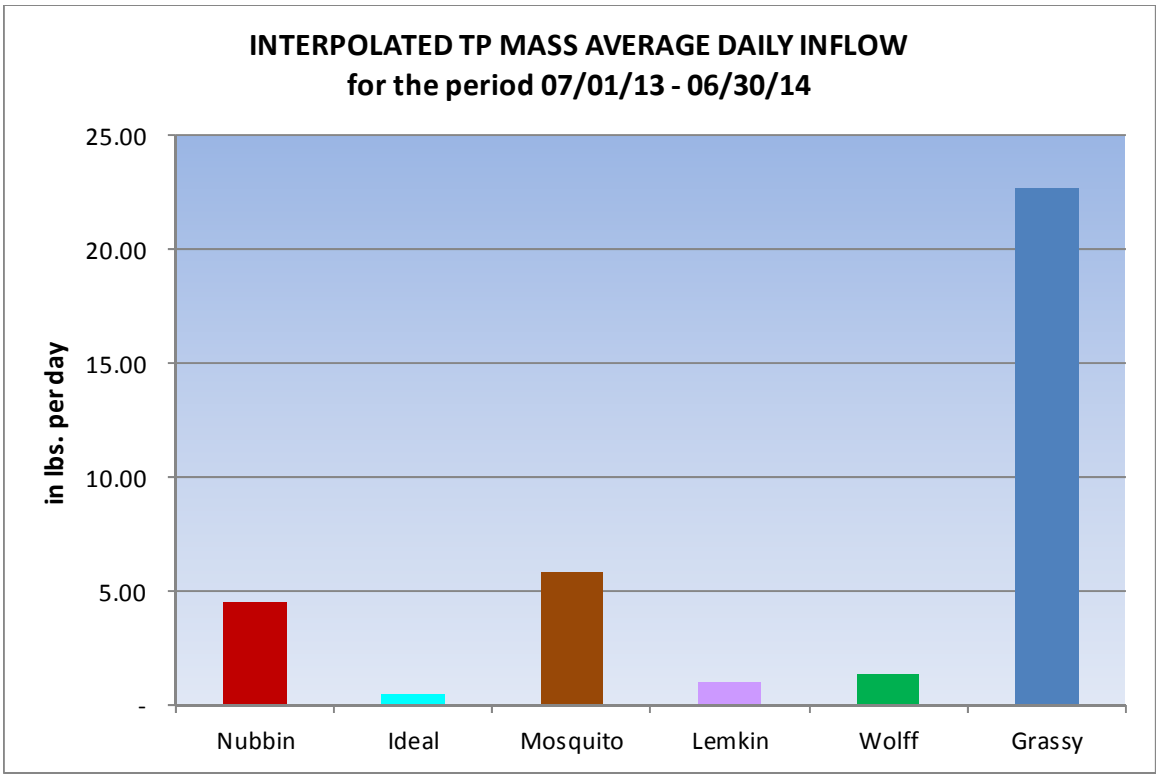


Figure 64. Average Daily TP Mass Inflow Levels by Site.

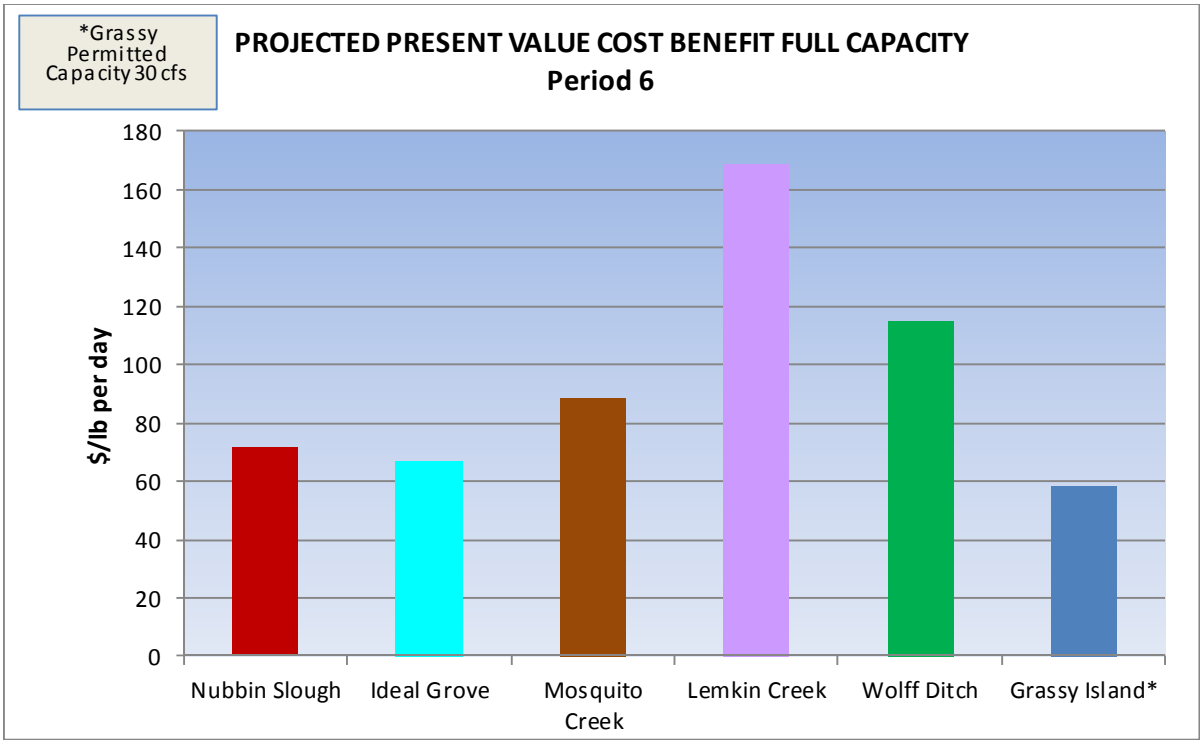


Figure 65. Projected Cost/Benefit by Site PV based on Full Capacity Utilization.

Environmental and Ancillary Benefits

As stated, this Report does not quantify environmental and other benefits in calculating cost/benefit values; however, the effectiveness of HWTT on qualitative factors is discussed below. Additionally, as HWTT projects require a significantly smaller land area as compared to traditional wetland treatment or systems with large detention/reservoir areas, positive savings will accrue through a reduction in land costs. HWTT projects are also well suited for implementation on either existing SFWMD properties and/or private property with associated cost benefits.

Flora and Fauna

As well as removal of P, the HWTT systems provide environmental benefits through wetland and wildlife habitat restoration and creation. Wetlands provide a valuable environment for a wide range of plant and animal species. The intrinsically high habitat value of wetlands is due in large part to their water and nutrient storage functions, which support high levels of primary productivity. The HWTT systems provide many of the same ancillary benefits to wildlife as the native marshes of South Florida, for example, water supply, food source and refuge.

The Lemkin Creek/Wolff Ditch site provides flow to a restored downstream wetland. The Nubbin Slough site was retrofitted from a traditional chemical treatment system that was not actively removing phosphorus to a partial HWTT system, providing additional desirable habitat. Ideal Grove is a converted wetland treatment system that was not effective in nutrient removal; the new facility provides added wildlife surroundings. The HWTT Mosquito Creek facility likewise affords new wetland and wildlife habitat. Informal field observations have confirmed utilization of the HWTT wetland sites by a variety of wildlife. Photographs of various flora and fauna at the sites or downstream wetlands are shown in Figure 66 through Figure 72.

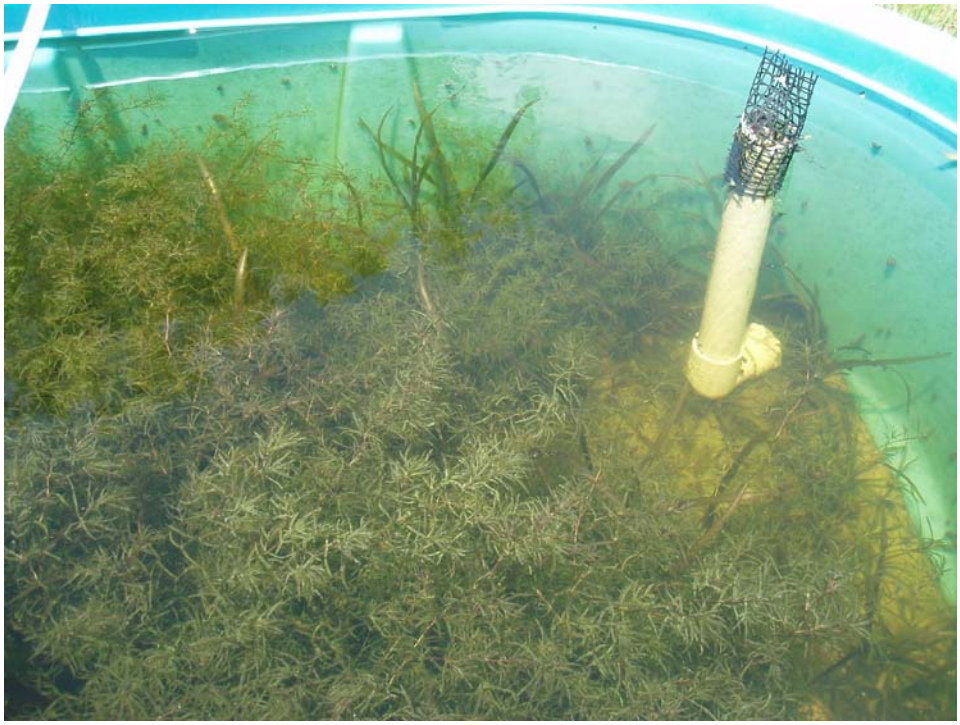


Figure 66. Southern naiad (*Najas*) and *Vallisneria*, Mesocosm.



Figure 67. Otters, HWTT Treatment Facility.



Figure 68. Roseate Spoonbills, Grassy Island limerock beds.



Figure 69. Baby alligator, Wolff Ditch Treatment Facility.



Figure 70. Everglades Rat snake, Nubbin Slough Treatment Facility.



Figure 71. Lotus Flower, HWTT Treatment Facility.



Figure 72. Gallinule, Ideal Grove Treatment Facility.

Further Minimization of Coagulant Use

The HWTT affords several mechanisms for minimizing coagulant use and economizing on the cost per mass of TP removed. HWTT design and operational factors that can be adjusted include: relative size and configuration of the wetland (floating and/or submerged vegetation) unit processes; type and dose of coagulants; coagulant aids and buffers; and amendment dosing cycles. For some Northern Everglades locations, depending on the size and configuration of the associated wetland unit processes, it is possible to implement extremely low frequency coagulant dosing and still achieve desired outflow TP concentrations and mass TP reductions.

Another mechanism for minimizing coagulant use in an HWTT system is the reuse of spent floc (see discussion below). At HWTT facilities such as the Nubbin and Grassy Island sites, where floc tilling is not performed, the floc drying beds will accumulate increasingly large amounts of dried floc over time. One potential use for this dried floc will be to recycle the material back into the HWTT flow train. For example, the dried floc may be introduced into the inflow region, or broadcast over the shallow zone of the FAV pond.

Effective Nitrogen Removal

TN concentration was effectively reduced in all of the HWTT systems during the monitoring period. Mean inflow TN concentration ranged from 1.59 mg/L at the Lemkin HWTT facility to 4.55 mg/L at the Mosquito Creek facility. The lowest mean outflow TN concentration (1.09 mg/L) was observed at the Grassy Island HWTT system, which achieved an average reduction in TN concentration of 43 percent. N removal in this system appears to be enhanced by the shallow SAV zone, which provides an extended HRT in the back end of the system. The Ideal Groves HWTT system, which also incorporates a back-end SAV zone, achieved an average TN reduction of 57 percent, from a mean concentration of 2.81 mg/L at the inflow to 1.20 mg/L in the outflow stream. Lower percent reduction of TN was observed at the Lemkin and Wolff HWTT facilities (18 and 21 percent, respectively), owing to the relatively low inflow concentration at both sites. Outflow TN concentrations at both Lemkin and Wolff (1.30 and 1.31 mg/L, respectively), however,

were comparable to outflow TN at the Ideal and Grassy facilities. Mean outflow TN concentrations were highest for Nubbin Slough (2.29 mg/L) and Mosquito Creek (2.38 mg/L), the two HWTT systems lacking a shallow vegetated zone. Nevertheless, reductions in mean TN concentrations were favorable at both sites: 28 and 48 percent at Nubbin and Mosquito Creek, respectively.

Efficient Floc Management Alternatives

Prior to the initiation of the HWTT project, no floc management activities had been performed in any of the chemical dosing facilities in the Northern Everglades. HWTT systems cycle wet floc internally to enhance contaminant removal per unit area. This concept was clearly illustrated by simple jar test re-use studies presented in previous reports. At an operational scale (presently at Nubbin Slough, Mosquito Creek and Grassy Island), wet floc is pumped to adjacent drying beds and subjected to passive, solar drying; the resultant dried material will be subsequently reintroduced into the system to achieve additional TP removal. The first use will be to broadcast throughout the water hyacinth zones to stabilize P in the underlying sediments. The dry material is stable and low-volume, thus it can be incorporated into the relatively large footprint HWTT system on a sustainable basis.

Further, in HWTT facilities several options are available with respect to final use of floc materials. The systems can capitalize on dry season periods by drawing down water levels in shallow zones and tilling the dried floc and vegetation into the soil using conventional farm machinery. Deep zones incorporated into the system keep vegetation viable during the drydown and tilling operations. Because both the vegetation and floc exhibit a dramatic volume (~90%) reduction upon drying, this patented tilling technique can be repeated numerous times without creating a substantial change in the shallow zone ground elevation. Moreover, in laboratory trials, shallow zone soil cores collected post-tilling (of vegetation and floc) revealed no release of P to the water following reflooding with low P (rain) waters.

Suitability for Treating Northern Everglades Runoff

HWTT systems offer a cost-effective technology for treating runoff P in the Northern Everglades watersheds. The technology is compatible with the distinct wet season/dry season rainfall regime and is capable of achieving high TP mass load reductions and low outflow TP concentrations. HWTT systems combine the benefits of treatment wetlands and conventional chemical treatment systems, while eliminating the major drawbacks, for example, the large footprint and year-round water requirements of wetland systems and the high operations cost of chemical systems.

Operational Flexibility

HWTT provides operational flexibility primarily through utilization of several varying components to maximize treatment while minimizing costs. Each component can be implemented based on very specific site-conditions, which can be invaluable in managing a diverse set of circumstances and water quality parameters.

The hybrid process can also be constructed in areas with limited land availability as compared to traditional wetland treatment systems. As the technology relies in part on chemical amendments, it is less vulnerable to natural disasters/disturbances and would recover faster than systems that rely solely on vegetation (hurricane wind damage, natural predation and drought effects).

Scale-up issues and costs are also relatively minor as compared to wetland treatment. Where land is not available, the technology can be deployed directly within the water body (DeBusk et al., 2005).

Enhanced System Evaluation Techniques

Watershed Technologies has designed, constructed and fully implemented a "Mesocosm" facility (Figure 73) for rapid assessment of comparisons between traditional chemical treatment and HWTT and for the investigation of optimal operational parameters necessary for full-scale design and optimization. The system is a mobile unit, which can be assembled and utilized at current sites as well as off-site locations, providing invaluable performance data in real time and consequently reducing personnel and other operating costs.



Figure 73. Photograph of Mesocosm assembled at the Grassy Island Site during Phase I construction.

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Appendices

Appendix I. Comparative Summary of Operating Performance Statistics for the HWTT Systems for Periods 1- 6. (Click to Open Linked File.)

Schedule 1. Comparative Performance Statistics for Operational Sites Period 6.

SUMMARY TP PERFORMANCE & COMPARISON Sites 1-3, 5-7												
Site	Average Daily Flow gpm**	Average Inflow Conc.*	Average Outflow Conc.*	lbs. of TP Removed per Day**	Facility Size cfs****	% Capacity Utilization Based on Flow	Facility Purpose	# Days in Period	# Days On-Line	# Days On-Line Flow > 0.0000	# Days in *Period* Flow > 0.0000 Less Non-Controllable Down Time	% Days On-Line vs. Available Days ***
Nubbin Slough	470	799	247	3.15	7.40	14%	Remove P & N in cost-effective & environmentally sound manner.	365	350	348	361	96%
Ideal Grove	52	862	48	0.50	1.30	9%	Remove P & N in cost-effective & environmentally sound manner.	365	362	362	364	99%
Mosquito Creek	760	640	150	4.49	6.00	28%	Remove P & N in cost-effective & environmentally sound manner.	365	310	302	344	88%
Lemkin Creek	806	101	29	0.71	5.00	36%	Remove P & N in cost-effective & environmentally sound manner, provide flow to downstream wetlands.	365	358	358	358	100%
Wolff Ditch	762	146	24	1.11	20.00	8%	Remove P & N in cost-effective & environmentally sound manner, provide flow to downstream wetlands.	365	364	364	364	100%
Grassy Island	3861	490	93	18.43	20.00	43%	Remove P & N in cost-effective & environmentally sound manner & provide lower input concentrations to downstream waters.	365	362	362	362	100%
Tributary TMDL			113									
Lake Inflow TMDL			40									
Notes:	*Flow Weighted in µg/L		**Average per on-line flow day			*** Excl. No Flow Days & Non-Controllable Downtime				****Grassy 10 to 20cfs 11/29/12		

Appendix II. Nubbin Slough TP Reduction & Operations Report
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WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
7/1/2013	18.2647	0.6128	17.6519	980.5		
7/2/2013	18.8620	0.6328	18.2292	1012.6		
7/3/2013	17.3631	0.5825	16.7806	932.1		sampling date
7/4/2013	16.7176	0.6126	16.1049	980.3		
7/5/2013	15.1733	0.6126	14.5607	980.2		
7/6/2013	13.6289	0.6125	13.0163	980.1		
7/7/2013	12.1536	0.6160	11.5376	985.6		
7/8/2013	10.7592	0.6251	10.1341	1000.3		
7/9/2013	9.7936	0.6666	9.1271	1066.6		
7/10/2013	7.8152	0.6420	7.1732	1027.3		sampling date
7/11/2013	8.7281	1.1155	7.6125	1037.9		
7/12/2013	9.2961	1.5387	7.7575	1009.2		
7/13/2013	10.0428	1.9803	8.0625	1003.0		
7/14/2013	11.1282	2.4945	8.6337	1029.0		
7/15/2013	11.5153	2.8490	8.6662	991.3		
7/16/2013	12.2278	3.2729	8.9549	984.7		
7/17/2013	13.1862	3.7641	9.4221	997.5		sampling date
7/18/2013	13.0894	4.7646	8.3248	997.9		
7/19/2013	13.0348	5.7849	7.2500	1001.6		
7/20/2013	13.0173	6.8324	6.1850	1008.2		
7/21/2013	13.0958	7.9523	5.1435	1022.5		
7/22/2013	13.4290	9.2787	4.1503	1057.0		
7/23/2013	13.1437	10.1998	2.9439	1043.0		
7/24/2013	12.8488	11.0821	1.7667	1028.0		sampling date
7/25/2013	13.0272	10.4425	2.5847	1059.5		
7/26/2013	12.9032	9.5308	3.3723	1066.9		
7/27/2013	12.7350	8.5776	4.1574	1071.0		
7/28/2013	12.5795	7.6257	4.9538	1076.2		
7/29/2013	12.9167	6.9294	5.9872	1124.6		
7/30/2013	12.5583	5.8301	6.7282	1113.0		
7/31/2013	12.4990	4.8667	7.6322	1128.0		sampling date
8/1/2013	12.9573	4.9684	7.9889	1148.4		
8/2/2013	13.2886	5.0195	8.2691	1157.0		
8/3/2013	13.4885	5.0205	8.4679	1154.0		
8/4/2013	13.0445	4.7857	8.2587	1097.0		
8/5/2013	12.5774	4.5496	8.0278	1040.0		
8/6/2013	12.9725	4.6279	8.3446	1055.0		
8/7/2013	13.3054	4.6825	8.6230	1064.5		sampling date
8/8/2013	9.9224	3.5288	6.3936	844.4		
8/9/2013	8.3404	3.0014	5.3390	758.1		
8/10/2013	7.6223	2.7799	4.8424	743.4		
8/11/2013	7.1474	2.6467	4.5007	752.0		
8/12/2013	6.4182	2.4188	3.9994	733.0		
8/13/2013	6.2843	2.4172	3.8670	784.8		
8/14/2013	5.7357	2.2601	3.4756	790.2		sampling date
8/15/2013	5.9329	2.6822	3.2507	797.9		

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Appendix III. Ideal Grove TP Reduction & Operations Report
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WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 99%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	193.5049	10.7444	182.7606	gpm On-Line Flow > 0	Operational/	
PER DAY	0.5345	0.0297	0.5049	51.56	Flow Status	Comments
7/1/2013	0.5847	0.0083	0.5765	49.3		
7/2/2013	0.5662	0.0080	0.5581	47.7		
7/3/2013	0.6104	0.0087	0.6018	51.5		sampling date
7/4/2013	0.5725	0.0096	0.5630	51.5		
7/5/2013	0.5075	0.0099	0.4976	49.0		
7/6/2013	0.4647	0.0106	0.4541	48.3		
7/7/2013	0.4296	0.0115	0.4181	48.4		
7/8/2013	0.4141	0.0129	0.4012	50.9		
7/9/2013	0.6325	0.0240	0.6285	88.4		
7/10/2013	0.5829	0.0253	0.5576	87.9		sampling date
7/11/2013	0.5829	0.0337	0.5493	87.2		
7/12/2013	0.6638	0.0477	0.6162	98.4		
7/13/2013	0.6862	0.0587	0.6275	100.9		
7/14/2013	0.6889	0.0683	0.6206	100.5		
7/15/2013	0.6783	0.0764	0.6020	98.2		
7/16/2013	0.6650	0.0836	0.5814	95.5		
7/17/2013	0.6551	0.0909	0.5642	93.3		sampling date
7/18/2013	0.7193	0.0973	0.6220	90.8		
7/19/2013	0.7815	0.1035	0.6779	88.6		
7/20/2013	0.8277	0.1078	0.7199	85.1		
7/21/2013	0.8857	0.1137	0.7720	83.3		
7/22/2013	0.9580	0.1215	0.8365	83.1		
7/23/2013	1.0011	0.1256	0.8755	80.5		
7/24/2013	1.0515	0.1307	0.9208	78.8		sampling date
7/25/2013	0.9980	0.1251	0.8729	79.5		
7/26/2013	0.9450	0.1196	0.8254	80.3		
7/27/2013	0.8665	0.1109	0.7557	78.8		
7/28/2013	0.7834	0.1014	0.6819	76.7		
7/29/2013	0.7402	0.0972	0.6430	78.5		
7/30/2013	0.6947	0.0927	0.6020	80.4		
7/31/2013	0.6288	0.0856	0.5432	80.0		sampling date
8/1/2013	0.7311	0.0901	0.6410	82.1		
8/2/2013	0.8276	0.0936	0.7339	83.2		
8/3/2013	0.9148	0.0960	0.8188	83.3		
8/4/2013	1.0177	0.0998	0.9178	84.7		
8/5/2013	0.7265	0.0671	0.6594	55.6		
8/6/2013					Off-Line	Power failure
8/7/2013	1.0192	0.0849	0.9343	67.3		sampling date
8/8/2013	1.3104	0.1204	1.1899	90.1		
8/9/2013	1.2156	0.1231	1.0925	87.1		
8/10/2013	1.1650	0.1297	1.0353	87.2		
8/11/2013	1.0572	0.1294	0.9277	82.8		
8/12/2013	0.6868	0.0924	0.5943	56.4		
8/13/2013	0.5132	0.0760	0.4373	44.3		
8/14/2013	1.3028	0.2121	1.0906	118.5		sampling date
8/15/2013	1.5547	0.2358	1.3190	148.9		
8/16/2013	1.4542	0.2024	1.2518	147.2		

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Appendix IV. Mosquito Creek TP Reduction & Operations Report
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WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 88%
	TP MASS (lbs.) INFLOW	TP MASS (lbs.) OUTFLOW	TP (lbs.) REMOVAL	AVERAGE DAILY FLOW	On-Line Unless Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
7/1/2013	11.7823	0.3508	11.4315	748.4		
7/2/2013	15.9019	0.4734	15.4285	1010.0		
7/3/2013	13.8130	0.4112	13.4017	877.4		sampling date
7/4/2013	15.2455	0.7197	14.5259	1045.3		
7/5/2013	14.0042	0.9473	13.0569	1043.1		
7/6/2013	12.6956	1.1674	11.5282	1034.9		
7/7/2013	11.4747	1.3922	10.0825	1033.0		
7/8/2013	10.2776	1.6192	8.6584	1033.0		
7/9/2013	9.0566	1.8414	7.2152	1030.3		
7/10/2013	7.8403	2.0619	5.7784	1027.4		sampling date
7/11/2013	7.8111	1.9211	5.8900	1038.0		
7/12/2013	7.5280	1.7195	5.8085	1014.7		
7/13/2013	7.4113	1.5592	5.8521	1013.6		
7/14/2013	7.3644	1.4125	5.9519	1022.0		
7/15/2013	7.4466	1.2858	6.1608	1048.9		
7/16/2013	7.5165	1.1497	6.3668	1074.9		
7/17/2013	6.7053	0.8894	5.8160	973.7		sampling date
7/18/2013	7.5688	1.1383	6.4305	1062.5		
7/19/2013	7.7058	1.2870	6.4188	1047.0		
7/20/2013	7.8348	1.4306	6.4042	1031.3		
7/21/2013	8.1263	1.6028	6.5235	1037.3		
7/22/2013	8.3153	1.7547	6.5606	1030.3		
7/23/2013	6.8800	1.5412	5.3388	828.1		
7/24/2013	7.0762	1.6720	5.4042	828.1		sampling date
7/25/2013	6.8857	1.5455	5.3402	828.1		
7/26/2013	6.6952	1.4189	5.2762	828.1		
7/27/2013	6.5047	1.2924	5.2123	828.1		
7/28/2013	6.3141	1.1659	5.1483	828.1		
7/29/2013	7.3641	1.2499	6.1142	995.9		
7/30/2013	8.0074	1.2319	6.7755	1117.6		
7/31/2013	7.6071	1.0415	6.5655	1097.0		sampling date
8/1/2013	8.7630	1.3017	7.4612	1087.8		
8/2/2013	9.4556	1.4878	7.9678	1030.4		
8/3/2013	10.3672	1.7025	8.6646	1006.7		
8/4/2013	11.5384	1.9586	9.5798	1010.5		
8/5/2013	12.4875	2.1764	10.3110	995.8		
8/6/2013	13.2376	2.3574	10.8802	969.0		
8/7/2013	25.4254	4.6097	20.8158	1720.0		sampling date
8/8/2013					Off-Line	power failure
8/9/2013	15.2545	2.3833	12.8712	1116.8		
8/10/2013	22.6412	3.2171	19.4241	1728.6		
8/11/2013	21.7486	2.7551	18.9935	1734.8		
8/12/2013	20.7527	2.2791	18.4736	1733.0		
8/13/2013	19.7969	1.8076	17.9893	1734.5		
8/14/2013	18.8211	1.3339	17.4872	1734.3		sampling date
8/15/2013	17.7706	1.8216	15.9489	1730.9		
8/16/2013	16.7564	2.3118	14.4446	1730.8		

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Appendix V. Lemkin Creek TP Reduction & Operations Report
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WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.) INFLOW	TP MASS (lbs.) OUTFLOW	TP (lbs.) REMOVAL	AVERAGE DAILY FLOW	On-Line Unless Otherwise Noted	
TOTAL PER DAY	354.6269 0.9906	101.0536 0.2823	253.5733 0.7083	gpm On-Line Flow > 0 806.08	Operational/ Flow Status	Comments
7/1/2013	1.3448	0.2490	1.0958	828.9		
7/2/2013	1.3281	0.2459	1.0822	818.6		
7/3/2013	1.3240	0.2452	1.0788	816.1		sampling date
7/4/2013	1.0749	0.2085	0.8664	723.0		
7/5/2013	1.0298	0.2107	0.8191	762.2		
7/6/2013	0.9255	0.2013	0.7242	761.4		
7/7/2013	0.8160	0.1907	0.6253	755.6		
7/8/2013	0.7066	0.1799	0.5268	748.3		
7/9/2013	0.6295	0.1777	0.4517	778.4		
7/10/2013	0.5141	0.1653	0.3489	764.0		sampling date
7/11/2013	0.5662	0.1715	0.3947	734.5		
7/12/2013	0.7162	0.2066	0.5095	824.4		
7/13/2013	0.8224	0.2279	0.5945	850.8		
7/14/2013	0.8183	0.2191	0.5992	768.7		
7/15/2013	0.9143	0.2377	0.6766	786.7		
7/16/2013	1.0054	0.2548	0.7506	797.8		
7/17/2013	1.0996	0.2725	0.8272	809.7		sampling date
7/18/2013	1.1326	0.2795	0.8531	847.9		
7/19/2013	1.1338	0.2786	0.8552	863.3		
7/20/2013	1.1075	0.2710	0.8366	857.8		
7/21/2013	1.0614	0.2585	0.8029	836.6		
7/22/2013	1.0404	0.2522	0.7882	834.7		
7/23/2013	1.0214	0.2464	0.7750	834.4		
7/24/2013	1.0016	0.2404	0.7612	833.4		sampling date
7/25/2013	1.2050	0.2621	0.9429	807.7		
7/26/2013	1.5554	0.3147	1.2407	872.8		
7/27/2013	1.7820	0.3410	1.4410	859.9		
7/28/2013	2.0209	0.3701	1.6508	855.4		
7/29/2013	2.2941	0.4054	1.8887	864.8		
7/30/2013	2.5774	0.4421	2.1353	875.9		
7/31/2013	2.8212	0.4719	2.3492	872.7		sampling date
8/1/2013	2.6321	0.4515	2.1806	862.3		
8/2/2013	2.4913	0.4393	2.0520	867.4		
8/3/2013	2.3267	0.4229	1.9038	864.3		
8/4/2013	2.1679	0.4075	1.7604	863.1		
8/5/2013	1.9985	0.3900	1.6085	857.2		
8/6/2013	1.7987	0.3661	1.4326	836.1		
8/7/2013	1.6591	0.3541	1.3050	841.7		sampling date
8/8/2013	1.6070	0.3563	1.2507	854.0		
8/9/2013	1.5307	0.3534	1.1774	854.0		
8/10/2013	1.4752	0.3554	1.1198	866.2		
8/11/2013	1.3926	0.3511	1.0415	862.9		
8/12/2013	1.3105	0.3468	0.9637	859.6		
8/13/2013	1.2492	0.3481	0.9010	870.3		
8/14/2013	1.1532	0.3398	0.8134	856.7		sampling date
8/15/2013	1.1423	0.3220	0.8202	841.1		
8/16/2013	1.1162	0.3007	0.8155	814.7		

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Appendix VI. Wolff Ditch TP Reduction & Operations Report
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WATERSHED TECHNOLOGIES						
Wolff Ditch TP Reduction & Operations Report						
for the period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
7/1/2013	1.0994	0.1763	0.9232	772.0		
7/2/2013	1.0852	0.1740	0.9112	762.0		
7/3/2013	1.0866	0.1742	0.9124	763.0		sampling date
7/4/2013	1.1043	0.1780	0.9263	768.0		
7/5/2013	1.1250	0.1823	0.9427	775.0		
7/6/2013	1.1518	0.1876	0.9642	786.0		
7/7/2013	1.1507	0.1883	0.9624	778.0		
7/8/2013	1.1644	0.1915	0.9729	780.0		
7/9/2013	1.1661	0.1927	0.9734	774.0		
7/10/2013	1.1782	0.1956	0.9826	775.0		sampling date
7/11/2013	1.2481	0.2009	1.0472	780.0		
7/12/2013	1.3238	0.2070	1.1168	788.0		
7/13/2013	1.3973	0.2127	1.1846	794.0		
7/14/2013	1.4551	0.2159	1.2392	791.0		
7/15/2013	1.5087	0.2186	1.2901	786.0		
7/16/2013	1.5794	0.2238	1.3556	790.0		
7/17/2013	1.6404	0.2276	1.4129	789.0		sampling date
7/18/2013	1.6120	0.2189	1.3931	792.0		
7/19/2013	1.5773	0.2094	1.3679	792.0		
7/20/2013	1.5485	0.2006	1.3478	795.0		
7/21/2013	1.5194	0.1918	1.3276	798.0		
7/22/2013	1.1161	0.1370	0.9791	600.0		
7/23/2013					Off-Line	power failure
7/24/2013	0.6133	0.0707	0.5427	346.0		sampling date
7/25/2013	1.7000	0.1746	1.5254	807.0		
7/26/2013	1.9841	0.1856	1.7985	813.0		
7/27/2013	2.2778	0.1973	2.0805	821.0		
7/28/2013	2.5489	0.2070	2.3419	820.0		
7/29/2013	2.7022	0.2076	2.4947	785.0		
7/30/2013	2.8964	0.2120	2.6844	767.0		
7/31/2013	3.0456	0.2137	2.8319	741.0		sampling date
8/1/2013	2.8372	0.2212	2.6360	732.0		
8/2/2013	2.7649	0.2363	2.5286	748.0		
8/3/2013	2.6835	0.2535	2.4300	769.0		
8/4/2013	2.6130	0.2733	2.3397	796.0		
8/5/2013	2.4944	0.2896	2.2048	811.0		
8/6/2013	2.3181	0.2996	2.0184	808.0		
8/7/2013	2.0977	0.3030	1.7946	788.0		sampling date
8/8/2013	2.0265	0.2910	1.7355	774.0		
8/9/2013	1.9437	0.2774	1.6663	755.0		
8/10/2013	1.8094	0.2566	1.5529	715.0		
8/11/2013	1.5319	0.2157	1.3162	616.0		
8/12/2013	1.7346	0.2426	1.4920	710.0		
8/13/2013	1.5740	0.2185	1.3555	656.0		
8/14/2013	1.5405	0.2122	1.3283	654.0		sampling date
8/15/2013	1.6330	0.2258	1.4071	685.0		
8/16/2013	1.7151	0.2380	1.4770	711.0		

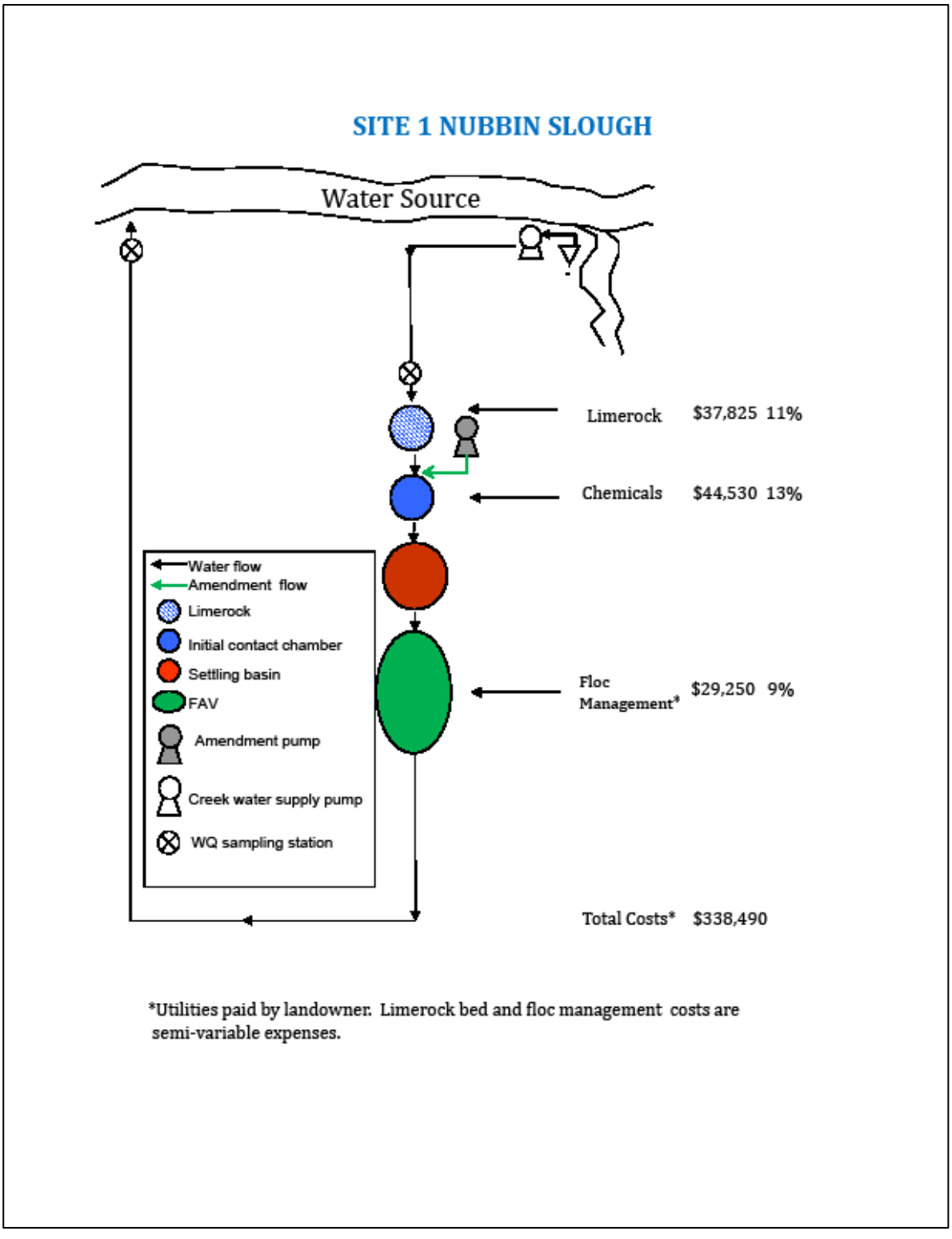
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Appendix VII. Grassy Island TP Reduction & Operations Report
(Click to Open Linked File)

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
7/1/2013	55.9793	9.6074	46.3720	5771.9		
7/2/2013	87.1065	14.9495	72.1570	8981.4		
7/3/2013	83.9258	14.4036	69.5222	8653.4		sampling date
7/4/2013	81.5839	15.5556	66.0283	8428.3		
7/5/2013	79.6227	16.7042	62.9185	8241.8		
7/6/2013	75.5728	17.3053	58.2675	7837.9		
7/7/2013	75.8415	18.8285	57.0131	7881.2		
7/8/2013	79.7265	21.3355	58.3910	8301.2		
7/9/2013	78.1555	22.4331	55.7224	8153.7		
7/10/2013	84.1323	25.7893	58.3430	8794.6		sampling date
7/11/2013	76.4932	21.6134	54.8798	8148.1		
7/12/2013	72.5313	18.6872	53.8441	7875.9		
7/13/2013	70.8061	16.4093	54.3969	7840.6		
7/14/2013	71.1862	14.5796	56.6066	8041.7		
7/15/2013	70.1784	12.4049	57.7736	8091.0		
7/16/2013	69.6122	10.2702	59.3420	8194.4		
7/17/2013	68.0195	7.9618	60.0577	8178.9		sampling date
7/18/2013	69.4353	9.9111	59.5242	8390.7		
7/19/2013	73.7913	12.4473	61.3441	8961.7		
7/20/2013	76.3351	14.8767	61.4584	9317.2		
7/21/2013	72.6068	16.0720	56.5348	8907.0		
7/22/2013	69.4709	17.2354	52.2355	8565.6		
7/23/2013	71.2174	19.5924	51.6251	8825.7		
7/24/2013	71.7345	21.6922	50.0423	8935.4		sampling date
7/25/2013	67.4117	20.1551	47.2566	8541.9		
7/26/2013	71.0488	20.9917	50.0571	9160.9		
7/27/2013	69.0874	20.1596	48.9278	9067.2		
7/28/2013	65.7738	18.9434	46.8304	8789.5		
7/29/2013	69.4191	19.7205	49.6986	9448.6		
7/30/2013	64.6230	18.0944	46.5285	8961.9		
7/31/2013	67.6035	18.6427	48.9609	9555.8		
8/1/2013	63.9363	17.3499	46.5864	9214.8		
8/2/2013	62.9840	16.8031	46.1808	9259.3		sampling date
8/3/2013	67.9489	18.3323	49.6167	9671.9		
8/4/2013	66.7123	18.1871	48.5252	9203.5		
8/5/2013	68.9695	18.9856	49.9839	9230.6		
8/6/2013	71.6855	19.9126	51.7728	9315.8		
8/7/2013	72.0729	20.1904	51.8825	9102.2		
8/8/2013	75.9338	21.4414	54.4923	9326.9		
8/9/2013	79.4824	22.6114	56.8710	9502.3		sampling date
8/10/2013	77.2157	21.5058	55.7098	9642.9		
8/11/2013	71.8872	19.5528	52.3344	9396.6		
8/12/2013	50.0794	13.2626	36.8169	6866.5		
8/13/2013	24.8273	6.3789	18.4484	3579.4		
8/14/2013	57.8662	14.3609	43.5054	8795.5		

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Appendix VIII. Variable and Total Cost Detail by Site.
(Click to Open Linked File)



Appendix IX. Estimated Rough Order of Magnitude Replacement Costs Sites 1-3, 5-7, Discounted Future Values & Discount Rate Sensitivity Analyses.
(Click to Open Linked File.)

HWTT
Estimated Replacement Costs Order of Magnitude Excluding Labor & Overhead
in 2010 - 2013 dollars (See Note)
System Life in Years 50
Net Discount Rate Compounded Annually
(6% ROR less 2% inflation) 4%
RC = Replacement Cost

Item	Average Estimated Life	Estimated RC* in 2010 - 2013 Dollars	PV* in 2010 - 2013 Dollars	Year 2020	Year 2030	Year 2040	Year 2050	# of Replace-ments
Site 1 Nubbin Slough								
Pumps	10	$ 14,000	$ 23,100	$ 9,500	$ 6,400	$ 4,300	$ 2,900	4
Limerock (projected life 5-10 years)	10	34,110	56,200	23,000	15,600	10,500	7,100	4
Monitoring & Control Equipment	10	20,000	33,000	13,500	9,100	6,200	4,200	4
Total Replacement Cost		$ 68,110	$ 112,300	$ 46,000	$ 31,100	$ 21,000	$ 14,200	
Site 2 Ideal Grove								
Pumps	10	$ 4,000	$ 6,500	$ 2,700	$ 1,800	$ 1,200	$ 800	4
Limerock (projected life 5-10 years)	10	-	-	-	-	-	-	4
Monitoring & Control Equipment	10	8,000	13,300	5,400	3,700	2,500	1,700	4
Total Replacement Cost		$ 12,000	$ 19,800	$ 8,100	$ 5,500	$ 3,700	$ 2,500	
Site 3 Mosquito Creek								
Pumps	10	$ 16,000	$ 26,300	$ 10,800	$ 7,300	$ 4,900	$ 3,300	4
Limerock (projected life 5-10 years)	10	35,000	57,700	23,600	16,000	10,800	7,300	4
Monitoring & Control Equipment	10	13,000	21,400	8,800	5,900	4,000	2,700	4
Total Replacement Cost		$ 64,000	$ 105,400	$ 43,200	$ 29,200	$ 19,700	$ 13,300	
Site 5 Lemkin Creek								
Pumps	10	$ 32,000	$ 52,800	$ 21,600	$ 14,600	$ 9,900	$ 6,700	4
Limerock (projected life 5-10 years)	10	8,750	14,400	5,900	4,000	2,700	1,800	4
Monitoring & Control Equipment	10	16,000	26,300	10,800	7,300	4,900	3,300	4
Total Replacement Cost		$ 56,750	$ 93,500	$ 38,300	$ 25,900	$ 17,500	$ 11,800	
Site 6 Wolff Ditch								
Pumps	10	$ 59,000	$ 97,300	$ 39,900	$ 26,900	$ 18,200	$ 12,300	4
Limerock (projected life 5-10 years)	10	8,750	14,400	5,900	4,000	2,700	1,800	4
Monitoring & Control Equipment	10	18,000	29,600	12,200	8,200	5,500	3,700	4
Total Replacement Cost		$ 85,750	$ 141,300	$ 58,000	$ 39,100	$ 26,400	$ 17,800	
Site 7 Grassy Island through Phase III								
Pumps	10	212,450	$ 350,300	$ 143,500	$ 97,000	$ 65,500	$ 44,300	4
Limerock (projected life 5-10 years)	10	77,050	127,100	52,100	35,200	23,800	16,000	4
Monitoring & Control Equipment	10	81,450	134,300	55,000	37,200	25,100	17,000	4
Total Replacement Cost		$ 370,950	$ 611,700	$ 250,600	$ 169,400	$ 114,400	$ 77,300	
Total Replacement Costs		$ 657,560	$ 1,084,000					

Note: The information contained herein is based upon a set of assumptions including estimated current year costs, life & discount rates.

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WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
7/1/2013	55.9793	9.6074	46.3720	5771.9		
7/2/2013	87.1065	14.9495	72.1570	8981.4		
7/3/2013	83.9258	14.4036	69.5222	8653.4		sampling date
7/4/2013	81.5839	15.5556	66.0283	8428.3		
7/5/2013	79.6227	16.7042	62.9185	8241.8		
7/6/2013	75.5728	17.3053	58.2675	7837.9		
7/7/2013	75.8415	18.8285	57.0131	7881.2		
7/8/2013	79.7265	21.3355	58.3910	8301.2		
7/9/2013	78.1555	22.4331	55.7224	8153.7		
7/10/2013	84.1323	25.7893	58.3430	8794.6		sampling date
7/11/2013	76.4932	21.6134	54.8798	8148.1		
7/12/2013	72.5313	18.6872	53.8441	7875.9		
7/13/2013	70.8061	16.4093	54.3969	7840.6		
7/14/2013	71.1862	14.5796	56.6066	8041.7		
7/15/2013	70.1784	12.4049	57.7736	8091.0		
7/16/2013	69.6122	10.2702	59.3420	8194.4		
7/17/2013	68.0195	7.9618	60.0577	8178.9		sampling date
7/18/2013	69.4353	9.9111	59.5242	8390.7		
7/19/2013	73.7913	12.4473	61.3441	8961.7		
7/20/2013	76.3351	14.8767	61.4584	9317.2		
7/21/2013	72.6068	16.0720	56.5348	8907.0		
7/22/2013	69.4709	17.2354	52.2355	8565.6		
7/23/2013	71.2174	19.5924	51.6251	8825.7		
7/24/2013	71.7345	21.6922	50.0423	8935.4		sampling date
7/25/2013	67.4117	20.1551	47.2566	8541.9		
7/26/2013	71.0488	20.9917	50.0571	9160.9		
7/27/2013	69.0874	20.1596	48.9278	9067.2		
7/28/2013	65.7738	18.9434	46.8304	8789.5		
7/29/2013	69.4191	19.7205	49.6986	9448.6		
7/30/2013	64.6230	18.0944	46.5285	8961.9		
7/31/2013	67.6035	18.6427	48.9609	9555.8		
8/1/2013	63.9363	17.3499	46.5864	9214.8		
8/2/2013	62.9840	16.8031	46.1808	9259.3		sampling date
8/3/2013	67.9489	18.3323	49.6167	9671.9		
8/4/2013	66.7123	18.1871	48.5252	9203.5		
8/5/2013	68.9695	18.9856	49.9839	9230.6		
8/6/2013	71.6855	19.9126	51.7728	9315.8		
8/7/2013	72.0729	20.1904	51.8825	9102.2		
8/8/2013	75.9338	21.4414	54.4923	9326.9		
8/9/2013	79.4824	22.6114	56.8710	9502.3		sampling date
8/10/2013	77.2157	21.5058	55.7098	9642.9		
8/11/2013	71.8872	19.5528	52.3344	9396.6		
8/12/2013	50.0794	13.2626	36.8169	6866.5		
8/13/2013	24.8273	6.3789	18.4484	3579.4		
8/14/2013	57.8662	14.3609	43.5054	8795.5		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
8/15/2013	46.5494	11.0979	35.4516	7481.5		
8/16/2013	31.9582	7.2692	24.6890	5449.1		sampling date
8/17/2013	30.1443	6.0659	24.0785	5129.3		
8/18/2013	49.2005	8.6151	40.5854	8354.8		
8/19/2013	50.6138	7.5457	43.0681	8577.3		
8/20/2013	51.2386	6.3111	44.9275	8665.6		
8/21/2013	51.6525	5.0291	46.6235	8717.9		sampling date
8/22/2013	50.6443	5.8436	44.8007	8660.6		
8/23/2013	48.1613	6.4483	41.7131	8346.3		
8/24/2013	48.0125	7.3409	40.6716	8433.4		
8/25/2013	45.7768	7.8930	37.8838	8151.3		
8/26/2013	47.4838	9.1406	38.3433	8573.2		
8/27/2013	44.6728	9.5216	35.1512	8179.8		
8/28/2013	46.5405	10.9079	35.6326	8644.1		sampling date
8/29/2013	47.5670	9.9597	37.6073	8606.9		
8/30/2013	48.0728	8.9245	39.1483	8479.8		
8/31/2013	48.7330	7.9470	40.7860	8385.5		
9/1/2013	50.4936	7.1489	43.3447	8480.5		
9/2/2013	34.4821	4.1755	30.3065	5655.9		
9/3/2013	54.2970	5.5134	48.7836	8702.7		
9/4/2013	54.4891	4.5151	49.9740	8538.5		sampling date
9/5/2013	54.3474	5.3750	48.9724	8919.4		
9/6/2013	52.9152	6.1664	46.7488	9115.9		
9/7/2013	49.5672	6.7416	42.8256	8985.6		
9/8/2013	48.2150	7.6004	40.6146	9222.7		
9/9/2013	42.8806	7.7951	35.0855	8681.3		
9/10/2013	40.2625	8.4122	31.8503	8656.7		
9/11/2013	38.8859	9.3198	29.5661	8913.5		sampling date
9/12/2013	38.9226	8.4551	30.4674	8418.4		
9/13/2013	45.3219	8.9369	36.3849	9278.7		
9/14/2013	44.4829	7.9704	36.5125	8645.1		
9/15/2013	45.8231	7.4650	38.3581	8475.7		
9/16/2013	50.7838	7.5230	43.2609	8960.7		
9/17/2013	54.9813	7.4041	47.5772	9274.3		
9/18/2013	56.3393	6.8920	49.4473	9102.7		sampling date
9/19/2013	56.5433	7.8216	48.7217	8846.1		
9/20/2013	59.0067	9.0484	49.9583	8947.9		
9/21/2013	61.2096	10.2506	50.9591	9005.3		
9/22/2013	61.0206	11.0307	49.9899	8717.6		
9/23/2013	61.7998	11.9475	49.8523	8580.6		
9/24/2013	64.3865	13.2117	51.1748	8695.2		
9/25/2013	64.0671	13.8660	50.2011	8421.6		sampling date
9/26/2013	52.8604	11.1680	41.6923	7171.9		
9/27/2013	63.8517	13.1392	50.7126	8950.9		
9/28/2013	60.4319	12.0804	48.3516	8762.5		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
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	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
9/29/2013	55.7835	10.8000	44.9834	8376.2		
9/30/2013	54.0922	10.1070	43.9851	8421.9		
10/1/2013	51.8415	9.3093	42.5322	8380.6		
10/2/2013	50.3041	8.6381	41.6660	8456.0		sampling date
10/3/2013	49.0622	8.5225	40.5397	8442.1		
10/4/2013	47.6370	8.3743	39.2627	8395.3		
10/5/2013	47.0713	8.3780	38.6934	8501.4		
10/6/2013	45.6385	8.2280	37.4105	8452.3		
10/7/2013	46.7133	8.5349	38.1784	8877.1		
10/8/2013	45.7897	8.4830	37.3067	8934.8		
10/9/2013	42.8046	8.0452	34.7594	8582.4		sampling date
10/10/2013	41.4228	7.2660	34.1568	8610.6		
10/11/2013	36.3197	5.8806	30.4391	7837.9		
10/12/2013	31.3625	4.6210	26.7415	7036.7		
10/13/2013	29.9832	3.9448	26.0383	7005.2		
10/14/2013	24.2228	2.7719	21.4508	5903.2		
10/15/2013	18.9568	1.8153	17.1415	4827.9		
10/16/2013	18.2628	1.3756	16.8872	4870.5		sampling date
10/17/2013	16.1376	1.2277	14.9099	4133.4		
10/18/2013	16.7311	1.2846	15.4466	4122.3		
10/19/2013	12.5664	0.9729	11.5934	2982.6		
10/20/2013	13.0582	1.0189	12.0393	2989.7		
10/21/2013	12.2756	0.9647	11.3109	2714.5		
10/22/2013	13.7959	1.0914	12.7045	2949.9		
10/23/2013	14.2578	1.1349	13.1228	2951.1		sampling date
10/24/2013	12.9473	1.0199	11.9274	2828.7		
10/25/2013	15.9916	1.2448	14.7468	3699.1		
10/26/2013	16.9437	1.3012	15.6426	4164.1		
10/27/2013	16.0009	1.2098	14.7911	4194.3		
10/28/2013	13.3681	0.9926	12.3755	3754.3		
10/29/2013	6.5283	0.4745	6.0537	1974.3		
10/30/2013	3.7630	0.2667	3.4964	1232.7		sampling date
10/31/2013	6.9408	0.5054	6.4354	2238.5		
11/1/2013	5.5842	0.4171	5.1670	1773.5		
11/2/2013	6.5148	0.4986	6.0162	2037.9		
11/3/2013	6.5937	0.5163	6.0774	2032.0		
11/4/2013	6.6532	0.5325	6.1207	2020.4		
11/5/2013	6.8150	0.5568	6.2582	2039.8		
11/6/2013	6.1634	0.5136	5.6498	1818.6		sampling date
11/7/2013	5.9013	0.5363	5.3651	1850.6		
11/8/2013	6.9419	0.6902	6.2518	2322.9		
11/9/2013	6.5548	0.7158	5.8391	2350.9		
11/10/2013	5.9392	0.7156	5.2236	2295.0		
11/11/2013	5.4380	0.7269	4.7111	2277.6		
11/12/2013	4.6506	0.6942	3.9564	2126.2		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
11/13/2013	4.1844	0.7030	3.4813	2105.9		
11/14/2013	4.1753	0.7973	3.3780	2336.9		
11/15/2013	3.7563	0.8252	2.9310	2367.8		sampling date
11/16/2013	3.8117	0.7453	3.0665	2366.9		
11/17/2013	3.8222	0.6576	3.1646	2338.5		
11/18/2013	3.9210	0.5853	3.3357	2364.2		
11/19/2013	3.8114	0.4846	3.3268	2265.3		
11/20/2013	2.9574	0.3124	2.6450	1733.0		sampling date
11/21/2013	3.6194	0.3791	3.2403	1855.8		
11/22/2013	4.1547	0.4324	3.7223	1893.5		
11/23/2013	4.5637	0.4724	4.0913	1871.9		
11/24/2013	4.9957	0.5149	4.4808	1862.9		
11/25/2013	5.2929	0.5436	4.7493	1809.2		
11/26/2013	5.8382	0.5977	5.2405	1842.1		
11/27/2013	6.7717	0.6915	6.0802	1984.0		sampling date
11/28/2013	7.5230	0.7054	6.8176	2220.9		
11/29/2013	7.5848	0.6469	6.9379	2256.3		
11/30/2013	7.5605	0.5798	6.9807	2266.4		
12/1/2013	7.4625	0.5070	6.9555	2254.5		
12/2/2013	7.3265	0.4328	6.8937	2230.7		
12/3/2013	7.2238	0.3616	6.8622	2216.8		
12/4/2013	7.2519	0.2965	6.9554	2243.2		sampling date
12/5/2013	7.4813	0.3117	7.1696	2269.6		
12/6/2013	7.0556	0.2992	6.7564	2099.9		
12/7/2013	6.0208	0.2597	5.7611	1758.7		
12/8/2013	6.0738	0.2662	5.8076	1741.9		
12/9/2013	6.3593	0.2829	6.0764	1791.1		
12/10/2013	6.3792	0.2879	6.0913	1765.1		
12/11/2013	6.3049	0.2885	6.0164	1714.4		sampling date
12/12/2013	6.7215	0.3011	6.4205	1736.1		
12/13/2013	6.9424	0.3049	6.6375	1707.6		
12/14/2013	7.2742	0.3137	6.9605	1707.7		
12/15/2013	5.8671	0.2488	5.6183	1317.4		
12/16/2013	2.1036	0.0878	2.0158	452.6		
12/17/2013	8.3288	0.3426	7.9862	1720.3		
12/18/2013	8.8029	0.3572	8.4457	1748.1		sampling date
12/19/2013	8.5314	0.3570	8.1744	1787.0		
12/20/2013	7.8502	0.3397	7.5105	1739.5		
12/21/2013	7.3274	0.3288	6.9986	1723.5		
12/22/2013	6.9725	0.3255	6.6470	1747.5		
12/23/2013	6.4111	0.3125	6.0986	1719.4		
12/24/2013	6.2870	0.3214	5.9656	1813.3		
12/25/2013	5.7366	0.3091	5.4275	1789.4		
12/26/2013	5.1615	0.2949	4.8666	1753.0		sampling date
12/27/2013	5.2653	0.2761	4.9892	1701.9		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
12/28/2013	5.6372	0.2716	5.3656	1738.2		
12/29/2013	6.2353	0.2761	5.9592	1838.0		
12/30/2013	7.3131	0.2978	7.0153	2064.7		
12/31/2013	8.8330	0.3307	8.5023	2393.0		
1/1/2014	9.2321	0.3178	8.9143	2403.8		
1/2/2014	8.6786	0.2745	8.4041	2175.1		sampling date
1/3/2014	7.0197	0.2243	6.7954	1882.2		
1/4/2014	7.9563	0.2572	7.6990	2293.4		
1/5/2014	7.3217	0.2399	7.0818	2281.7		
1/6/2014	6.1737	0.2055	5.9682	2093.9		
1/7/2014	5.6571	0.1918	5.4653	2104.5		
1/8/2014	5.2406	0.1816	5.0590	2158.7		sampling date
1/9/2014	6.0735	0.2122	5.8613	2377.4		
1/10/2014	6.2834	0.2212	6.0622	2343.0		
1/11/2014	6.5216	0.2312	6.2904	2321.8		
1/12/2014	6.8907	0.2458	6.6449	2347.1		
1/13/2014	7.1361	0.2560	6.8801	2329.9		
1/14/2014	7.6273	0.2750	7.3523	2391.1		
1/15/2014	8.1201	0.2942	7.8259	2448.0		sampling date
1/16/2014	8.2786	0.2716	8.0070	2326.1		
1/17/2014	8.7412	0.2606	8.4806	2299.6		
1/18/2014	9.4712	0.2574	9.2138	2342.5		
1/19/2014	10.1661	0.2525	9.9135	2372.3		
1/20/2014	10.5458	0.2400	10.3059	2329.3		
1/21/2014	11.3975	0.2380	11.1595	2389.7		
1/22/2014	11.7755	0.2259	11.5496	2349.7		sampling date
1/23/2014	10.9019	0.2303	10.6715	2353.5		
1/24/2014	10.1451	0.2376	9.9076	2385.6		
1/25/2014	9.0956	0.2379	8.8578	2348.3		
1/26/2014	8.0201	0.2365	7.7836	2295.5		
1/27/2014	6.9322	0.2331	6.6991	2225.8		
1/28/2014	5.8033	0.2259	5.5775	2121.9		
1/29/2014	4.9476	0.2272	4.7204	2100.4		sampling date
1/30/2014	6.9125	0.3574	6.5551	2449.0		
1/31/2014	7.1731	0.4006	6.7725	2180.6		
2/1/2014	6.9195	0.4080	6.5116	1842.0		
2/2/2014	7.7888	0.4781	7.3107	1844.1		
2/3/2014	8.9864	0.5690	8.4173	1915.9		
2/4/2014	9.7249	0.6313	9.0936	1885.6		
2/5/2014	10.8473	0.7185	10.1287	1928.6		sampling date
2/6/2014	10.5469	0.6848	9.8621	1881.5		
2/7/2014	11.6938	0.7439	10.9499	2093.2		
2/8/2014	3.8575	0.2403	3.6172	692.8		low to no flow power outage
2/9/2014					Off-Line	low to no flow power outage
2/10/2014	4.7623	0.2839	4.4784	861.2		low to no flow power outage

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
2/11/2014	13.1726	0.7674	12.4052	2390.2		low to no flow power outage
2/12/2014	12.5434	0.7136	11.8298	2283.8		sampling date
2/13/2014	12.1465	0.7046	11.4419	2280.0		
2/14/2014	11.2839	0.6680	10.6159	2185.7		
2/15/2014	9.4855	0.5735	8.9120	1897.9		
2/16/2014	8.8773	0.5487	8.3286	1836.8		
2/17/2014	8.4681	0.5357	7.9324	1814.0		
2/18/2014	8.2342	0.5337	7.7006	1828.5		
2/19/2014	7.9060	0.5256	7.3804	1822.3		sampling date
2/20/2014	7.8697	0.5041	7.3656	1779.4		
2/21/2014	7.8893	0.4869	7.4024	1750.5		
2/22/2014	7.9173	0.4708	7.4465	1724.6		
2/23/2014	7.7789	0.4456	7.3332	1663.9		
2/24/2014	9.2095	0.5083	8.7011	1935.1		
2/25/2014	11.3942	0.6059	10.7883	2352.6		
2/26/2014	11.5496	0.5916	10.9580	2343.9		sampling date
2/27/2014	12.0351	0.6953	11.3399	2563.0		
2/28/2014	10.7571	0.6992	10.0579	2409.8		
3/1/2014	10.4118	0.7603	9.6515	2460.2		
3/2/2014	9.8386	0.8065	9.0321	2459.5		
3/3/2014	9.2204	0.8485	8.3719	2446.7		
3/4/2014	5.9374	0.6139	5.3235	1678.8		
3/5/2014	2.8072	0.3267	2.4805	849.4		sampling date
3/6/2014	8.2288	0.9807	7.2481	2567.2		
3/7/2014	7.9050	0.9657	6.9393	2545.2		
3/8/2014	4.7339	0.5934	4.1404	1574.7		
3/9/2014	4.3324	0.5579	3.7746	1490.5		
3/10/2014	4.9197	0.6514	4.2683	1752.6		
3/11/2014	5.3114	0.7241	4.5873	1961.7		
3/12/2014	5.2175	0.7333	4.4841	2000.6		sampling date
3/13/2014	4.8459	0.6411	4.2048	1895.6		
3/14/2014	4.3039	0.5325	3.7715	1718.2		
3/15/2014	3.9408	0.4523	3.4886	1606.3		
3/16/2014	3.9294	0.4143	3.5151	1635.9		
3/17/2014	3.7860	0.3623	3.4237	1610.8		
3/18/2014	4.5439	0.3886	4.1554	1976.6		
3/19/2014	5.0010	0.3744	4.6266	2225.3		sampling date
3/20/2014	5.6903	0.3734	5.3169	2265.5		
3/21/2014	4.4444	0.2584	4.1861	1600.9		
3/22/2014	4.2968	0.2232	4.0736	1413.1		
3/23/2014	5.1544	0.2410	4.9134	1559.6		
3/24/2014	6.4411	0.2726	6.1685	1804.5		
3/25/2014	7.0139	0.2701	6.7438	1829.5		
3/26/2014	7.1853	0.2529	6.9325	1753.3		sampling date
3/27/2014	6.8393	0.2458	6.5936	1756.4		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
3/28/2014	6.4474	0.2370	6.2104	1747.5		
3/29/2014	6.1807	0.2329	5.9477	1773.4		
3/30/2014	5.6970	0.2206	5.4764	1736.4		
3/31/2014	5.4671	0.2181	5.2490	1777.0		
4/1/2014	5.1599	0.2128	4.9471	1796.4		
4/2/2014	4.7775	0.2044	4.5730	1790.6		sampling date
4/3/2014	4.4556	0.2141	4.2416	1640.5		
4/4/2014	2.2462	0.1193	2.1269	812.6		
4/5/2014					Off-Line	low to no flow power outage
4/6/2014					Off-Line	low to no flow power outage
4/7/2014	2.2981	0.1547	2.1434	790.2		
4/8/2014	3.6397	0.2610	3.3787	1231.1		
4/9/2014	3.5787	0.2720	3.3067	1191.1		sampling date
4/10/2014	3.4353	0.2472	3.1881	1124.7		
4/11/2014	3.4774	0.2366	3.2408	1120.3		
4/12/2014	3.6956	0.2374	3.4582	1171.8		
4/13/2014	3.6126	0.2188	3.3939	1127.7		
4/14/2014	3.1249	0.1781	2.9468	960.5		
4/15/2014	2.7304	0.1462	2.5842	826.6		
4/16/2014	2.6642	0.1337	2.5305	794.6		sampling date
4/17/2014	2.4593	0.1284	2.3309	770.9		
4/18/2014	2.8568	0.1556	2.7012	943.8		
4/19/2014	3.5452	0.2019	3.3433	1238.0		
4/20/2014	3.2801	0.1960	3.0841	1214.6		
4/21/2014	3.0471	0.1917	2.8554	1200.8		
4/22/2014	2.8953	0.1926	2.7027	1219.4		
4/23/2014	2.6371	0.1863	2.4508	1192.5		sampling date
4/24/2014	2.4774	0.1746	2.3028	1142.5		
4/25/2014	2.3902	0.1680	2.2222	1124.5		
4/26/2014	2.3741	0.1664	2.2077	1140.0		
4/27/2014	2.2457	0.1569	2.0888	1101.0		
4/28/2014	2.0741	0.1445	1.9297	1038.8		
4/29/2014	2.0550	0.1427	1.9123	1051.8		
4/30/2014	2.1986	0.1521	2.0465	1150.6		sampling date
5/1/2014	2.0314	0.1414	1.8900	1004.4		
5/2/2014	1.7920	0.1254	1.6666	839.7		
5/3/2014	1.9919	0.1401	1.8518	887.0		
5/4/2014	1.9003	0.1343	1.7661	806.2		
5/5/2014	2.6820	0.1902	2.4917	1086.3		
5/6/2014	3.5564	0.2532	3.3032	1378.2		
5/7/2014	4.7680	0.3406	4.4275	1771.2		sampling date
5/8/2014	5.3259	0.3811	4.9448	1877.8		
5/9/2014	5.5248	0.3960	5.1287	1853.7		
5/10/2014	5.7379	0.4120	5.3260	1836.3		
5/11/2014	5.9404	0.4271	5.5133	1817.2		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
5/12/2014	5.6921	0.4098	5.2824	1667.7		
5/13/2014	4.8464	0.3493	4.4971	1362.4		
5/14/2014	4.9670	0.3584	4.6086	1341.9		
5/15/2014	5.0655	0.3658	4.6997	1317.2		
5/16/2014	5.1436	0.3718	4.7717	1289.1		sampling date
5/17/2014	4.7859	0.3669	4.4189	1293.8		
5/18/2014	4.3988	0.3598	4.0390	1290.6		
5/19/2014	3.7159	0.3266	3.3893	1191.9		
5/20/2014	3.6705	0.3496	3.3209	1298.5		
5/21/2014	2.7772	0.2896	2.4877	1095.2		sampling date
5/22/2014	1.3168	0.1409	1.1759	547.0		
5/23/2014	2.8373	0.3122	2.5251	1245.4		
5/24/2014	2.8513	0.3234	2.5279	1326.5		
5/25/2014	2.7888	0.3270	2.4618	1380.1		
5/26/2014	2.3802	0.2894	2.0907	1258.0		
5/27/2014	2.0128	0.2548	1.7580	1141.5		
5/28/2014	1.6471	0.2180	1.4291	1007.7		sampling date
5/29/2014	1.5241	0.2090	1.3151	977.7		
5/30/2014	1.6607	0.2364	1.4243	1119.6		
5/31/2014	1.6938	0.2510	1.4428	1203.1		
6/1/2014	1.5732	0.2433	1.3299	1180.8		
6/2/2014	1.5764	0.2552	1.3212	1254.4		
6/3/2014	2.3611	0.4015	1.9595	1998.9		
6/4/2014	1.5310	0.2746	1.2564	1384.7		sampling date
6/5/2014	0.8097	0.1163	0.6935	594.0		
6/6/2014	0.6574	0.0783	0.5790	405.6		
6/7/2014	2.1649	0.2197	1.9452	1152.6		
6/8/2014	2.3929	0.2106	2.1823	1120.4		
6/9/2014	2.3760	0.1841	2.1919	992.8		
6/10/2014	2.9561	0.2039	2.7522	1115.2		
6/11/2014	4.0471	0.2509	3.7962	1391.5		sampling date
6/12/2014	5.8375	0.8591	4.9784	1489.3		
6/13/2014	11.9541	2.3600	9.5940	2424.3		
6/14/2014	8.3370	1.9223	6.4147	1403.0		
6/15/2014	27.9544	7.1025	20.8519	4020.3		
6/16/2014	34.5323	9.3793	25.1530	4335.8		
6/17/2014	47.3205	13.4956	33.8249	5272.0		
6/18/2014	57.8764	17.1331	40.7433	5795.2		sampling date
6/19/2014	54.6024	16.4604	38.1420	5378.2		
6/20/2014	58.6070	17.9758	40.6313	5680.0		
6/21/2014	53.6690	16.7344	36.9346	5119.2		
6/22/2014	37.8836	11.9992	25.8843	3557.4		
6/23/2014	28.6809	9.2215	19.4594	2652.0		
6/24/2014	25.2782	8.2447	17.0335	2302.1		
6/25/2014	24.9387	8.2462	16.6925	2237.4		

WATERSHED TECHNOLOGIES						
Grassy Island TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	362	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	8233.3782	1563.4602	6669.9181	gpm On-Line Flow > 0	Operational/	
PER DAY	22.7441	4.3190	18.4252	3861.3	Flow Status	Comments
6/26/2014	38.9021	13.0332	25.8689	3439.1		
6/27/2014	25.5872	8.6809	16.9063	2229.4		sampling date
6/28/2014	25.1313	8.5262	16.6051	2189.7		
6/29/2014	25.7772	8.7453	17.0318	2245.9		
6/30/2014	25.1107	8.5192	16.5915	2187.9		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line	**362**	**# Days On-Line Flow > 0.0000**	**362**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **99%**
	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**193.5049**	**10.7444**	**182.7606**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.5345**	**0.0297**	**0.5049**	**51.56**	**Flow Status**	**Comments**
7/1/2013	0.5847	0.0083	0.5765	49.3		
7/2/2013	0.5662	0.0080	0.5581	47.7		
7/3/2013	0.6104	0.0087	0.6018	51.5		sampling date
7/4/2013	0.5725	0.0096	0.5630	51.5		
7/5/2013	0.5075	0.0099	0.4976	49.0		
7/6/2013	0.4647	0.0106	0.4541	48.3		
7/7/2013	0.4296	0.0115	0.4181	48.4		
7/8/2013	0.4141	0.0129	0.4012	50.9		
7/9/2013	0.6525	0.0240	0.6285	88.4		
7/10/2013	0.5829	0.0253	0.5576	87.9		sampling date
7/11/2013	0.5829	0.0337	0.5493	87.2		
7/12/2013	0.6638	0.0477	0.6162	98.4		
7/13/2013	0.6862	0.0587	0.6275	100.9		
7/14/2013	0.6889	0.0683	0.6206	100.5		
7/15/2013	0.6783	0.0764	0.6020	98.2		
7/16/2013	0.6650	0.0836	0.5814	95.5		
7/17/2013	0.6551	0.0909	0.5642	93.3		sampling date
7/18/2013	0.7193	0.0973	0.6220	90.8		
7/19/2013	0.7815	0.1035	0.6779	88.6		
7/20/2013	0.8277	0.1078	0.7199	85.1		
7/21/2013	0.8857	0.1137	0.7720	83.3		
7/22/2013	0.9580	0.1215	0.8365	83.1		
7/23/2013	1.0011	0.1256	0.8755	80.5		
7/24/2013	1.0515	0.1307	0.9208	78.8		sampling date
7/25/2013	0.9980	0.1251	0.8729	79.5		
7/26/2013	0.9450	0.1196	0.8254	80.3		
7/27/2013	0.8665	0.1109	0.7557	78.8		
7/28/2013	0.7834	0.1014	0.6819	76.7		
7/29/2013	0.7402	0.0972	0.6430	78.5		
7/30/2013	0.6947	0.0927	0.6020	80.4		
7/31/2013	0.6288	0.0856	0.5432	80.0		sampling date
8/1/2013	0.7311	0.0901	0.6410	82.1		
8/2/2013	0.8276	0.0936	0.7339	83.2		
8/3/2013	0.9148	0.0960	0.8188	83.3		
8/4/2013	1.0177	0.0998	0.9178	84.7		
8/5/2013	0.7265	0.0671	0.6594	55.6		
8/6/2013					Off-Line	Power failure
8/7/2013	1.0192	0.0849	0.9343	67.3		sampling date
8/8/2013	1.3104	0.1204	1.1899	90.1		
8/9/2013	1.2156	0.1231	1.0925	87.1		
8/10/2013	1.1650	0.1297	1.0353	87.2		
8/11/2013	1.0572	0.1294	0.9277	82.8		
8/12/2013	0.6868	0.0924	0.5943	56.4		
8/13/2013	0.5132	0.0760	0.4373	44.3		
8/14/2013	1.3028	0.2121	1.0906	118.5		sampling date
8/15/2013	1.5547	0.2358	1.3190	148.9		
8/16/2013	1.4542	0.2024	1.2518	147.2		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line	**362**	**# Days On-Line Flow > 0.0000**	**362**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **99%**
	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**193.5049**	**10.7444**	**182.7606**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.5345**	**0.0297**	**0.5049**	**51.56**	**Flow Status**	**Comments**
8/17/2013	1.3317	0.1668	1.1649	142.8		
8/18/2013	1.2275	0.1344	1.0931	140.0		
8/19/2013	1.1206	0.1027	1.0179	136.5		
8/20/2013	1.0036	0.0714	0.9322	131.2		
8/21/2013	0.5563	0.0264	0.5299	78.5		sampling date
8/22/2013	0.3661	0.0178	0.3483	54.5		
8/23/2013	0.3230	0.0161	0.3069	50.8		
8/24/2013	0.2831	0.0145	0.2687	47.3		
8/25/2013	0.2522	0.0133	0.2389	44.9		
8/26/2013	0.2656	0.0144	0.2512	50.6		
8/27/2013	0.2562	0.0144	0.2418	52.6		
8/28/2013	0.2298	0.0135	0.2164	51.0		sampling date
8/29/2013	0.4246	0.0131	0.4114	51.3		
8/30/2013	0.6089	0.0125	0.5964	50.6		
8/31/2013	0.7467	0.0113	0.7354	47.2		
9/1/2013	0.9392	0.0110	0.9282	48.0		
9/2/2013	1.1768	0.0112	1.1656	50.4		
9/3/2013	1.3697	0.0108	1.3589	50.5		
9/4/2013	1.4940	0.0099	1.4841	48.4		sampling date
9/5/2013	1.4481	0.0154	1.4327	48.3		
9/6/2013	1.4373	0.0215	1.4159	49.4		
9/7/2013	1.3734	0.0267	1.3467	48.7		
9/8/2013	1.3285	0.0323	1.2961	48.6		
9/9/2013	2.5410	0.0750	2.4660	96.2		
9/10/2013	2.8349	0.0993	2.7356	111.0		
9/11/2013	2.7326	0.1120	2.6207	110.9		sampling date
9/12/2013	2.7031	0.1376	2.5656	113.5		
9/13/2013	2.5695	0.1581	2.4114	111.8		
9/14/2013	2.4647	0.1798	2.2849	111.2		
9/15/2013	2.3928	0.2040	2.1887	112.1		
9/16/2013	2.2342	0.2202	2.0140	108.9		
9/17/2013	2.1182	0.2393	1.8788	107.6		
9/18/2013	2.0163	0.2594	1.7569	106.9		sampling date
9/19/2013	2.0008	0.2302	1.7705	102.7		
9/20/2013	2.0064	0.2053	1.8011	99.8		
9/21/2013	1.9947	0.1801	1.8145	96.3		
9/22/2013	1.5477	0.1223	1.4254	72.5		
9/23/2013	1.8166	0.1241	1.6925	82.7		
9/24/2013	2.0073	0.1169	1.8904	88.9		
9/25/2013	2.1545	0.1049	2.0496	92.9		sampling date
9/26/2013	2.3409	0.1017	2.2391	97.5		
9/27/2013	2.2932	0.0884	2.2048	92.3		
9/28/2013	2.3074	0.0784	2.2290	89.9		
9/29/2013	2.4440	0.0725	2.3715	92.3		
9/30/2013	2.5169	0.0645	2.4524	92.1		
10/1/2013	2.6829	0.0586	2.6243	95.3		
10/2/2013	2.0976	0.0383	2.0593	72.4		sampling date

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 99%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	193.5049	10.7444	182.7606	gpm On-Line Flow > 0	Operational/	
PER DAY	0.5345	0.0297	0.5049	51.56	Flow Status	Comments
10/3/2013	2.6070	0.0492	2.5578	98.5		
10/4/2013	2.2499	0.0442	2.2057	93.9		
10/5/2013	1.8792	0.0386	1.8405	87.5		
10/6/2013	1.6687	0.0362	1.6325	87.9		
10/7/2013	1.0957	0.0255	1.0702	66.5		
10/8/2013	0.7173	0.0181	0.6992	51.3		
10/9/2013	0.5305	0.0150	0.5155	46.2		sampling date
10/10/2013	0.4657	0.0139	0.4518	43.0		
10/11/2013	0.4634	0.0148	0.4486	45.5		
10/12/2013	0.4497	0.0153	0.4344	47.2		
10/13/2013	0.4247	0.0155	0.4091	47.8		
10/14/2013	0.3862	0.0152	0.3710	46.9		
10/15/2013	0.3527	0.0151	0.3376	46.6		
10/16/2013	0.3333	0.0156	0.3177	48.1		sampling date
10/17/2013	0.3255	0.0158	0.3097	48.0		
10/18/2013	0.3044	0.0153	0.2891	45.8		
10/19/2013	0.2978	0.0155	0.2823	45.7		
10/20/2013	0.2889	0.0156	0.2733	45.3		
10/21/2013	0.2992	0.0168	0.2824	47.9		
10/22/2013	0.2805	0.0163	0.2642	45.9		
10/23/2013	0.2813	0.0170	0.2643	47.1		sampling date
10/24/2013	0.2495	0.0152	0.2343	44.1		
10/25/2013	0.2237	0.0138	0.2099	41.9		
10/26/2013	0.2097	0.0131	0.1966	41.8		
10/27/2013	0.1921	0.0122	0.1799	40.9		
10/28/2013	0.1761	0.0114	0.1647	40.2		
10/29/2013	0.1543	0.0102	0.1441	37.9		
10/30/2013	0.1545	0.0104	0.1441	41.2		sampling date
10/31/2013	0.1517	0.0101	0.1416	41.3		
11/1/2013	0.1390	0.0091	0.1299	38.6		
11/2/2013	0.1389	0.0089	0.1300	39.4		
11/3/2013	0.1314	0.0083	0.1231	38.0		
11/4/2013	0.1249	0.0077	0.1172	37.0		
11/5/2013	0.1203	0.0073	0.1129	36.4		
11/6/2013	0.1342	0.0080	0.1262	41.5		sampling date
11/7/2013	0.1338	0.0086	0.1252	43.4		
11/8/2013	0.1271	0.0089	0.1182	43.2		
11/9/2013	0.1127	0.0086	0.1041	40.3		
11/10/2013	0.1063	0.0088	0.0975	40.1		
11/11/2013	0.0982	0.0089	0.0893	39.2		
11/12/2013	0.0879	0.0087	0.0792	37.3		
11/13/2013	0.0799	0.0087	0.0712	36.1		sampling date
11/14/2013	0.0836	0.0087	0.0749	36.1		
11/15/2013	0.0953	0.0096	0.0857	39.3		
11/16/2013	0.1060	0.0103	0.0957	42.0		
11/17/2013	0.0974	0.0092	0.0882	37.0		
11/18/2013	0.0951	0.0087	0.0864	34.8		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line	**362**	**# Days On-Line Flow > 0.0000**	**362**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **99%**
	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**193.5049**	**10.7444**	**182.7606**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.5345**	**0.0297**	**0.5049**	**51.56**	**Flow Status**	**Comments**
11/19/2013	0.0968	0.0085	0.0883	34.1		
11/20/2013	0.0957	0.0082	0.0875	32.5		sampling date
11/21/2013	0.1265	0.0075	0.1190	31.3		
11/22/2013	0.2397	0.0105	0.2292	46.7		
11/23/2013	0.3253	0.0110	0.3142	52.2		
11/24/2013	0.3760	0.0101	0.3659	51.4		
11/25/2013	0.4275	0.0093	0.4182	50.8		
11/26/2013	0.4740	0.0085	0.4655	49.9		
11/27/2013	0.5335	0.0079	0.5256	50.3		sampling date
11/28/2013	0.4644	0.0076	0.4568	46.4		
11/29/2013	0.4407	0.0080	0.4328	46.8		
11/30/2013	0.3924	0.0079	0.3845	44.5		
12/1/2013	0.3656	0.0082	0.3575	44.5		
12/2/2013	0.3302	0.0083	0.3219	43.3		
12/3/2013	0.2883	0.0081	0.2802	41.0		
12/4/2013	0.2577	0.0082	0.2495	40.1		sampling date
12/5/2013	0.2611	0.0078	0.2533	37.9		
12/6/2013	0.3020	0.0085	0.2935	41.0		
12/7/2013	0.3389	0.0091	0.3298	43.3		
12/8/2013	0.3664	0.0093	0.3570	44.2		
12/9/2013	0.3899	0.0095	0.3804	44.5		
12/10/2013	0.4776	0.0111	0.4665	51.8		
12/11/2013	0.4906	0.0110	0.4797	50.7		sampling date
12/12/2013	0.4420	0.0109	0.4312	49.8		
12/13/2013	0.3843	0.0105	0.3738	47.6		
12/14/2013	0.3282	0.0100	0.3182	45.2		
12/15/2013	0.2980	0.0103	0.2877	46.2		
12/16/2013	0.2581	0.0103	0.2478	45.8		
12/17/2013	0.2041	0.0096	0.1945	42.3		
12/18/2013	0.1538	0.0088	0.1451	38.3		sampling date
12/19/2013	0.1464	0.0081	0.1383	35.6		
12/20/2013	0.1622	0.0088	0.1534	38.6		
12/21/2013	0.1909	0.0101	0.1807	44.4		
12/22/2013	0.1957	0.0102	0.1855	44.5		
12/23/2013	0.1997	0.0101	0.1896	44.4		
12/24/2013	0.1997	0.0099	0.1898	43.5		
12/25/2013	0.2042	0.0099	0.1942	43.6		
12/26/2013	0.2086	0.0100	0.1987	43.6		sampling date
12/27/2013	0.2090	0.0092	0.1998	40.9		
12/28/2013	0.2182	0.0089	0.2093	40.2		
12/29/2013	0.2255	0.0085	0.2170	39.2		
12/30/2013	0.1962	0.0069	0.1893	32.3		
12/31/2013	0.2768	0.0091	0.2677	43.2		
1/1/2014	0.2921	0.0090	0.2831	43.4		
1/2/2014	0.3070	0.0089	0.2981	43.5		sampling date
1/3/2014	0.2631	0.0081	0.2551	41.0		
1/4/2014	0.2218	0.0072	0.2146	38.4		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line	**362**	**# Days On-Line Flow > 0.0000**	**362**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **99%**

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	**193.5049**	**10.7444**	**182.7606**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.5345**	**0.0297**	**0.5049**	**51.56**	**Flow Status**	**Comments**
1/5/2014	0.1863	0.0065	0.1798	36.3		
1/6/2014	0.1694	0.0065	0.1629	37.7		
1/7/2014	0.1375	0.0059	0.1316	35.6		
1/8/2014	0.1002	0.0049	0.0953	31.1		sampling date
1/9/2014	0.1468	0.0054	0.1415	34.3		
1/10/2014	0.2125	0.0062	0.2063	39.8		
1/11/2014	0.2341	0.0057	0.2284	36.5		
1/12/2014	0.2474	0.0052	0.2423	33.1		
1/13/2014	0.3630	0.0066	0.3564	42.5		
1/14/2014	0.4395	0.0072	0.4324	45.8		
1/15/2014	0.4963	0.0073	0.4890	46.6		sampling date
1/16/2014	0.3826	0.0062	0.3764	39.5		
1/17/2014	0.3125	0.0057	0.3068	35.8		
1/18/2014	0.2553	0.0053	0.2500	32.9		
1/19/2014	0.1886	0.0045	0.1841	27.8		
1/20/2014	0.0616	0.0017	0.0599	10.6		
1/21/2014					Off-Line	floc removal
1/22/2014					Off-Line	floc removal, sampling date
1/23/2014	0.0342	0.0012	0.0330	40.3		
1/24/2014	0.0798	0.0027	0.0770	47.0		
1/25/2014	0.1012	0.0035	0.0977	39.8		
1/26/2014	0.1272	0.0044	0.1228	37.5		
1/27/2014	0.1664	0.0057	0.1607	39.2		
1/28/2014	0.2049	0.0070	0.1978	40.3		
1/29/2014	0.2377	0.0082	0.2295	40.0		sampling date
1/30/2014	0.2495	0.0080	0.2415	38.1		
1/31/2014	0.2484	0.0074	0.2410	34.7		
2/1/2014	0.2515	0.0071	0.2444	32.4		
2/2/2014	0.2820	0.0076	0.2744	33.7		
2/3/2014	0.3085	0.0079	0.3006	34.3		
2/4/2014	0.3593	0.0088	0.3505	37.5		
2/5/2014	0.3953	0.0093	0.3860	38.7		sampling date
2/6/2014	0.3769	0.0093	0.3676	38.6		
2/7/2014	0.3429	0.0090	0.3340	36.8		
2/8/2014	0.3147	0.0087	0.3060	35.4		
2/9/2014	0.2915	0.0085	0.2830	34.5		
2/10/2014	0.2530	0.0079	0.2451	31.6		
2/11/2014	0.2346	0.0078	0.2269	31.0		
2/12/2014	0.3036	0.0107	0.2929	42.5		sampling date
2/13/2014	0.3555	0.0121	0.3434	50.2		
2/14/2014	0.3156	0.0103	0.3054	44.9		
2/15/2014	0.2891	0.0090	0.2802	41.5		
2/16/2014	0.2621	0.0077	0.2544	37.9		
2/17/2014	0.2621	0.0073	0.2548	38.2		
2/18/2014	0.2476	0.0066	0.2410	36.4		
2/19/2014	0.2425	0.0060	0.2365	35.9		sampling date
2/20/2014	0.3145	0.0064	0.3081	35.8		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line	**362**	**# Days On-Line Flow > 0.0000**	**362**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **99%**
	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**193.5049**	**10.7444**	**182.7606**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.5345**	**0.0297**	**0.5049**	**51.56**	**Flow Status**	**Comments**
2/21/2014	0.4390	0.0077	0.4313	40.7		
2/22/2014	0.5163	0.0080	0.5083	40.3		
2/23/2014	0.5564	0.0079	0.5486	37.5		
2/24/2014	0.6219	0.0081	0.6138	36.9		
2/25/2014	0.7194	0.0088	0.7107	38.1		
2/26/2014	0.7821	0.0090	0.7731	37.4		sampling date
2/27/2014	0.7142	0.0089	0.7053	36.4		
2/28/2014	0.6632	0.0090	0.6543	36.2		
3/1/2014	0.5690	0.0084	0.5606	33.4		
3/2/2014	0.5725	0.0093	0.5633	36.4		
3/3/2014	0.5404	0.0096	0.5307	37.5		
3/4/2014	0.5544	0.0110	0.5433	42.2		
3/5/2014	0.4783	0.0107	0.4676	40.4		sampling date
3/6/2014	0.4486	0.0103	0.4383	39.4		
3/7/2014	0.4096	0.0097	0.4000	37.5		
3/8/2014	0.3532	0.0086	0.3447	33.8		
3/9/2014	0.3188	0.0080	0.3108	31.8		
3/10/2014	0.3064	0.0079	0.2985	32.1		
3/11/2014	0.2900	0.0078	0.2822	31.8		
3/12/2014	0.2936	0.0082	0.2855	33.9		sampling date
3/13/2014	0.2678	0.0073	0.2605	31.3		
3/14/2014	0.3236	0.0085	0.3150	38.2		
3/15/2014	0.3376	0.0087	0.3290	40.3		
3/16/2014	0.2944	0.0073	0.2871	35.6		
3/17/2014	0.2921	0.0070	0.2850	35.7		
3/18/2014	0.2703	0.0063	0.2640	33.4		
3/19/2014	0.2653	0.0060	0.2593	33.2		sampling date
3/20/2014	0.2335	0.0059	0.2277	32.0		
3/21/2014	0.3904	0.0110	0.3793	58.9		
3/22/2014	0.4336	0.0139	0.4197	73.0		
3/23/2014	0.3803	0.0140	0.3663	72.4		
3/24/2014	0.2546	0.0110	0.2436	55.7		
3/25/2014	0.1839	0.0095	0.1744	47.4		
3/26/2014	0.1464	0.0094	0.1370	45.8		sampling date
3/27/2014	0.1614	0.0089	0.1525	44.9		
3/28/2014	0.1811	0.0086	0.1725	45.3		
3/29/2014	0.1990	0.0083	0.1907	45.3		
3/30/2014	0.2139	0.0079	0.2060	44.6		
3/31/2014	0.2291	0.0075	0.2216	44.1		
4/1/2014	0.2425	0.0071	0.2354	43.3		
4/2/2014	0.2550	0.0066	0.2484	42.5		sampling date
4/3/2014	0.2318	0.0067	0.2251	42.2		
4/4/2014	0.2085	0.0068	0.2017	41.8		
4/5/2014	0.1834	0.0068	0.1766	40.9		
4/6/2014	0.1595	0.0068	0.1527	40.1		
4/7/2014	0.1377	0.0069	0.1308	39.6		
4/8/2014	0.1192	0.0071	0.1121	40.2		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 99%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	193.5049	10.7444	182.7606	gpm On-Line Flow > 0	Operational/	
PER DAY	0.5345	0.0297	0.5049	51.56	Flow Status	Comments
4/9/2014	0.0976	0.0071	0.0905	39.6		sampling date
4/10/2014	0.0990	0.0074	0.0916	39.5		
4/11/2014	0.0994	0.0076	0.0918	38.9		
4/12/2014	0.1006	0.0078	0.0928	38.7		
4/13/2014	0.0992	0.0078	0.0914	37.6		
4/14/2014	0.0990	0.0079	0.0911	36.9		
4/15/2014	0.0989	0.0080	0.0908	36.2		
4/16/2014	0.1006	0.0083	0.0923	36.2		sampling date
4/17/2014	0.1433	0.0078	0.1354	35.1		
4/18/2014	0.1845	0.0075	0.1770	34.2		
4/19/2014	0.2232	0.0071	0.2161	33.3		
4/20/2014	0.2500	0.0065	0.2435	31.2		
4/21/2014	0.3204	0.0070	0.3134	34.4		
4/22/2014	0.4140	0.0077	0.4063	39.0		
4/23/2014	0.4153	0.0067	0.4086	34.8		sampling date
4/24/2014	0.4895	0.0092	0.4803	44.2		
4/25/2014	0.4447	0.0098	0.4349	43.4		
4/26/2014	0.3849	0.0100	0.3749	40.9		
4/27/2014	0.3509	0.0107	0.3403	40.9		
4/28/2014	0.3046	0.0109	0.2936	39.3		
4/29/2014	0.2542	0.0109	0.2433	36.8		
4/30/2014	0.2212	0.0114	0.2098	36.4		sampling date
5/1/2014	0.2602	0.0112	0.2490	37.2		
5/2/2014	0.2799	0.0103	0.2696	35.4		
5/3/2014	0.2888	0.0092	0.2796	32.7		
5/4/2014	0.3065	0.0085	0.2980	31.4		
5/5/2014	0.4458	0.0109	0.4349	41.8		
5/6/2014	0.5088	0.0110	0.4978	43.9		
5/7/2014	0.5749	0.0111	0.5639	46.0		sampling date
5/8/2014	0.5347	0.0114	0.5233	46.0		
5/9/2014	0.4729	0.0112	0.4617	44.0		
5/10/2014	0.4344	0.0115	0.4229	44.0		
5/11/2014	0.3958	0.0118	0.3841	44.0		
5/12/2014	0.3573	0.0121	0.3452	44.0		
5/13/2014	0.3139	0.0122	0.3017	43.3		
5/14/2014	0.2624	0.0119	0.2505	41.2		sampling date
5/15/2014	0.2688	0.0123	0.2565	44.0		
5/16/2014	0.2559	0.0118	0.2440	43.7		
5/17/2014	0.2316	0.0109	0.2208	41.3		
5/18/2014	0.2102	0.0100	0.2002	39.3		
5/19/2014	0.2167	0.0104	0.2063	42.5		
5/20/2014	0.2122	0.0104	0.2018	43.8		
5/21/2014	0.1979	0.0098	0.1881	43.1		sampling date
5/22/2014	0.1844	0.0100	0.1745	42.7		
5/23/2014	0.1704	0.0101	0.1603	42.1		
5/24/2014	0.1586	0.0102	0.1483	42.0		
5/25/2014	0.1449	0.0103	0.1346	41.4		

WATERSHED TECHNOLOGIES						
Ideal Grove TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	362	# Days On-Line Flow > 0.0000	362	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 99%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	193.5049	10.7444	182.7606	gpm On-Line Flow > 0	Operational/	
PER DAY	0.5345	0.0297	0.5049	51.56	Flow Status	Comments
5/26/2014	0.1309	0.0103	0.1206	40.6		
5/27/2014	0.1174	0.0103	0.1071	39.8		
5/28/2014	0.1064	0.0105	0.0959	39.7		sampling date
5/29/2014	0.1156	0.0104	0.1053	39.5		
5/30/2014	0.1213	0.0100	0.1113	38.2		
5/31/2014	0.1247	0.0094	0.1152	36.4		
6/1/2014	0.1305	0.0091	0.1213	35.5		
6/2/2014	0.1622	0.0106	0.1516	41.3		
6/3/2014	0.1769	0.0108	0.1661	42.4		
6/4/2014	0.1875	0.0107	0.1768	42.4		sampling date
6/5/2014	0.1844	0.0107	0.1736	41.7		
6/6/2014	0.1824	0.0109	0.1716	41.3		
6/7/2014	0.1793	0.0109	0.1684	40.7		
6/8/2014	0.1758	0.0109	0.1649	39.9		
6/9/2014	0.1786	0.0113	0.1673	40.6		
6/10/2014	0.1781	0.0115	0.1666	40.6		
6/11/2014	0.1753	0.0115	0.1638	40.0		sampling date
6/12/2014	0.1884	0.0111	0.1774	39.3		
6/13/2014	0.1873	0.0099	0.1774	35.9		
6/14/2014	0.1913	0.0091	0.1822	34.0		
6/15/2014	0.1999	0.0086	0.1913	33.1		
6/16/2014	0.2580	0.0102	0.2478	40.0		
6/17/2014	0.2787	0.0100	0.2686	40.6		
6/18/2014	0.2802	0.0092	0.2710	38.5		sampling date
6/19/2014	0.2648	0.0097	0.2551	35.3		
6/20/2014	0.2588	0.0103	0.2485	33.4		
6/21/2014	0.2289	0.0099	0.2191	28.7		
6/22/2014	0.1926	0.0089	0.1837	23.5		
6/23/2014	0.1484	0.0073	0.1412	17.6		
6/24/2014	0.1141	0.0059	0.1082	13.2		
6/25/2014	0.3412	0.0185	0.3228	38.4		sampling date
6/26/2014	0.4269	0.0231	0.4038	48.1		
6/27/2014	0.4242	0.0230	0.4012	47.8		
6/28/2014	0.4151	0.0225	0.3926	46.7		
6/29/2014	0.4124	0.0223	0.3901	46.4		
6/30/2014	0.4174	0.0226	0.3948	47.0		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
7/1/2013	1.3448	0.2490	1.0958	828.9		
7/2/2013	1.3281	0.2459	1.0822	818.6		
7/3/2013	1.3240	0.2452	1.0788	816.1		sampling date
7/4/2013	1.0749	0.2085	0.8664	723.0		
7/5/2013	1.0298	0.2107	0.8191	762.2		
7/6/2013	0.9255	0.2013	0.7242	761.4		
7/7/2013	0.8160	0.1907	0.6253	755.6		
7/8/2013	0.7066	0.1799	0.5268	748.3		
7/9/2013	0.6295	0.1777	0.4517	778.4		
7/10/2013	0.5141	0.1653	0.3489	764.0		sampling date
7/11/2013	0.5662	0.1715	0.3947	734.5		
7/12/2013	0.7162	0.2066	0.5095	824.4		
7/13/2013	0.8224	0.2279	0.5945	850.8		
7/14/2013	0.8183	0.2191	0.5992	768.7		
7/15/2013	0.9143	0.2377	0.6766	786.7		
7/16/2013	1.0054	0.2548	0.7506	797.8		
7/17/2013	1.0996	0.2725	0.8272	809.7		sampling date
7/18/2013	1.1326	0.2795	0.8531	847.9		
7/19/2013	1.1338	0.2786	0.8552	863.3		
7/20/2013	1.1075	0.2710	0.8366	857.8		
7/21/2013	1.0614	0.2585	0.8029	836.6		
7/22/2013	1.0404	0.2522	0.7882	834.7		
7/23/2013	1.0214	0.2464	0.7750	834.4		
7/24/2013	1.0016	0.2404	0.7612	833.4		sampling date
7/25/2013	1.2050	0.2621	0.9429	807.7		
7/26/2013	1.5554	0.3147	1.2407	872.8		
7/27/2013	1.7820	0.3410	1.4410	859.9		
7/28/2013	2.0209	0.3701	1.6508	855.4		
7/29/2013	2.2941	0.4054	1.8887	864.8		
7/30/2013	2.5774	0.4421	2.1353	875.9		
7/31/2013	2.8212	0.4719	2.3492	872.7		sampling date
8/1/2013	2.6321	0.4515	2.1806	862.3		
8/2/2013	2.4913	0.4393	2.0520	867.4		
8/3/2013	2.3267	0.4229	1.9038	864.3		
8/4/2013	2.1679	0.4075	1.7604	863.1		
8/5/2013	1.9985	0.3900	1.6085	857.2		
8/6/2013	1.7987	0.3661	1.4326	836.1		
8/7/2013	1.6591	0.3541	1.3050	841.7		sampling date
8/8/2013	1.6070	0.3563	1.2507	854.0		
8/9/2013	1.5307	0.3534	1.1774	854.0		
8/10/2013	1.4752	0.3554	1.1198	866.2		
8/11/2013	1.3926	0.3511	1.0415	862.9		
8/12/2013	1.3105	0.3468	0.9637	859.6		
8/13/2013	1.2492	0.3481	0.9010	870.3		
8/14/2013	1.1532	0.3398	0.8134	856.7		sampling date
8/15/2013	1.1423	0.3220	0.8202	841.1		
8/16/2013	1.1162	0.3007	0.8155	814.7		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
8/17/2013	1.1992	0.3084	0.8908	867.7		
8/18/2013	1.2338	0.3024	0.9314	885.0		
8/19/2013	1.0237	0.2387	0.7849	728.0		
8/20/2013	1.0381	0.2300	0.8081	732.0		
8/21/2013	1.0083	0.2118	0.7964	705.0		sampling date
8/22/2013	1.2215	0.2631	0.9584	794.1		
8/23/2013	1.1904	0.2619	0.9285	723.0		
8/24/2013	1.1037	0.2473	0.8564	629.0		
8/25/2013	1.1680	0.2659	0.9021	627.0		
8/26/2013	1.5610	0.3603	1.2007	792.0		
8/27/2013	1.7080	0.3991	1.3089	821.5		
8/28/2013	1.8614	0.4398	1.4216	851.0		sampling date
8/29/2013	1.7776	0.4262	1.3514	847.3		
8/30/2013	1.7157	0.4179	1.2978	854.1		
8/31/2013	1.5917	0.3944	1.1973	829.2		
9/1/2013	1.4221	0.3589	1.0632	777.0		
9/2/2013	1.1281	0.2904	0.8377	648.0		
9/3/2013	1.1908	0.3132	0.8776	721.0		
9/4/2013	0.8905	0.2398	0.6508	570.0		sampling date
9/5/2013	1.0604	0.2857	0.7747	676.5		
9/6/2013	1.2314	0.3320	0.8993	783.0		
9/7/2013	1.3317	0.3594	0.9723	844.0		
9/8/2013	1.3098	0.3537	0.9561	827.5		
9/9/2013	1.3044	0.3525	0.9518	821.3		
9/10/2013	1.2141	0.3284	0.8857	762.0		
9/11/2013	1.2839	0.3475	0.9364	803.3		sampling date
9/12/2013	1.3325	0.3559	0.9766	791.1		
9/13/2013	1.2524	0.3304	0.9220	707.5		
9/14/2013	1.2045	0.3142	0.8903	649.0		
9/15/2013	1.4156	0.3655	1.0501	729.0		
9/16/2013	1.6403	0.4195	1.2209	809.0		
9/17/2013	1.6357	0.4146	1.2212	774.0		
9/18/2013	1.7133	0.4307	1.2826	779.0		sampling date
9/19/2013	1.8358	0.4521	1.3836	836.0		
9/20/2013	1.8934	0.4567	1.4367	863.6		
9/21/2013	1.6760	0.3957	1.2803	765.6		
9/22/2013	1.4209	0.3282	1.0927	650.1		
9/23/2013	1.7278	0.3902	1.3377	791.8		
9/24/2013	1.8999	0.4192	1.4807	872.0		
9/25/2013	1.9228	0.4143	1.5085	883.9		sampling date
9/26/2013	1.9749	0.4314	1.5434	907.1		
9/27/2013	1.9429	0.4302	1.5126	891.7		
9/28/2013	1.9462	0.4367	1.5094	892.6		
9/29/2013	1.9057	0.4333	1.4724	873.3		
9/30/2013	1.7003	0.3917	1.3086	778.6		
10/1/2013	1.5294	0.3568	1.1726	699.8		
10/2/2013	1.5154	0.3580	1.1574	692.8		sampling date

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
10/3/2013	1.4854	0.3492	1.1362	680.2		
10/4/2013	1.5045	0.3518	1.1526	690.0		
10/5/2013	1.4400	0.3350	1.1050	661.5		
10/6/2013	1.3931	0.3224	1.0707	640.9		
10/7/2013	1.4559	0.3352	1.1207	670.9		
10/8/2013	1.5189	0.3478	1.1711	701.0		
10/9/2013	1.5119	0.3444	1.1675	698.9		sampling date
10/10/2013	1.4797	0.3636	1.1161	699.0		
10/11/2013	1.3976	0.3697	1.0279	675.0		
10/12/2013	1.5343	0.4360	1.0984	758.0		
10/13/2013	1.6634	0.5068	1.1566	841.0		
10/14/2013	1.6191	0.5282	1.0909	838.3		
10/15/2013	1.5138	0.5280	0.9857	803.0		
10/16/2013	1.5942	0.5939	1.0003	867.0		sampling date
10/17/2013	1.5145	0.5757	0.9388	826.0		
10/18/2013	1.3622	0.5283	0.8339	745.0		
10/19/2013	1.4519	0.5742	0.8777	796.3		
10/20/2013	1.3297	0.5361	0.7935	731.3		
10/21/2013	1.3598	0.5589	0.8009	750.0		
10/22/2013	1.2975	0.5434	0.7541	717.7		
10/23/2013	1.3494	0.5758	0.7737	748.6		sampling date
10/24/2013	1.3553	0.5889	0.7664	820.6		
10/25/2013	1.2905	0.5729	0.7176	860.0		
10/26/2013	1.0472	0.4770	0.5702	776.0		
10/27/2013	0.9299	0.4370	0.4929	776.0		
10/28/2013	0.7247	0.3540	0.3707	692.0		
10/29/2013	0.6748	0.3464	0.3283	752.9		
10/30/2013	0.6308	0.3459	0.2849	846.5		sampling date
10/31/2013	0.6050	0.3351	0.2699	863.7		
11/1/2013	0.5660	0.3171	0.2489	862.9		
11/2/2013	0.4860	0.2758	0.2102	795.2		
11/3/2013	0.4672	0.2690	0.1982	824.6		
11/4/2013	0.4414	0.2584	0.1829	845.6		
11/5/2013	0.4071	0.2431	0.1640	852.9		
11/6/2013	0.3590	0.2194	0.1396	829.7		sampling date
11/7/2013	0.3505	0.2161	0.1344	806.9		
11/8/2013	0.3358	0.2089	0.1269	770.0		
11/9/2013	0.3555	0.2231	0.1324	812.0		
11/10/2013	0.3569	0.2258	0.1310	812.0		
11/11/2013	0.3764	0.2402	0.1362	853.0		
11/12/2013	0.3769	0.2425	0.1344	851.0		
11/13/2013	0.3752	0.2434	0.1318	843.8		sampling date
11/14/2013	0.3731	0.2286	0.1445	816.9		
11/15/2013	0.3858	0.2233	0.1625	823.2		
11/16/2013	0.4093	0.2237	0.1857	851.5		
11/17/2013	0.4300	0.2218	0.2083	872.7		
11/18/2013	0.4396	0.2138	0.2258	871.0		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
11/19/2013	0.4371	0.2004	0.2367	845.8		
11/20/2013	0.4622	0.1996	0.2626	874.0		sampling date
11/21/2013	0.5669	0.2220	0.3449	862.2		
11/22/2013	0.6870	0.2505	0.4365	873.7		
11/23/2013	0.8064	0.2784	0.5280	881.2		
11/24/2013	0.8955	0.2960	0.5995	857.9		
11/25/2013	0.9934	0.3171	0.6763	847.1		
11/26/2013	1.0868	0.3369	0.7499	835.1		
11/27/2013	1.1708	0.3542	0.8166	818.7		sampling date
11/28/2013	1.0239	0.3279	0.6960	805.9		
11/29/2013	0.8937	0.3067	0.5871	804.6		
11/30/2013	0.7670	0.2866	0.4804	806.4		
12/1/2013	0.6459	0.2690	0.3769	816.1		
12/2/2013	0.5330	0.2563	0.2766	843.6		
12/3/2013	0.4000	0.2357	0.1644	847.3		
12/4/2013	0.2565	0.2072	0.0493	820.9		sampling date
12/5/2013	0.2765	0.2019	0.0747	805.3		
12/6/2013	0.2927	0.1947	0.0980	782.0		
12/7/2013	0.3077	0.1878	0.1200	759.5		
12/8/2013	0.3371	0.1898	0.1473	773.0		
12/9/2013	0.3823	0.1996	0.1827	818.7		
12/10/2013	0.4201	0.2043	0.2159	843.8		
12/11/2013	0.4412	0.2006	0.2407	834.4		sampling date
12/12/2013	0.4253	0.1964	0.2289	823.0		
12/13/2013	0.4158	0.1952	0.2207	823.8		
12/14/2013	0.4301	0.2053	0.2248	872.8		
12/15/2013	0.4277	0.2078	0.2200	889.8		
12/16/2013	0.4070	0.2013	0.2057	868.3		
12/17/2013	0.3857	0.1943	0.1914	844.5		
12/18/2013	0.3733	0.1917	0.1816	839.4		sampling date
12/19/2013	0.3987	0.1936	0.2051	853.5		
12/20/2013	0.4383	0.2017	0.2366	895.0		
12/21/2013	0.4496	0.1964	0.2531	877.6		
12/22/2013	0.4616	0.1919	0.2697	863.2		
12/23/2013	0.4767	0.1889	0.2878	855.3		
12/24/2013	0.5004	0.1893	0.3111	862.9		
12/25/2013	0.5058	0.1829	0.3229	839.6		
12/26/2013	0.5088	0.1761	0.3327	814.1		sampling date
12/27/2013	0.5066	0.1841	0.3225	831.3		
12/28/2013	0.5160	0.1969	0.3192	868.7		
12/29/2013	0.4941	0.1979	0.2962	854.0		
12/30/2013	0.4762	0.2004	0.2759	845.7		
12/31/2013	0.4606	0.2036	0.2570	841.0		
1/1/2014	0.4458	0.2071	0.2387	837.6		
1/2/2014	0.4245	0.2073	0.2172	821.5		sampling date
1/3/2014	0.4056	0.2060	0.1995	809.9		
1/4/2014	0.4111	0.2175	0.1937	848.2		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
1/5/2014	0.4057	0.2237	0.1821	865.6		
1/6/2014	0.3985	0.2292	0.1693	880.4		
1/7/2014	0.3809	0.2289	0.1520	872.2		
1/8/2014	0.3592	0.2258	0.1334	853.9		sampling date
1/9/2014	0.3588	0.2211	0.1376	852.9		
1/10/2014	0.3565	0.2154	0.1412	847.6		
1/11/2014	0.3524	0.2086	0.1438	837.8		
1/12/2014	0.3553	0.2059	0.1494	844.7		
1/13/2014	0.3562	0.2021	0.1541	846.8		
1/14/2014	0.3332	0.1850	0.1483	792.3		
1/15/2014	0.3238	0.1758	0.1480	769.7		sampling date
1/16/2014	0.3302	0.1869	0.1433	818.5		
1/17/2014	0.3158	0.1867	0.1291	817.4		
1/18/2014	0.2801	0.1733	0.1068	758.9		
1/19/2014	0.2442	0.1584	0.0858	693.8		
1/20/2014	0.2459	0.1677	0.0782	734.5		
1/21/2014	0.2361	0.1697	0.0664	743.3		
1/22/2014	0.2288	0.1739	0.0549	761.4		sampling date
1/23/2014	0.2424	0.1764	0.0660	784.5		
1/24/2014	0.2495	0.1740	0.0755	785.5		
1/25/2014	0.2565	0.1715	0.0851	786.4		
1/26/2014	0.2641	0.1693	0.0948	788.7		
1/27/2014	0.2654	0.1632	0.1022	772.9		
1/28/2014	0.2682	0.1583	0.1099	761.9		
1/29/2014	0.2711	0.1536	0.1175	752.0		sampling date
1/30/2014	0.2880	0.1578	0.1302	766.0		
1/31/2014	0.3002	0.1593	0.1409	767.0		
2/1/2014	0.3027	0.1558	0.1469	744.0		
2/2/2014	0.3054	0.1527	0.1527	723.0		
2/3/2014	0.3477	0.1691	0.1786	794.3		
2/4/2014	0.3626	0.1717	0.1909	800.0		
2/5/2014	0.3984	0.1839	0.2145	850.0		sampling date
2/6/2014	0.3815	0.1795	0.2020	817.0		
2/7/2014	0.3761	0.1804	0.1957	808.3		
2/8/2014	0.3819	0.1867	0.1952	823.8		
2/9/2014	0.3813	0.1900	0.1914	825.7		
2/10/2014	0.3848	0.1953	0.1895	836.4		
2/11/2014	0.3915	0.2023	0.1891	854.0		
2/12/2014					Off-Line	pump failure; sampling date
2/13/2014					Off-Line	pump failure
2/14/2014					Off-Line	pump failure
2/15/2014					Off-Line	pump failure
2/16/2014					Off-Line	pump failure
2/17/2014	0.2565	0.0969	0.1596	664.0		
2/18/2014	0.3965	0.1498	0.2467	855.2		
2/19/2014	0.4611	0.1742	0.2869	852.7		sampling date
2/20/2014	0.4015	0.1591	0.2424	724.0		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
2/21/2014	0.0919	0.0381	0.0539	161.8		
2/22/2014					Off-Line	pump failure
2/23/2014					Off-Line	pump failure
2/24/2014	0.2401	0.1109	0.1292	393.9		
2/25/2014	0.2337	0.1114	0.1223	375.0		
2/26/2014	0.4618	0.2265	0.2353	725.0		sampling date
2/27/2014	0.4922	0.2407	0.2516	792.0		
2/28/2014	0.4455	0.2170	0.2284	735.0		
3/1/2014	0.1908	0.0926	0.0982	323.0		
3/2/2014	0.3393	0.1641	0.1752	590.0		
3/3/2014	0.1511	0.0728	0.0783	270.0		
3/4/2014	0.3992	0.1914	0.2078	733.4		
3/5/2014	0.3861	0.1843	0.2018	730.1		sampling date
3/6/2014	0.3656	0.1792	0.1865	709.8		
3/7/2014	0.3563	0.1794	0.1769	710.7		
3/8/2014	0.3361	0.1740	0.1621	689.3		
3/9/2014	0.3262	0.1737	0.1525	688.4		
3/10/2014	0.2852	0.1564	0.1288	619.8		
3/11/2014	0.3202	0.1810	0.1392	717.3		
3/12/2014	0.0299	0.0174	0.0124	69.0		sampling date
3/13/2014	0.3245	0.1821	0.1424	747.0		
3/14/2014	0.3057	0.1649	0.1408	701.0		
3/15/2014	0.3476	0.1799	0.1677	794.0		
3/16/2014	0.3389	0.1681	0.1708	771.0		
3/17/2014	0.3457	0.1641	0.1816	783.4		
3/18/2014	0.3377	0.1532	0.1846	762.5		
3/19/2014	0.3336	0.1442	0.1893	750.2		sampling date
3/20/2014	0.3431	0.1467	0.1964	742.9		
3/21/2014	0.3121	0.1320	0.1801	651.5		
3/22/2014	0.1690	0.0707	0.0982	340.5		
3/23/2014	0.3718	0.1542	0.2176	724.2		
3/24/2014	0.5169	0.2125	0.3045	974.4		
3/25/2014	0.6905	0.2814	0.4091	1260.8		
3/26/2014	0.6740	0.2725	0.4015	1193.3		sampling date
3/27/2014	0.6646	0.2797	0.3849	1225.1		
3/28/2014	0.6067	0.2663	0.3404	1166.3		
3/29/2014	0.4983	0.2285	0.2698	1000.9		
3/30/2014	0.4636	0.2226	0.2410	974.8		
3/31/2014	0.4454	0.2244	0.2210	982.6		
4/1/2014	0.4232	0.2242	0.1989	982.0		
4/2/2014	0.3992	0.2231	0.1761	977.0		sampling date
4/3/2014	0.4235	0.2374	0.1860	1032.0		
4/4/2014	0.3923	0.2207	0.1716	952.0		
4/5/2014	0.5180	0.2923	0.2257	1252.0		
4/6/2014	0.4516	0.2557	0.1960	1087.0		
4/7/2014	0.4602	0.2613	0.1988	1103.0		
4/8/2014	0.4831	0.2752	0.2079	1153.2		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	358	# Days On-Line Flow > 0.0000:	358	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	358	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 100%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	354.6269	101.0536	253.5733	gpm On-Line Flow > 0	Operational/	
PER DAY	0.9906	0.2823	0.7083	806.08	Flow Status	Comments
4/9/2014	0.4865	0.2780	0.2085	1156.5		sampling date
4/10/2014	0.5021	0.2805	0.2216	1184.0		
4/11/2014	0.4965	0.2712	0.2253	1161.4		
4/12/2014	0.4866	0.2598	0.2268	1129.1		
4/13/2014	0.4739	0.2472	0.2266	1091.0		
4/14/2014	0.4772	0.2433	0.2339	1090.0		
4/15/2014	0.4778	0.2380	0.2398	1082.9		
4/16/2014	0.4774	0.2322	0.2451	1073.6		sampling date
4/17/2014	0.4586	0.2221	0.2365	1051.6		
4/18/2014	0.4460	0.2149	0.2311	1043.2		
4/19/2014	0.4298	0.2061	0.2237	1026.0		
4/20/2014	0.4212	0.2009	0.2203	1026.6		
4/21/2014	0.4508	0.2139	0.2370	1122.2		
4/22/2014	0.4873	0.2298	0.2575	1239.6		
4/23/2014	0.3314	0.1553	0.1761	861.7		sampling date
4/24/2014	0.2667	0.1229	0.1438	675.5		
4/25/2014	0.5063	0.2295	0.2767	1249.5		
4/26/2014	0.4885	0.2180	0.2705	1175.7		
4/27/2014	0.5256	0.2310	0.2946	1234.3		
4/28/2014	0.4083	0.1768	0.2315	936.4		
4/29/2014	0.3195	0.1364	0.1831	715.8		
4/30/2014	0.3211	0.1352	0.1859	703.1		sampling date
5/1/2014	0.3177	0.1310	0.1867	675.4		
5/2/2014	0.2277	0.0921	0.1357	470.3		
5/3/2014	0.3276	0.1299	0.1977	657.9		
5/4/2014	0.3550	0.1382	0.2168	693.9		
5/5/2014	0.3830	0.1464	0.2365	729.0		
5/6/2014	0.3763	0.1414	0.2349	698.1		
5/7/2014	0.3925	0.1451	0.2475	710.0		sampling date
5/8/2014	0.3832	0.1450	0.2381	704.0		
5/9/2014	0.3809	0.1477	0.2332	711.0		
5/10/2014	0.3737	0.1485	0.2252	709.0		
5/11/2014	0.3531	0.1438	0.2093	681.0		
5/12/2014	0.3697	0.1543	0.2153	725.0		
5/13/2014	0.3690	0.1580	0.2111	736.1		
5/14/2014	0.2709	0.1189	0.1519	549.7		sampling date
5/15/2014	0.1974	0.0854	0.1120	407.7		
5/16/2014	0.3496	0.1489	0.2007	735.1		
5/17/2014	0.3506	0.1469	0.2037	750.8		
5/18/2014	0.3268	0.1346	0.1921	712.8		
5/19/2014	0.3233	0.1308	0.1925	718.8		
5/20/2014	0.3188	0.1265	0.1923	722.6		
5/21/2014	0.3050	0.1186	0.1864	705.0		sampling date
5/22/2014	0.3042	0.1174	0.1867	684.0		
5/23/2014	0.3279	0.1257	0.2022	718.0		
5/24/2014	0.3239	0.1234	0.2005	691.0		
5/25/2014	0.3192	0.1208	0.1984	664.0		

WATERSHED TECHNOLOGIES						
Lemkin Creek TP Reduction & Operations Report						
Period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	
# of Days On-Line:	**358**	**# Days On-Line Flow > 0.0000:**	**358**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**358**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:** **100%**
	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**354.6269**	**101.0536**	**253.5733**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**0.9906**	**0.2823**	**0.7083**	**806.08**	**Flow Status**	**Comments**
5/26/2014	0.3183	0.1198	0.1985	646.0		
5/27/2014	0.3441	0.1288	0.2154	681.8		
5/28/2014	0.3471	0.1291	0.2179	671.6		sampling date
5/29/2014	0.3314	0.1334	0.1979	647.7		
5/30/2014	0.3203	0.1390	0.1813	632.5		
5/31/2014	0.3160	0.1472	0.1688	630.3		
6/1/2014	0.3107	0.1548	0.1559	626.1		
6/2/2014	0.3484	0.1852	0.1633	709.6		
6/3/2014	0.3504	0.1981	0.1523	721.1		
6/4/2014	0.3426	0.2056	0.1370	712.7		sampling date
6/5/2014	0.3454	0.1926	0.1528	701.0		
6/6/2014	0.3528	0.1824	0.1704	699.0		
6/7/2014	0.3550	0.1698	0.1852	687.0		
6/8/2014	0.3855	0.1702	0.2153	729.0		
6/9/2014	0.3864	0.1570	0.2294	714.5		
6/10/2014	0.3778	0.1408	0.2370	683.4		
6/11/2014	0.4056	0.1381	0.2675	718.1		sampling date
6/12/2014	1.0117	0.2207	0.7910	659.1		
6/13/2014	1.6413	0.3127	1.3285	655.2		
6/14/2014	2.3355	0.4166	1.9189	672.1		
6/15/2014	3.3053	0.5668	2.7385	743.6		
6/16/2014	3.5319	0.5902	2.9418	652.3		
6/17/2014	5.2996	0.8692	4.4303	830.0		
6/18/2014	5.4427	0.8804	4.5623	740.0		sampling date
6/19/2014	4.9637	0.8043	4.1594	691.0		
6/20/2014	4.8475	0.7870	4.0606	691.4		
6/21/2014	5.5913	0.9094	4.6819	817.4		
6/22/2014	5.3110	0.8656	4.4454	796.5		
6/23/2014	5.4223	0.8856	4.5367	834.6		
6/24/2014	5.2782	0.8639	4.4142	834.5		
6/25/2014	4.9678	0.8150	4.1528	807.3		sampling date
6/26/2014	4.8283	0.7921	4.0361	784.7		
6/27/2014	6.4399	1.0566	5.3834	1046.6		
6/28/2014	7.6239	1.2508	6.3731	1239.0		
6/29/2014	9.5030	1.5591	7.9439	1544.4		
6/30/2014	8.9379	1.4664	7.4715	1452.5		

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
7/1/2013	11.7823	0.3508	11.4315	748.4		
7/2/2013	15.9019	0.4734	15.4285	1010.0		
7/3/2013	13.8130	0.4112	13.4017	877.4		sampling date
7/4/2013	15.2455	0.7197	14.5259	1045.3		
7/5/2013	14.0042	0.9473	13.0569	1043.1		
7/6/2013	12.6956	1.1674	11.5282	1034.9		
7/7/2013	11.4747	1.3922	10.0825	1033.0		
7/8/2013	10.2776	1.6192	8.6584	1033.0		
7/9/2013	9.0566	1.8414	7.2152	1030.3		
7/10/2013	7.8403	2.0619	5.7784	1027.4		sampling date
7/11/2013	7.8111	1.9211	5.8900	1038.0		
7/12/2013	7.5280	1.7195	5.8085	1014.7		
7/13/2013	7.4113	1.5592	5.8521	1013.6		
7/14/2013	7.3644	1.4125	5.9519	1022.0		
7/15/2013	7.4466	1.2858	6.1608	1048.9		
7/16/2013	7.5165	1.1497	6.3668	1074.9		
7/17/2013	6.7053	0.8894	5.8160	973.7		sampling date
7/18/2013	7.5688	1.1383	6.4305	1062.5		
7/19/2013	7.7058	1.2870	6.4188	1047.0		
7/20/2013	7.8348	1.4306	6.4042	1031.3		
7/21/2013	8.1263	1.6028	6.5235	1037.3		
7/22/2013	8.3153	1.7547	6.5606	1030.3		
7/23/2013	6.8800	1.5412	5.3388	828.1		
7/24/2013	7.0762	1.6720	5.4042	828.1		sampling date
7/25/2013	6.8857	1.5455	5.3402	828.1		
7/26/2013	6.6952	1.4189	5.2762	828.1		
7/27/2013	6.5047	1.2924	5.2123	828.1		
7/28/2013	6.3141	1.1659	5.1483	828.1		
7/29/2013	7.3641	1.2499	6.1142	995.9		
7/30/2013	8.0074	1.2319	6.7755	1117.6		
7/31/2013	7.6071	1.0415	6.5655	1097.0		sampling date
8/1/2013	8.7630	1.3017	7.4612	1087.8		
8/2/2013	9.4556	1.4878	7.9678	1030.4		
8/3/2013	10.3672	1.7025	8.6646	1006.7		
8/4/2013	11.5384	1.9586	9.5798	1010.5		
8/5/2013	12.4875	2.1764	10.3110	995.8		
8/6/2013	13.2376	2.3574	10.8802	969.0		
8/7/2013	25.4254	4.6097	20.8158	1720.0		sampling date
8/8/2013					Off-Line	power failure
8/9/2013	15.2545	2.3833	12.8712	1116.8		
8/10/2013	22.6412	3.2171	19.4241	1728.6		
8/11/2013	21.7486	2.7551	18.9935	1734.8		
8/12/2013	20.7527	2.2791	18.4736	1733.0		
8/13/2013	19.7969	1.8076	17.9893	1734.5		
8/14/2013	18.8211	1.3339	17.4872	1734.3		sampling date
8/15/2013	17.7706	1.8216	15.9489	1730.9		
8/16/2013	16.7564	2.3118	14.4446	1730.8		

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
8/17/2013	15.6607	2.7875	12.8732	1721.7		
8/18/2013	14.6547	3.2756	11.3790	1721.9		
8/19/2013	10.3664	2.8588	7.5075	1308.1		
8/20/2013	7.9644	2.6790	5.2854	1085.1		
8/21/2013	7.2782	2.9657	4.3125	1077.6		sampling date
8/22/2013	7.5112	3.0123	4.4990	1081.0		
8/23/2013	7.6414	3.0180	4.6234	1069.9		
8/24/2013	7.8919	3.0714	4.8205	1075.8		
8/25/2013	8.0298	3.0812	4.9486	1066.3		
8/26/2013	8.1558	3.0872	5.0686	1055.9		
8/27/2013	8.2255	3.0730	5.1525	1038.8		
8/28/2013	8.2733	3.0519	5.2214	1019.9		sampling date
8/29/2013	7.9747	2.8843	5.0903	1048.0		
8/30/2013	7.6756	2.7131	4.9625	1080.1		
8/31/2013	6.9258	2.3824	4.5434	1048.9		
9/1/2013	6.6765	2.2230	4.4535	1094.5		
9/2/2013	6.3813	2.0416	4.3397	1140.1		
9/3/2013	5.6929	1.7326	3.9603	1117.6		
9/4/2013	5.0667	1.4457	3.6210	1103.6		sampling date
9/5/2013	4.9966	1.4244	3.5722	1077.5		
9/6/2013	4.9727	1.4164	3.5564	1061.7		
9/7/2013	4.9902	1.4201	3.5701	1055.0		
9/8/2013	5.0963	1.4490	3.6473	1067.0		
9/9/2013	4.7262	1.3427	3.3836	980.0		
9/10/2013	4.7975	1.3618	3.4357	985.3		
9/11/2013	4.6315	1.3136	3.3179	942.2		sampling date
9/12/2013	4.6389	1.3699	3.2690	939.8		
9/13/2013	4.6434	1.4250	3.2184	936.8		
9/14/2013	4.7339	1.5072	3.2267	951.1		
9/15/2013	5.0828	1.6762	3.4065	1017.0		
9/16/2013	4.9570	1.6908	3.2662	987.8		
9/17/2013	5.5786	1.9653	3.6133	1107.1		
9/18/2013	5.3377	1.9398	3.3979	1055.0		sampling date
9/19/2013	5.9594	2.3666	3.5929	1044.3		
9/20/2013	6.6927	2.8373	3.8554	1053.3		
9/21/2013	7.4218	3.3087	4.1131	1060.1		
9/22/2013	8.0464	3.7333	4.3131	1052.0		
9/23/2013	8.4038	4.0280	4.3758	1013.0		
9/24/2013	9.3456	4.6019	4.7437	1045.0		
9/25/2013	10.0979	5.0869	5.0110	1052.9		sampling date
9/26/2013	9.5420	4.8371	4.7048	1070.4		
9/27/2013	8.6933	4.4391	4.2543	1055.3		
9/28/2013	7.9677	4.1032	3.8644	1053.8		
9/29/2013	7.1875	3.7389	3.4486	1044.0		
9/30/2013	5.6473	2.9736	2.6737	909.7		
10/1/2013	6.4500	3.4472	3.0028	1166.0		
10/2/2013	5.3894	2.9348	2.4546	1110.0		sampling date

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
10/3/2013	4.7970	2.6327	2.1642	1006.9		
10/4/2013	4.0332	2.2314	1.8017	863.0		
10/5/2013	4.3102	2.4046	1.9056	940.6		
10/6/2013	3.3328	1.8753	1.4574	742.0		
10/7/2013	4.0756	2.3137	1.7619	926.2		
10/8/2013	4.3131	2.4710	1.8421	1000.9		
10/9/2013	4.6992	2.7178	1.9814	1114.0		sampling date
10/10/2013	4.7413	2.6418	2.0995	1124.0		
10/11/2013	4.6110	2.4716	2.1394	1093.1		
10/12/2013	4.6860	2.4126	2.2734	1110.9		
10/13/2013	4.6992	2.3200	2.3793	1114.0		
10/14/2013	4.6275	2.1866	2.4409	1097.0		
10/15/2013	4.4282	1.9987	2.4295	1049.7		
10/16/2013	4.0834	1.7567	2.3267	968.0		sampling date
10/17/2013	4.3966	1.9385	2.4581	1033.0		
10/18/2013	4.3437	1.9608	2.3829	1011.6		
10/19/2013	4.3743	2.0198	2.3544	1009.8		
10/20/2013	4.3798	2.0669	2.3130	1002.4		
10/21/2013	4.5130	2.1747	2.3382	1024.0		
10/22/2013	4.3561	2.1419	2.2142	980.0		
10/23/2013	4.5059	2.2590	2.2469	1005.2		sampling date
10/24/2013	4.4167	2.1180	2.2987	1012.0		
10/25/2013	3.6212	1.6532	1.9680	852.9		
10/26/2013	3.4174	1.4770	1.9404	828.0		
10/27/2013	2.8229	1.1473	1.6756	704.2		
10/28/2013	2.3732	0.8996	1.4735	610.0		
10/29/2013	2.1057	0.7370	1.3686	558.2		
10/30/2013	1.9567	0.6244	1.3324	535.6		sampling date
10/31/2013	4.5941	0.7958	3.7983	531.6		
11/1/2013	7.3435	0.9850	6.3585	538.7		
11/2/2013	8.9723	1.0407	7.9316	481.8		
11/3/2013	9.9418	1.0490	8.8928	421.1		
11/4/2013	13.0986	1.2927	11.8059	458.0		
11/5/2013	16.1510	1.5165	14.6345	480.8		
11/6/2013	18.1943	1.6437	16.5506	471.6		sampling date
11/7/2013	17.6249	1.9519	15.6730	515.4		
11/8/2013	13.6068	1.8662	11.7406	456.3		
11/9/2013	11.3892	1.9662	9.4230	447.7		
11/10/2013	9.4283	2.1015	7.3268	447.7		
11/11/2013	7.4675	2.2368	5.2307	447.7		
11/12/2013	5.9813	2.5765	3.4048	486.3		
11/13/2013	3.7620	2.6602	1.1018	475.0		sampling date
11/14/2013	4.3623	2.5540	1.8083	509.8		
11/15/2013	4.7449	2.2807	2.4641	516.1		
11/16/2013	5.0970	1.9850	3.1120	518.5		
11/17/2013	5.5529	1.7177	3.8352	530.5		
11/18/2013	5.8952	1.4054	4.4897	530.9		

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 88%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
11/19/2013	6.0312	1.0565	4.9747	513.7		
11/20/2013	6.4740	0.7668	5.7072	523.0		sampling date
11/21/2013	5.9841	0.8518	5.1323	525.0		
11/22/2013	6.7745	1.1566	5.6179	650.3		
11/23/2013	9.7984	2.0089	7.7895	1038.2		
11/24/2013	8.9055	2.2020	6.7036	1053.0		
11/25/2013	7.8732	2.3665	5.5067	1053.0		
11/26/2013	6.6396	2.4565	4.1831	1022.0		
11/27/2013	5.6377	2.6162	3.0215	1022.0		sampling date
11/28/2013	4.1940	1.8237	2.3703	788.0		
11/29/2013					Off-Line	power failure
11/30/2013					Off-Line	power failure
12/1/2013					Off-Line	power failure
12/2/2013					Off-Line	power failure
12/3/2013	4.3341	1.0822	3.2518	995.8		
12/4/2013	3.8925	0.7875	3.1050	936.1		sampling date
12/5/2013	3.5672	0.6604	2.9068	843.6		
12/6/2013	2.9036	0.4893	2.4142	675.4		
12/7/2013	4.6634	0.7110	3.9524	1067.3		
12/8/2013	4.6867	0.6416	4.0451	1055.6		
12/9/2013					Off-Line	flow meter enhancements
12/10/2013					Off-Line	flow meter enhancements
12/11/2013					Off-Line	flow meter; sampling date
12/12/2013					Off-Line	flow meter enhancements
12/13/2013	0.2810	0.0485	0.2325	207.7		
12/14/2013	0.0000	0.0000	0.0000	0.0	No Flow	low water in creek
12/15/2013	0.0000	0.0000	0.0000	0.0	No Flow	low water in creek
12/16/2013	0.6642	0.1146	0.5495	196.4		
12/17/2013	1.1399	0.1967	0.9432	280.9		
12/18/2013	1.5512	0.2677	1.2835	327.6		sampling date
12/19/2013	1.5009	0.2510	1.2499	319.5		
12/20/2013	1.8021	0.2916	1.5104	386.7		
12/21/2013	1.7777	0.2779	1.4998	384.6		
12/22/2013	1.7473	0.2634	1.4840	381.1		
12/23/2013	1.7352	0.2517	1.4836	381.6		
12/24/2013	1.7042	0.2373	1.4669	377.9		
12/25/2013	1.7209	0.2295	1.4915	384.8		
12/26/2013	1.6969	0.2161	1.4807	382.6		sampling date
12/27/2013	1.7160	0.2235	1.4925	384.0		
12/28/2013	1.7356	0.2309	1.5047	385.4		
12/29/2013	1.7498	0.2377	1.5121	385.6		
12/30/2013	1.7489	0.2423	1.5066	382.5		
12/31/2013	1.7701	0.2500	1.5201	384.3		
1/1/2014	1.7754	0.2555	1.5199	382.6		
1/2/2014	1.8419	0.2699	1.5720	394.0		sampling date
1/3/2014	1.6162	0.2627	1.3535	370.5		
1/4/2014	1.4785	0.2676	1.2108	365.0		

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
1/5/2014	1.3645	0.2764	1.0881	365.1		
1/6/2014	1.2537	0.2859	0.9677	366.0		
1/7/2014	1.2143	0.3141	0.9002	390.1		
1/8/2014	0.6999	0.2073	0.4927	250.0		sampling date
1/9/2014	0.5414	0.1423	0.3990	177.1		
1/10/2014	0.6182	0.1452	0.4730	186.7		
1/11/2014	0.6685	0.1409	0.5276	187.4		
1/12/2014	0.7154	0.1359	0.5795	187.1		
1/13/2014	0.7247	0.1244	0.6003	177.7		
1/14/2014	0.9435	0.1469	0.7967	217.7		
1/15/2014	1.1975	0.1693	1.0282	260.8		sampling date
1/16/2014	1.1553	0.1537	1.0016	258.0		
1/17/2014	1.1457	0.1424	1.0032	262.5		
1/18/2014	1.1174	0.1286	0.9888	262.9		
1/19/2014	1.0735	0.1131	0.9603	259.4		
1/20/2014	1.0282	0.0978	0.9304	255.5		
1/21/2014	0.9978	0.0841	0.9137	255.1		
1/22/2014	0.9653	0.0703	0.8951	254.2		sampling date
1/23/2014	1.9817	0.1897	1.7920	266.2		
1/24/2014	2.8011	0.2901	2.5110	252.6		
1/25/2014	3.7159	0.3995	3.3163	252.1		
1/26/2014	4.6903	0.5155	4.1747	255.1		
1/27/2014	5.5357	0.6173	4.9184	251.3		
1/28/2014	6.5160	0.7341	5.7819	253.8		
1/29/2014	7.4656	0.8475	6.6181	254.6		sampling date
1/30/2014	6.6894	0.7515	5.9379	255.1		
1/31/2014	5.9485	0.6594	5.2891	257.3		
2/1/2014	9.1418	0.9955	8.1462	456.6		
2/2/2014	8.7007	0.9243	7.7765	514.2		
2/3/2014	8.7023	0.8908	7.8115	629.7		
2/4/2014	8.2098	0.7902	7.4195	765.8		
2/5/2014	5.6364	0.4801	5.1563	739.7		sampling date
2/6/2014	5.8393	0.4625	5.3768	769.7		
2/7/2014	5.7209	0.4187	5.3023	757.3		
2/8/2014	5.5412	0.3719	5.1694	736.7		
2/9/2014	5.5162	0.3364	5.1798	736.6		
2/10/2014	5.4974	0.3013	5.1962	737.3		
2/11/2014	5.4602	0.2652	5.1950	735.5		
2/12/2014	5.4362	0.2298	5.2064	735.5		sampling date
2/13/2014	5.1534	0.2153	4.9381	733.4		
2/14/2014	4.9303	0.2033	4.7271	739.9		
2/15/2014	4.6568	0.1891	4.4677	739.3		
2/16/2014	4.3852	0.1751	4.2102	738.9		
2/17/2014	4.1123	0.1609	3.9513	738.1		
2/18/2014	3.8328	0.1466	3.6862	736.1		
2/19/2014	3.5575	0.1324	3.4251	734.5		sampling date
2/20/2014	3.6427	0.1408	3.5019	732.4		

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
2/21/2014	3.7318	0.1494	3.5824	731.1		
2/22/2014	3.8302	0.1583	3.6720	731.7		
2/23/2014	3.9190	0.1668	3.7522	730.4		
2/24/2014	4.0241	0.1760	3.8481	732.2		
2/25/2014	4.1183	0.1847	3.9336	732.0		
2/26/2014	4.3890	0.2016	4.1874	762.4		sampling date
2/27/2014	4.3018	0.2205	4.0813	792.9		
2/28/2014	4.0383	0.2314	3.8069	792.8		
3/1/2014	3.7638	0.2415	3.5223	790.3		
3/2/2014	3.5022	0.2524	3.2498	790.3		
3/3/2014	3.2161	0.2613	2.9549	784.4		
3/4/2014	2.8039	0.2580	2.5458	744.0		
3/5/2014	1.4982	0.1572	1.3410	435.9		sampling date
3/6/2014	0.9042	0.1018	0.8024	263.5		
3/7/2014	1.6886	0.2030	1.4856	492.8		
3/8/2014	1.8045	0.2309	1.5736	527.4		
3/9/2014	1.8244	0.2475	1.5769	534.0		
3/10/2014	2.0628	0.2959	1.7669	604.7		
3/11/2014	2.4030	0.3634	2.0396	705.5		
3/12/2014	2.2835	0.3631	1.9204	671.4		sampling date
3/13/2014	1.6498	0.2525	1.3973	422.6		
3/14/2014	1.1322	0.1681	0.9642	256.9		
3/15/2014	1.2545	0.1816	1.0729	255.5		
3/16/2014	1.3828	0.1960	1.1868	255.4		
3/17/2014	1.5136	0.2108	1.3028	255.8		
3/18/2014	1.6462	0.2259	1.4204	256.4		
3/19/2014	2.3738	0.3214	2.0523	342.9		sampling date
3/20/2014	2.1981	0.3023	1.8958	320.2		
3/21/2014	2.1523	0.3007	1.8517	316.1		
3/22/2014	2.1520	0.3053	1.8467	318.7		
3/23/2014	2.0749	0.2990	1.7759	309.9		
3/24/2014	2.0255	0.2965	1.7291	305.1		
3/25/2014	3.1423	0.4672	2.6752	477.4		
3/26/2014	3.3532	0.5064	2.8468	513.8		sampling date
3/27/2014	3.1905	0.5069	2.6836	514.3		
3/28/2014	3.0213	0.5063	2.5150	513.8		
3/29/2014	2.8518	0.5057	2.3461	513.1		
3/30/2014	2.6862	0.5057	2.1805	513.1		
3/31/2014	2.5100	0.5036	2.0064	511.0		
4/1/2014	2.3408	0.5027	1.8381	510.1		
4/2/2014	2.1609	0.4991	1.6617	506.5		sampling date
4/3/2014	2.3152	0.5097	1.8055	502.5		
4/4/2014	2.5111	0.5293	1.9818	507.4		
4/5/2014	2.6696	0.5410	2.1286	504.6		
4/6/2014	1.9240	0.3761	1.5479	341.6		
4/7/2014	0.6078	0.1150	0.4928	101.8		sampling date
4/8/2014					Off-Line	floc removal

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
4/9/2014					Off-Line	floc removal
4/10/2014					Off-Line	floc removal
4/11/2014					Off-Line	floc removal
4/12/2014					Off-Line	floc removal
4/13/2014					Off-Line	floc removal
4/14/2014					Off-Line	floc removal
4/15/2014					Off-Line	floc removal
4/16/2014					Off-Line	floc removal, sampling date
4/17/2014					Off-Line	floc removal
4/18/2014					Off-Line	floc removal
4/19/2014					Off-Line	floc removal
4/20/2014					Off-Line	floc removal
4/21/2014					Off-Line	floc removal
4/22/2014					Off-Line	floc removal
4/23/2014					Off-Line	floc removal, sampling date
4/24/2014					Off-Line	floc removal
4/25/2014					Off-Line	floc removal
4/26/2014					Off-Line	floc removal
4/27/2014					Off-Line	floc removal
4/28/2014					Off-Line	floc removal
4/29/2014					Off-Line	floc removal
4/30/2014					Off-Line	floc removal, sampling date
5/1/2014					Off-Line	floc removal
5/2/2014					Off-Line	floc removal
5/3/2014					Off-Line	floc removal
5/4/2014					Off-Line	floc removal
5/5/2014					Off-Line	floc removal & vegetation tilling
5/6/2014					Off-Line	floc removal & vegetation tilling
5/7/2014					Off-Line	floc removal & vegetation tilling, sampling date
5/8/2014					Off-Line	floc removal & vegetation tilling
5/9/2014					Off-Line	floc removal & vegetation tilling
5/10/2014					Off-Line	floc removal & vegetation tilling
5/11/2014					Off-Line	floc removal & vegetation tilling
5/12/2014					Off-Line	floc removal & vegetation tilling
5/13/2014					Off-Line	floc removal & vegetation tilling
5/14/2014					Off-Line	floc removal & vegetation tilling, sampling date
5/15/2014					Off-Line	floc removal & vegetation tilling
5/16/2014					Off-Line	floc removal & vegetation tilling
5/17/2014					Off-Line	floc removal & vegetation tilling
5/18/2014					Off-Line	floc removal & vegetation tilling
5/19/2014					Off-Line	floc removal & vegetation tilling
5/20/2014	0.1278	0.0325	0.0953	17.3		low canal water
5/21/2014	0.1449	0.0319	0.1131	16.8		low canal water
5/22/2014	0.0981	0.0191	0.0791	10.0		low canal water
5/23/2014	0.0375	0.0065	0.0310	3.4		low canal water, sampling date
5/24/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek

WATERSHED TECHNOLOGIES						
Mosquito Large Pond TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	310	# Days On-Line Flow > 0.0000	302	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	344	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	88%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	1774.8524	417.8059	1357.0464	gpm On-Line Flow > 0	Operational/	
PER DAY	5.8770	1.3835	4.4935	759.85	Flow Status	Comments
5/25/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek
5/26/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek
5/27/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek
5/28/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek, sampling date
5/29/2014	0.0000	0.0000	0.0000	0.0	No Flow	no water in creek
5/30/2014	0.0100	0.0030	0.0070	1.5		low canal water
5/31/2014	1.8607	0.5973	1.2634	288.6		
6/1/2014	5.3344	1.8179	3.5165	871.1		
6/2/2014	5.1945	1.8843	3.3102	895.4		
6/3/2014	5.4273	2.1020	3.3253	990.6		
6/4/2014	4.8488	2.0118	2.8369	940.5		sampling date
6/5/2014	5.3278	2.2084	3.1194	991.8		
6/6/2014	5.5856	2.3132	3.2724	999.5		
6/7/2014	5.4909	2.2721	3.2189	945.9		
6/8/2014	6.0904	2.5181	3.5723	1011.5		
6/9/2014	6.6590	2.7512	3.9078	1067.6		
6/10/2014	6.4021	2.6433	3.7588	992.0		
6/11/2014	6.7167	2.7714	3.9453	1007.0		sampling date
6/12/2014	7.2250	2.9150	4.3099	973.0		
6/13/2014	7.6762	3.0399	4.6363	938.3		
6/14/2014	8.9414	3.4855	5.4559	1000.6		
6/15/2014	9.4688	3.6416	5.8272	977.0		
6/16/2014	10.2407	3.8927	6.3481	980.2		
6/17/2014	10.7155	4.0316	6.6838	956.5		
6/18/2014	11.6743	4.3529	7.3214	976.3		sampling date
6/19/2014	11.7118	4.0987	7.6131	1006.9		
6/20/2014	11.3772	3.7060	7.6712	1006.3		
6/21/2014	11.0740	3.3231	7.7509	1008.6		
6/22/2014	10.6028	2.8929	7.7099	995.3		
6/23/2014	9.8143	2.3936	7.4207	950.4		
6/24/2014	9.8007	2.0880	7.7127	980.0		
6/25/2014	9.4327	1.6991	7.7336	975.0		sampling date
6/26/2014	9.3553	1.6851	7.6702	967.0		
6/27/2014					Off-Line	instrumentation failure- lightning strike
6/28/2014					Off-Line	instrumentation failure- lightning strike
6/29/2014					Off-Line	instrumentation failure- lightning strike
6/30/2014					Off-Line	instrumentation failure- lightning strike

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
7/1/2013	18.2647	0.6128	17.6519	980.5		
7/2/2013	18.8620	0.6328	18.2292	1012.6		
7/3/2013	17.3631	0.5825	16.7806	932.1		sampling date
7/4/2013	16.7176	0.6126	16.1049	980.3		
7/5/2013	15.1733	0.6126	14.5607	980.2		
7/6/2013	13.6289	0.6125	13.0163	980.1		
7/7/2013	12.1536	0.6160	11.5376	985.6		
7/8/2013	10.7592	0.6251	10.1341	1000.3		
7/9/2013	9.7936	0.6666	9.1271	1066.6		
7/10/2013	7.8152	0.6420	7.1732	1027.3		sampling date
7/11/2013	8.7281	1.1155	7.6125	1037.9		
7/12/2013	9.2961	1.5387	7.7575	1009.2		
7/13/2013	10.0428	1.9803	8.0625	1003.0		
7/14/2013	11.1282	2.4945	8.6337	1029.0		
7/15/2013	11.5153	2.8490	8.6662	991.3		
7/16/2013	12.2278	3.2729	8.9549	984.7		
7/17/2013	13.1862	3.7641	9.4221	997.5		sampling date
7/18/2013	13.0894	4.7646	8.3248	997.9		
7/19/2013	13.0348	5.7849	7.2500	1001.6		
7/20/2013	13.0173	6.8324	6.1850	1008.2		
7/21/2013	13.0958	7.9523	5.1435	1022.5		
7/22/2013	13.4290	9.2787	4.1503	1057.0		
7/23/2013	13.1437	10.1998	2.9439	1043.0		
7/24/2013	12.8488	11.0821	1.7667	1028.0		sampling date
7/25/2013	13.0272	10.4425	2.5847	1059.5		
7/26/2013	12.9032	9.5308	3.3723	1066.9		
7/27/2013	12.7350	8.5776	4.1574	1071.0		
7/28/2013	12.5795	7.6257	4.9538	1076.2		
7/29/2013	12.9167	6.9294	5.9872	1124.6		
7/30/2013	12.5583	5.8301	6.7282	1113.0		
7/31/2013	12.4990	4.8667	7.6322	1128.0		sampling date
8/1/2013	12.9573	4.9684	7.9889	1148.4		
8/2/2013	13.2886	5.0195	8.2691	1157.0		
8/3/2013	13.4885	5.0205	8.4679	1154.0		
8/4/2013	13.0445	4.7857	8.2587	1097.0		
8/5/2013	12.5774	4.5496	8.0278	1040.0		
8/6/2013	12.9725	4.6279	8.3446	1055.0		
8/7/2013	13.3054	4.6825	8.6230	1064.5		sampling date
8/8/2013	9.9224	3.5288	6.3936	844.4		
8/9/2013	8.3404	3.0014	5.3390	758.1		
8/10/2013	7.6223	2.7799	4.8424	743.4		
8/11/2013	7.1474	2.6467	4.5007	752.0		
8/12/2013	6.4182	2.4188	3.9994	733.0		
8/13/2013	6.2843	2.4172	3.8670	784.8		
8/14/2013	5.7357	2.2601	3.4756	790.2		sampling date
8/15/2013	5.9329	2.6822	3.2507	797.9		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
8/16/2013	6.1433	3.1174	3.0259	807.0		
8/17/2013	9.9207	5.5584	4.3623	1273.6		
8/18/2013	10.1459	6.1969	3.9490	1273.6		
8/19/2013	10.3712	6.8354	3.5358	1273.6		
8/20/2013	5.7200	4.0344	1.6855	687.5		
8/21/2013	5.8415	4.3791	1.4625	687.5		sampling date
8/22/2013	7.4783	5.3631	2.1152	875.0		
8/23/2013	7.5218	5.1528	2.3691	875.0		
8/24/2013	7.5654	4.9424	2.6229	875.0		
8/25/2013	7.6089	4.7321	2.8768	875.0		
8/26/2013	7.6525	4.5218	3.1307	875.0		
8/27/2013					Off-Line	
8/28/2013					Off-Line	sampling date
8/29/2013	0.2943	0.1415	0.1528	275.6		
8/30/2013	1.1771	0.5659	0.6113	551.2		
8/31/2013	1.7657	0.8488	0.9169	551.2		
9/1/2013	2.3543	1.1317	1.2226	551.2		
9/2/2013	2.9429	1.4147	1.5282	551.2		
9/3/2013	3.5314	1.6976	1.8338	551.2		
9/4/2013	4.1200	1.9805	2.1395	551.2		sampling date
9/5/2013	4.7735	2.2375	2.5360	641.7		
9/6/2013	4.7503	2.1692	2.5812	641.7		
9/7/2013	5.2388	2.3282	2.9106	711.1		
9/8/2013	5.2132	2.2525	2.9606	711.1		
9/9/2013	5.1571	2.1641	2.9931	706.9		
9/10/2013	3.3421	1.3604	1.9817	460.4		
9/11/2013	3.3255	1.3114	2.0141	460.4		sampling date
9/12/2013	3.7516	1.2916	2.4600	460.4		
9/13/2013	4.1777	1.2719	2.9058	460.4		
9/14/2013	2.9581	0.8045	2.1535	295.8		
9/15/2013	3.2318	0.7918	2.4400	295.8		
9/16/2013	3.5056	0.7791	2.7264	295.8		
9/17/2013	8.8628	1.7973	7.0655	693.8		
9/18/2013	9.5048	1.7676	7.7372	693.8		sampling date
9/19/2013	10.6761	2.4933	8.1828	758.3		
9/20/2013	10.9625	3.0544	7.9081	758.3		
9/21/2013	11.4962	3.6950	7.8012	775.0		
9/22/2013	11.7889	4.2685	7.5204	775.0		
9/23/2013	12.0816	4.8420	7.2396	775.0		
9/24/2013	10.9107	4.7749	6.1358	683.3		
9/25/2013	11.1688	5.2805	5.8883	683.3		sampling date
9/26/2013	11.1916	5.6745	5.5171	733.3		
9/27/2013	10.3971	5.6820	4.7151	733.3		
9/28/2013	9.8973	5.8642	4.0331	755.8		
9/29/2013	9.0785	5.8719	3.2065	755.8		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	96%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
9/30/2013	8.2596	5.8797	2.3799	755.8		
10/1/2013	5.0043	3.9596	1.0447	508.3		
10/2/2013	0.2044	0.1820	0.0224	23.3		sampling date
10/3/2013	4.3232	3.2673	1.0558	477.1		
10/4/2013	4.4665	2.8136	1.6529	477.1		
10/5/2013	4.7883	2.4512	2.3372	495.6		
10/6/2013	4.9372	1.9798	2.9574	495.6		
10/7/2013	5.0861	1.5085	3.5776	495.6		
10/8/2013	8.7372	1.7310	7.0062	827.1		
10/9/2013	8.9857	0.9443	8.0414	827.1		sampling date
10/10/2013	5.0685	0.5850	4.4835	483.3		
10/11/2013	4.8860	0.6182	4.2678	483.3		
10/12/2013	4.6899	0.6495	4.0404	481.9		
10/13/2013	4.5079	0.6826	3.8252	481.9		
10/14/2013	4.3258	0.7157	3.6101	481.9		
10/15/2013	2.1728	0.3926	1.7802	252.7		
10/16/2013	2.0774	0.4100	1.6674	252.7		sampling date
10/17/2013	2.1737	0.4365	1.7372	252.7		
10/18/2013	3.4808	0.7099	2.7709	387.5		
10/19/2013	3.6285	0.7504	2.8780	387.5		
10/20/2013	3.7762	0.7910	2.9851	387.5		
10/21/2013	3.9239	0.8316	3.0923	387.5		
10/22/2013	4.0716	0.8722	3.1994	387.5		
10/23/2013	4.2192	0.9128	3.3065	387.5		sampling date
10/24/2013	4.0170	0.9707	3.0463	387.5		
10/25/2013	3.8148	1.0285	2.7862	387.5		
10/26/2013	2.4601	0.7399	1.7203	263.9		
10/27/2013	2.3224	0.7793	1.5431	263.9		
10/28/2013	2.1847	0.8187	1.3660	263.9		
10/29/2013	1.9069	0.7994	1.1075	245.8		
10/30/2013	1.1154	0.5243	0.5910	154.2		sampling date
10/31/2013	1.1302	0.5365	0.5937	154.2		
11/1/2013	1.0646	0.5101	0.5544	143.3		
11/2/2013	1.0783	0.5215	0.5569	143.3		
11/3/2013	1.0921	0.5328	0.5594	143.3		
11/4/2013	1.1059	0.5441	0.5618	143.3		
11/5/2013	0.8316	0.4125	0.4191	106.5		
11/6/2013	0.7911	0.3955	0.3955	100.0		sampling date
11/7/2013	0.8496	0.4026	0.4471	104.9		
11/8/2013	0.7840	0.3519	0.4321	94.5		
11/9/2013	0.8822	0.3750	0.5072	103.9		
11/10/2013	0.9091	0.3658	0.5433	104.7		
11/11/2013	0.8821	0.3357	0.5464	99.4		
11/12/2013	0.9261	0.3332	0.5929	102.1		
11/13/2013	0.9459	0.3214	0.6245	102.1		sampling date

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
11/14/2013	1.6010	0.5025	1.0984	171.5		
11/15/2013	0.8374	0.2415	0.5959	89.0		
11/16/2013	0.7618	0.2005	0.5612	80.4		
11/17/2013	0.7200	0.1717	0.5483	75.4		
11/18/2013	0.6937	0.1485	0.5453	72.1		
11/19/2013	1.0153	0.1929	0.8224	104.8		
11/20/2013	0.8176	0.1359	0.6817	83.8		sampling date
11/21/2013	1.0385	0.1710	0.8675	109.7		
11/22/2013	3.7727	0.6149	3.1578	411.2		
11/23/2013	5.9461	0.9585	4.9877	669.4		
11/24/2013	5.6592	0.9014	4.7579	658.7		
11/25/2013	3.8727	0.6089	3.2638	466.6		
11/26/2013	3.2035	0.4966	2.7069	400.1		
11/27/2013	3.1428	0.4797	2.6630	407.3		sampling date
11/28/2013	2.4651	0.3747	2.0904	336.3		
11/29/2013	1.8813	0.2846	1.5967	270.8		
11/30/2013	1.5886	0.2390	1.3496	242.1		
12/1/2013	1.9476	0.2912	1.6563	315.3		
12/2/2013	1.8263	0.2712	1.5551	315.3		
12/3/2013	1.9604	0.2888	1.6717	362.5		
12/4/2013	1.8210	0.2657	1.5553	362.5		sampling date
12/5/2013	1.7294	0.2531	1.4763	314.6		
12/6/2013	1.8785	0.2756	1.6028	314.6		
12/7/2013					Off-Line	Limerock bed rehab
12/8/2013					Off-Line	Limerock bed rehab
12/9/2013					Off-Line	Limerock bed rehab
12/10/2013					Off-Line	Limerock bed rehab
12/11/2013					Off-Line	Limerock bed rehab, sampling date
12/12/2013					Off-Line	Limerock bed rehab
12/13/2013					Off-Line	Limerock bed rehab
12/14/2013					Off-Line	Limerock bed rehab
12/15/2013					Off-Line	Limerock bed rehab
12/16/2013					Off-Line	Limerock bed rehab
12/17/2013					Off-Line	Limerock bed rehab
12/18/2013					Off-Line	Limerock bed rehab, sampling date
12/19/2013					Off-Line	Limerock bed rehab
12/20/2013	0.2464	0.3150	-0.0686	167.7		
12/21/2013	0.3696	0.3270	0.0426	167.7		
12/22/2013	0.4928	0.3390	0.1538	167.7		
12/23/2013	0.6160	0.3510	0.2650	167.7		
12/24/2013	1.0774	0.5291	0.5484	244.4		
12/25/2013	1.2570	0.5466	0.7104	244.4		
12/26/2013	1.4366	0.5640	0.8725	244.4		sampling date
12/27/2013	1.2437	0.4361	0.8076	200.0		
12/28/2013	1.3120	0.4107	0.9014	200.0		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
12/29/2013	1.3804	0.3853	0.9951	200.0		
12/30/2013	1.4487	0.3599	1.0888	200.0		
12/31/2013	1.5170	0.3344	1.1826	200.0		
1/1/2014	1.5854	0.3090	1.2763	200.0		
1/2/2014	1.6537	0.2836	1.3701	200.0		sampling date
1/3/2014	1.3360	0.2414	1.0946	166.7		
1/4/2014	1.2939	0.2464	1.0476	166.7		
1/5/2014	1.2519	0.2514	1.0005	166.7		
1/6/2014	1.2098	0.2564	0.9534	166.7		
1/7/2014	1.1678	0.2614	0.9064	166.7		
1/8/2014	1.1257	0.2664	0.8593	166.7		sampling date
1/9/2014	0.8891	0.1937	0.6954	133.3		
1/10/2014	4.1140	0.8166	3.2975	625.0		
1/11/2014	3.4558	0.6174	2.8385	531.9		
1/12/2014	3.4102	0.5397	2.8704	531.9		
1/13/2014	3.3645	0.4621	2.9024	531.9		
1/14/2014	2.4047	0.2786	2.1261	385.4		
1/15/2014	2.3716	0.2223	2.1492	385.4		sampling date
1/16/2014	2.3762	0.2376	2.1386	385.4		
1/17/2014	2.3808	0.2528	2.1281	385.4		
1/18/2014	1.3410	0.1507	1.1904	216.7		
1/19/2014	1.3436	0.1592	1.1844	216.7		
1/20/2014	1.3462	0.1678	1.1785	216.7		
1/21/2014	1.4266	0.1865	1.2402	229.2		
1/22/2014	1.4294	0.1955	1.2339	229.2		sampling date
1/23/2014	1.4266	0.1908	1.2358	229.2		
1/24/2014	1.2038	0.1573	1.0465	193.7		
1/25/2014	1.2015	0.1533	1.0482	193.7		
1/26/2014	1.1992	0.1494	1.0498	193.7		
1/27/2014	1.1969	0.1454	1.0515	193.7		
1/28/2014	1.0661	0.1262	0.9399	172.9		
1/29/2014	1.0640	0.1226	0.9414	172.9		sampling date
1/30/2014	3.0466	0.3306	2.7160	487.5		
1/31/2014	3.0935	0.3155	2.7779	487.5		
2/1/2014	6.1196	0.5855	5.5341	950.0		
2/2/2014	6.2109	0.5562	5.6548	950.0		
2/3/2014	6.3023	0.5268	5.7755	950.0		
2/4/2014	3.7717	0.2935	3.4782	560.4		
2/5/2014	3.8256	0.2761	3.5494	560.4		sampling date
2/6/2014	3.3889	0.2520	3.1370	495.8		
2/7/2014	3.3932	0.2596	3.1336	495.8		
2/8/2014	3.1310	0.2463	2.8847	456.9		
2/9/2014	3.1349	0.2534	2.8815	456.9		
2/10/2014	3.1388	0.2605	2.8784	456.9		
2/11/2014	0.8884	0.0756	0.8128	129.2		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
2/12/2014	0.8895	0.0776	0.8119	129.2		sampling date
2/13/2014	4.0804	0.4002	3.6802	616.7		
2/14/2014	4.0596	0.4458	3.6138	639.6		
2/15/2014	3.8872	0.4766	3.4106	639.6		
2/16/2014	3.7148	0.5073	3.2075	639.6		
2/17/2014	3.5424	0.5381	3.0043	639.6		
2/18/2014	1.6905	0.2853	1.4052	320.8		
2/19/2014	1.6040	0.3008	1.3033	320.8		sampling date
2/20/2014	0.1596	0.0264	0.1332	29.2		
2/21/2014	2.2289	0.3284	1.9006	375.0		
2/22/2014	1.8357	0.2417	1.5940	286.1		
2/23/2014	1.9708	0.2328	1.7379	286.1		
2/24/2014	2.1058	0.2240	1.8818	286.1		
2/25/2014	3.5898	0.3447	3.2452	458.3		
2/26/2014	3.8062	0.3305	3.4757	458.3		sampling date
2/27/2014	3.7995	0.3271	3.4724	458.0		
2/28/2014	3.7956	0.3240	3.4716	458.0		
3/1/2014	2.1190	0.1793	1.9397	256.0		
3/2/2014	2.1168	0.1775	1.9392	256.0		
3/3/2014	2.1146	0.1758	1.9388	256.0		
3/4/2014	2.1124	0.1740	1.9384	256.0		
3/5/2014	2.1102	0.1723	1.9379	256.0		sampling date
3/6/2014	1.0958	0.0913	1.0045	133.3		
3/7/2014	1.0924	0.0929	0.9994	133.3		
3/8/2014	0.2836	0.0246	0.2590	34.7		
3/9/2014	0.2827	0.0250	0.2576	34.7		
3/10/2014	0.2818	0.0255	0.2563	34.7		
3/11/2014	1.1966	0.1102	1.0864	147.9		
3/12/2014	1.1928	0.1120	1.0808	147.9		sampling date
3/13/2014	0.9889	0.0954	0.8935	120.8		
3/14/2014	1.0035	0.0994	0.9041	120.8		
3/15/2014	0.6787	0.0689	0.6098	80.6		
3/16/2014	0.6883	0.0715	0.6168	80.6		
3/17/2014	0.6980	0.0741	0.6239	80.6		
3/18/2014	0.8785	0.0953	0.7832	100.0		
3/19/2014	0.8905	0.0985	0.7920	100.0		sampling date
3/20/2014	0.8854	0.0992	0.7862	100.0		
3/21/2014	0.8802	0.0999	0.7803	100.0		
3/22/2014	0.6199	0.0713	0.5486	70.8		
3/23/2014	0.6162	0.0718	0.5445	70.8		
3/24/2014	0.6126	0.0722	0.5403	70.8		
3/25/2014	1.0208	0.1219	0.8989	118.7		
3/26/2014	1.0147	0.1227	0.8920	118.7		sampling date
3/27/2014	2.2839	0.2721	2.0118	277.1		
3/28/2014	2.2002	0.2578	1.9423	277.1		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
3/29/2014	1.7823	0.2051	1.5772	233.3		
3/30/2014	1.7118	0.1931	1.5187	233.3		
3/31/2014	1.6413	0.1811	1.4602	233.3		
4/1/2014	1.1360	0.1223	1.0137	168.7		
4/2/2014	1.0850	0.1136	0.9714	168.7		sampling date
4/3/2014	1.1757	0.1095	1.0662	168.7		
4/4/2014	1.2664	0.1055	1.1609	168.7		
4/5/2014	0.6702	0.0501	0.6201	83.3		
4/6/2014	0.7149	0.0481	0.6669	83.3		
4/7/2014	0.7597	0.0461	0.7136	83.3		
4/8/2014	0.8246	0.0452	0.7794	85.4		
4/9/2014	0.8705	0.0431	0.8274	85.4		sampling date
4/10/2014	0.8736	0.0411	0.8326	82.5		
4/11/2014	0.9065	0.0405	0.8660	82.5		
4/12/2014	0.9394	0.0399	0.8994	82.5		
4/13/2014	0.9722	0.0394	0.9329	82.5		
4/14/2014	1.0051	0.0388	0.9663	82.5		
4/15/2014	0.6815	0.0251	0.6564	54.2		
4/16/2014	0.6490	0.0228	0.6261	50.0		sampling date
4/17/2014	0.6233	0.0256	0.5978	52.1		
4/18/2014	0.5707	0.0274	0.5433	52.1		
4/19/2014	6.9897	0.3933	6.5964	702.8		
4/20/2014	6.2790	0.4175	5.8616	702.8		
4/21/2014	5.5684	0.4416	5.1267	702.8		
4/22/2014	2.4624	0.2361	2.2263	356.2		
4/23/2014	2.1022	0.2483	1.8539	356.2		sampling date
4/24/2014	2.4586	0.2688	2.1898	347.9		
4/25/2014	2.8642	0.2951	2.5691	347.9		
4/26/2014	9.3511	0.9191	8.4321	995.0		
4/27/2014	10.5111	0.9942	9.5169	995.0		
4/28/2014	11.6710	1.0694	10.6016	995.0		
4/29/2014	12.8309	1.1446	11.6864	995.0		
4/30/2014	13.9908	1.2197	12.7711	995.0		sampling date
5/1/2014	1.7741	0.1614	1.6127	136.7		
5/2/2014	1.6265	0.1553	1.4712	136.7		
5/3/2014	1.4789	0.1492	1.3297	136.7		
5/4/2014	1.3313	0.1431	1.1882	136.7		
5/5/2014	1.1838	0.1370	1.0467	136.7		
5/6/2014	0.6160	0.0778	0.5382	81.3		
5/7/2014	0.5283	0.0742	0.4541	81.3		sampling date
5/8/2014	0.3220	0.0364	0.2856	41.1		
5/9/2014	0.3769	0.0353	0.3416	41.1		
5/10/2014	0.4318	0.0341	0.3977	41.1		
5/11/2014	0.4868	0.0330	0.4538	41.1		
5/12/2014	0.5417	0.0319	0.5098	41.1		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	96%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless Noted Otherwise	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW		
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
5/13/2014	0.5966	0.0307	0.5659	41.1		
5/14/2014	0.6516	0.0296	0.6219	41.1		sampling date
5/15/2014	0.6150	0.0279	0.5871	39.6		
5/16/2014	0.6021	0.0273	0.5748	39.6		
5/17/2014	0.7443	0.0337	0.7105	50.0		
5/18/2014	0.7280	0.0330	0.6950	50.0		
5/19/2014	0.7116	0.0322	0.6795	50.0		
5/20/2014	0.2607	0.0118	0.2490	18.8		
5/21/2014	0.2546	0.0115	0.2431	18.8		sampling date
5/22/2014	0.0000	0.0000	0.0000	0.0	No Flow	low water
5/23/2014	0.0000	0.0000	0.0000	0.0	No Flow	low water
5/24/2014	0.3194	0.0120	0.3074	23.6		
5/25/2014	0.3190	0.0112	0.3078	23.6		
5/26/2014	0.3186	0.0104	0.3082	23.6		
5/27/2014	0.1404	0.0042	0.1362	10.4		
5/28/2014	0.1402	0.0039	0.1363	10.4		sampling date
5/29/2014	0.5645	0.0320	0.5325	45.8		
5/30/2014	0.5121	0.0470	0.4651	45.8		
5/31/2014	8.5154	1.1471	7.3683	849.0		
6/1/2014	7.5412	1.4234	6.1177	848.6		
6/2/2014	6.5709	1.7003	4.8706	848.6		
6/3/2014	4.5579	1.6090	2.9489	690.6		
6/4/2014	3.7682	1.8343	1.9339	690.6		sampling date
6/5/2014	3.8121	1.7549	2.0572	690.6		
6/6/2014	3.8559	1.6754	2.1805	690.6		
6/7/2014	3.2704	1.3384	1.9320	579.2		
6/8/2014	3.3072	1.2718	2.0354	579.2		
6/9/2014	4.8791	1.7584	3.1207	845.0		
6/10/2014	5.4769	1.8444	3.6325	938.3		
6/11/2014	5.5327	1.7353	3.7974	937.6		sampling date
6/12/2014	6.2557	2.2725	3.9833	942.7		
6/13/2014	6.8017	2.7410	4.0608	922.8		
6/14/2014	7.7211	3.3626	4.3586	952.6		
6/15/2014	8.2908	3.8354	4.4553	937.9		
6/16/2014	9.0149	4.3773	4.6376	941.5		
6/17/2014	9.6996	4.9007	4.7989	940.8		
6/18/2014	10.4232	5.4441	4.9791	943.7		sampling date
6/19/2014	10.5907	4.8879	5.7028	945.5		
6/20/2014	10.1909	4.1010	6.0899	897.3		
6/21/2014	10.4960	3.6202	6.8758	911.6		
6/22/2014	10.5927	3.0608	7.5319	907.7		
6/23/2014	11.2862	2.6462	8.6400	954.4		
6/24/2014	10.9805	1.9919	8.9886	916.4		
6/25/2014	11.0310	1.4307	9.6002	908.8		sampling date
6/26/2014	10.8994	1.4137	9.4857	897.9		

WATERSHED TECHNOLOGIES						
Nubbin Slough TP Reduction						
Period	7/1/2013	through	6/30/2014	365	days in period	
# of Days On-Line	350	# Days On-Line Flow > 0.0000	348	# Days in Period Flow > 0.0000 Less Uncontrollable Downtime:	361	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime: 96%
	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Noted Otherwise	
TOTAL	1585.5123	488.8311	1096.6811	gpm On-Line Flow > 0	Operational/	
PER DAY	4.5561	1.4047	3.1514	470.36	Flow Status	Comments
6/27/2014	10.8863	1.4120	9.4743	896.9		
6/28/2014	10.8979	1.4135	9.4844	897.8		
6/29/2014	8.2516	1.0703	7.1813	679.8		
6/30/2014	7.5622	0.9808	6.5813	623.0		

WATERSHED TECHNOLOGIES						
Wolff Ditch TP Reduction & Operations Report						
for the period	**7/1/2013**	**through**	**6/30/2014**	**365**	**days in period**	

# of Days On-Line:	**364**	**# Days On-Line Flow > 0.0000**	**364**	**# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:**	**364**	**% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:**	**100%**

	TP MASS (lbs.)		**TP (lbs.)**	**AVERAGE**	**On-Line Unless**	
	INFLOW	**OUTFLOW**	**REMOVAL**	**DAILY FLOW**	**Otherwise Noted**	
TOTAL	**485.3842**	**80.2928**	**405.0914**	**gpm On-Line Flow > 0**	**Operational/**	
PER DAY	**1.3335**	**0.2206**	**1.1129**	**762.2**	**Flow Status**	**Comments**
7/1/2013	1.0994	0.1763	0.9232	772.0		
7/2/2013	1.0852	0.1740	0.9112	762.0		
7/3/2013	1.0866	0.1742	0.9124	763.0		sampling date
7/4/2013	1.1043	0.1780	0.9263	768.0		
7/5/2013	1.1250	0.1823	0.9427	775.0		
7/6/2013	1.1518	0.1876	0.9642	786.0		
7/7/2013	1.1507	0.1883	0.9624	778.0		
7/8/2013	1.1644	0.1915	0.9729	780.0		
7/9/2013	1.1661	0.1927	0.9734	774.0		
7/10/2013	1.1782	0.1956	0.9826	775.0		sampling date
7/11/2013	1.2481	0.2009	1.0472	780.0		
7/12/2013	1.3238	0.2070	1.1168	788.0		
7/13/2013	1.3973	0.2127	1.1846	794.0		
7/14/2013	1.4551	0.2159	1.2392	791.0		
7/15/2013	1.5087	0.2186	1.2901	786.0		
7/16/2013	1.5794	0.2238	1.3556	790.0		
7/17/2013	1.6404	0.2276	1.4129	789.0		sampling date
7/18/2013	1.6120	0.2189	1.3931	792.0		
7/19/2013	1.5773	0.2094	1.3679	792.0		
7/20/2013	1.5485	0.2006	1.3478	795.0		
7/21/2013	1.5194	0.1918	1.3276	798.0		
7/22/2013	1.1161	0.1370	0.9791	600.0		
7/23/2013					Off-Line	power failure
7/24/2013	0.6133	0.0707	0.5427	346.0		sampling date
7/25/2013	1.7000	0.1746	1.5254	807.0		
7/26/2013	1.9841	0.1856	1.7985	813.0		
7/27/2013	2.2778	0.1973	2.0805	821.0		
7/28/2013	2.5489	0.2070	2.3419	820.0		
7/29/2013	2.7022	0.2076	2.4947	785.0		
7/30/2013	2.8964	0.2120	2.6844	767.0		
7/31/2013	3.0456	0.2137	2.8319	741.0		sampling date
8/1/2013	2.8572	0.2212	2.6360	732.0		
8/2/2013	2.7649	0.2363	2.5286	748.0		
8/3/2013	2.6835	0.2535	2.4300	769.0		
8/4/2013	2.6130	0.2733	2.3397	796.0		
8/5/2013	2.4944	0.2896	2.2048	811.0		
8/6/2013	2.3181	0.2996	2.0184	808.0		
8/7/2013	2.0977	0.3030	1.7946	788.0		sampling date
8/8/2013	2.0265	0.2910	1.7355	774.0		
8/9/2013	1.9437	0.2774	1.6663	755.0		
8/10/2013	1.8094	0.2566	1.5529	715.0		
8/11/2013	1.5319	0.2157	1.3162	616.0		
8/12/2013	1.7346	0.2426	1.4920	710.0		
8/13/2013	1.5740	0.2185	1.3555	656.0		
8/14/2013	1.5405	0.2122	1.3283	654.0		sampling date
8/15/2013	1.6330	0.2258	1.4071	685.0		
8/16/2013	1.7151	0.2380	1.4770	711.0		

WATERSHED TECHNOLOGIES						
Wolff Ditch TP Reduction & Operations Report						
for the period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
8/17/2013	1.9524	0.2720	1.6805	800.0		
8/18/2013	1.9751	0.2761	1.6990	800.0		
8/19/2013	1.9977	0.2802	1.7176	800.0		
8/20/2013	2.0204	0.2843	1.7361	800.0		
8/21/2013	2.0431	0.2884	1.7546	800.0		sampling date
8/22/2013	1.9744	0.2817	1.6928	785.0		
8/23/2013	1.9441	0.2803	1.6638	785.0		
8/24/2013	1.9747	0.2879	1.6869	810.0		
8/25/2013	1.9435	0.2865	1.6570	810.0		
8/26/2013	1.9122	0.2851	1.6271	810.0		
8/27/2013	1.7346	0.2616	1.4730	747.0		
8/28/2013	1.6601	0.2534	1.4067	727.0		sampling date
8/29/2013	1.6390	0.2478	1.3912	729.0		
8/30/2013	1.5934	0.2386	1.3548	720.0		
8/31/2013	1.7074	0.2531	1.4544	784.0		
9/1/2013	1.6648	0.2441	1.4207	777.0		
9/2/2013	1.6143	0.2341	1.3802	766.0		
9/3/2013	1.5480	0.2219	1.3261	747.0		
9/4/2013	1.5135	0.2143	1.2992	743.0		sampling date
9/5/2013	1.4873	0.2069	1.2804	713.0		
9/6/2013	1.4710	0.2011	1.2699	689.0		
9/7/2013	1.5505	0.2084	1.3421	710.0		
9/8/2013	1.8287	0.2419	1.5868	819.0		
9/9/2013	1.8505	0.2409	1.6096	811.0		
9/10/2013	1.8552	0.2378	1.6174	796.0		
9/11/2013	1.9179	0.2422	1.6758	806.0		sampling date
9/12/2013	1.8928	0.2318	1.6611	750.0		
9/13/2013	1.8329	0.2182	1.6147	687.0		
9/14/2013	2.0276	0.2352	1.7924	721.0		
9/15/2013	2.3090	0.2615	2.0475	781.0		
9/16/2013	2.5425	0.2816	2.2610	820.0		
9/17/2013	2.5829	0.2802	2.3028	796.0		
9/18/2013	2.5012	0.2661	2.2351	738.0		sampling date
9/19/2013	2.4171	0.2634	2.1537	727.0		
9/20/2013	2.5822	0.2883	2.2939	792.0		
9/21/2013	2.1796	0.2494	1.9302	682.0		
9/22/2013	2.4301	0.2851	2.1450	776.0		
9/23/2013	2.5182	0.3031	2.2151	821.0		
9/24/2013	2.5194	0.3111	2.2082	839.0		
9/25/2013	2.4389	0.3092	2.1297	830.0		sampling date
9/26/2013	2.3733	0.3038	2.0694	827.0		
9/27/2013	2.3333	0.3018	2.0315	833.0		
9/28/2013	2.1832	0.2853	1.8979	799.0		
9/29/2013	2.0804	0.2749	1.8055	781.0		
9/30/2013	2.0501	0.2740	1.7761	790.0		
10/1/2013	1.8720	0.2532	1.6189	741.0		
10/2/2013	2.0915	0.2864	1.8051	851.0		sampling date

WATERSHED TECHNOLOGIES						
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# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
10/3/2013	1.8375	0.2537	1.5838	750.0		
10/4/2013	1.8292	0.2546	1.5746	749.0		
10/5/2013	2.0182	0.2832	1.7350	829.0		
10/6/2013	2.0021	0.2833	1.7188	825.0		
10/7/2013	1.8724	0.2671	1.6053	774.0		
10/8/2013	1.9025	0.2736	1.6289	789.0		
10/9/2013	1.7522	0.2541	1.4982	729.0		sampling date
10/10/2013	1.8824	0.2713	1.6112	767.0		
10/11/2013	2.0114	0.2881	1.7233	803.0		
10/12/2013	1.8630	0.2653	1.5977	729.0		
10/13/2013	1.8895	0.2676	1.6219	725.0		
10/14/2013	1.9554	0.2755	1.6800	736.0		
10/15/2013	1.9196	0.2690	1.6506	709.0		
10/16/2013	1.9693	0.2746	1.6947	714.0		sampling date
10/17/2013	1.8574	0.2752	1.5822	700.0		
10/18/2013	1.8656	0.2941	1.5716	732.0		
10/19/2013	1.8036	0.3028	1.5008	738.0		
10/20/2013	1.7123	0.3066	1.4057	732.0		
10/21/2013	1.6245	0.3108	1.3137	727.0		
10/22/2013	1.6122	0.3301	1.2821	757.0		
10/23/2013	1.5552	0.3415	1.2137	768.0		sampling date
10/24/2013	1.4409	0.3223	1.1185	745.0		
10/25/2013	1.4081	0.3214	1.0867	764.0		
10/26/2013	1.3859	0.3232	1.0627	791.0		
10/27/2013	1.3222	0.3157	1.0065	796.0		
10/28/2013	1.2498	0.3061	0.9437	796.0		
10/29/2013	1.1773	0.2966	0.8808	796.0		
10/30/2013	1.1035	0.2866	0.8169	795.0		sampling date
10/31/2013	1.0735	0.2807	0.7928	786.0		
11/1/2013	1.0627	0.2798	0.7829	791.0		
11/2/2013	1.0490	0.2781	0.7709	794.0		
11/3/2013	1.0261	0.2740	0.7521	790.0		
11/4/2013	1.0263	0.2761	0.7502	804.0		
11/5/2013	1.0146	0.2750	0.7396	809.0		
11/6/2013	1.0003	0.2732	0.7270	812.0		sampling date
11/7/2013	0.9683	0.2719	0.6964	808.0		
11/8/2013	0.9436	0.2726	0.6710	810.0		
11/9/2013	0.9153	0.2722	0.6431	809.0		
11/10/2013	0.8893	0.2726	0.6168	810.0		
11/11/2013	0.8590	0.2716	0.5875	807.0		
11/12/2013	0.8289	0.2706	0.5584	804.0		
11/13/2013	0.8000	0.2699	0.5301	802.0		sampling date
11/14/2013	0.7834	0.2733	0.5100	804.0		
11/15/2013	0.7695	0.2778	0.4917	809.0		
11/16/2013	0.7517	0.2809	0.4707	810.0		
11/17/2013	0.7157	0.2770	0.4386	791.0		
11/18/2013	0.6965	0.2794	0.4171	790.0		

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# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
11/19/2013	0.6782	0.2821	0.3960	790.0		
11/20/2013	0.6573	0.2837	0.3736	787.0		sampling date
11/21/2013	0.6913	0.2828	0.4086	788.0		
11/22/2013	0.7180	0.2789	0.4391	781.0		
11/23/2013	0.7019	0.2594	0.4424	730.0		
11/24/2013	0.7326	0.2582	0.4744	730.0		
11/25/2013	0.7863	0.2647	0.5216	752.0		
11/26/2013	0.8397	0.2704	0.5693	772.0		
11/27/2013	0.8902	0.2746	0.6156	788.0		sampling date
11/28/2013	0.8573	0.2795	0.5777	806.0		
11/29/2013	0.8050	0.2785	0.5265	807.0		
11/30/2013	0.7488	0.2761	0.4728	804.0		
12/1/2013	0.6914	0.2730	0.4184	799.0		
12/2/2013	0.6386	0.2716	0.3670	799.0		
12/3/2013	0.5857	0.2702	0.3155	799.0		
12/4/2013	0.5309	0.2679	0.2631	796.0		sampling date
12/5/2013	0.6093	0.2546	0.3547	793.0		
12/6/2013	0.6878	0.2417	0.4461	791.0		
12/7/2013	0.7660	0.2289	0.5371	789.0		
12/8/2013	0.8438	0.2162	0.6276	787.0		
12/9/2013	0.9270	0.2048	0.7222	790.0		
12/10/2013	1.0032	0.1919	0.8114	787.0		
12/11/2013	1.0706	0.1777	0.8929	778.0		sampling date
12/12/2013	1.0874	0.1772	0.9102	759.0		
12/13/2013	1.1394	0.1826	0.9568	765.0		
12/14/2013	1.1796	0.1860	0.9936	763.0		
12/15/2013	1.2373	0.1922	1.0451	772.0		
12/16/2013	1.2827	0.1964	1.0863	773.0		
12/17/2013	1.3316	0.2012	1.1304	776.0		
12/18/2013	1.3632	0.2033	1.1599	769.0		sampling date
12/19/2013	1.3476	0.2091	1.1385	769.0		
12/20/2013	1.3216	0.2132	1.1084	763.0		
12/21/2013	1.3078	0.2192	1.0886	764.0		
12/22/2013	1.2923	0.2250	1.0674	764.0		
12/23/2013	1.2067	0.2180	0.9886	722.0		
12/24/2013	1.1838	0.2219	0.9619	717.0		
12/25/2013	1.1741	0.2282	0.9459	720.0		
12/26/2013	1.1563	0.2330	0.9233	718.0		sampling date
12/27/2013	1.1395	0.2309	0.9086	723.0		
12/28/2013	1.1255	0.2294	0.8961	730.0		
12/29/2013	1.1019	0.2259	0.8760	731.0		
12/30/2013	1.0768	0.2221	0.8547	731.0		
12/31/2013	1.0546	0.2190	0.8356	733.0		
1/1/2014	1.0296	0.2152	0.8144	733.1		
1/2/2014	0.9948	0.2094	0.7854	726.1		sampling date
1/3/2014	1.0184	0.2112	0.8072	722.2		
1/4/2014	1.0409	0.2128	0.8281	717.8		

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# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
1/5/2014	1.0641	0.2145	0.8496	714.1		
1/6/2014	1.1052	0.2199	0.8853	722.2		
1/7/2014	1.1265	0.2213	0.9052	717.4		
1/8/2014	1.1564	0.2244	0.9321	718.1		sampling date
1/9/2014	1.1409	0.2212	0.9197	723.9		
1/10/2014	1.1200	0.2170	0.9030	726.5		
1/11/2014	1.0998	0.2130	0.8869	729.6		
1/12/2014	1.0729	0.2076	0.8654	728.4		
1/13/2014	1.0404	0.2011	0.8393	723.1		
1/14/2014	1.0211	0.1972	0.8239	727.1		
1/15/2014	0.9946	0.1919	0.8027	726.0		sampling date
1/16/2014	0.9550	0.1900	0.7650	723.3		
1/17/2014	0.9150	0.1879	0.7271	720.2		
1/18/2014	0.8759	0.1860	0.6899	717.5		
1/19/2014	0.8368	0.1840	0.6527	714.6		
1/20/2014	0.7975	0.1820	0.6155	711.3		
1/21/2014	0.7569	0.1795	0.5774	706.5		
1/22/2014	0.7220	0.1784	0.5436	706.8		sampling date
1/23/2014	0.7144	0.1798	0.5346	707.6		
1/24/2014	0.7023	0.1801	0.5222	704.1		
1/25/2014	0.6949	0.1816	0.5133	705.2		
1/26/2014	0.6896	0.1836	0.5059	708.3		
1/27/2014	0.6820	0.1851	0.4969	709.3		
1/28/2014	0.6716	0.1858	0.4858	707.4		
1/29/2014	0.6603	0.1862	0.4741	704.4		sampling date
1/30/2014	0.6258	0.1737	0.4521	670.0		
1/31/2014	0.6279	0.1714	0.4564	674.7		
2/1/2014	0.6211	0.1668	0.4543	669.9		
2/2/2014	0.6266	0.1654	0.4612	678.4		
2/3/2014	0.6191	0.1606	0.4586	672.8		
2/4/2014	0.6301	0.1605	0.4696	687.3		
2/5/2014	0.6324	0.1581	0.4743	692.4		sampling date
2/6/2014	0.6873	0.1612	0.5262	690.3		
2/7/2014	0.7444	0.1648	0.5796	690.4		
2/8/2014	0.4789	0.1006	0.3783	412.6		
2/9/2014	0.1021	0.0205	0.0817	82.1		
2/10/2014	0.5639	0.1081	0.4558	425.5		
2/11/2014	1.0785	0.1986	0.8799	766.1		
2/12/2014	1.1777	0.2090	0.9688	790.3		sampling date
2/13/2014	1.1209	0.2063	0.9147	790.4		
2/14/2014	1.0595	0.2027	0.8568	787.2		
2/15/2014	0.9991	0.1993	0.7998	784.3		
2/16/2014	0.9259	0.1931	0.7328	770.4		
2/17/2014	0.8752	0.1915	0.6837	774.8		
2/18/2014	0.8191	0.1888	0.6303	774.5		
2/19/2014	0.7360	0.1795	0.5565	746.9		sampling date
2/20/2014	0.7493	0.1803	0.5690	739.8		

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# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
2/21/2014	0.7581	0.1801	0.5779	728.6		
2/22/2014	0.7736	0.1816	0.5920	724.5		
2/23/2014	0.7945	0.1843	0.6102	725.4		
2/24/2014	0.8174	0.1875	0.6299	728.0		
2/25/2014	0.8374	0.1900	0.6474	728.0		
2/26/2014	0.8599	0.1930	0.6668	730.1		sampling date
2/27/2014	0.8410	0.1927	0.6483	728.9		
2/28/2014	0.8206	0.1920	0.6285	726.4		
3/1/2014	0.8007	0.1915	0.6092	724.2		
3/2/2014	0.7791	0.1904	0.5887	720.3		
3/3/2014	0.7593	0.1898	0.5695	718.0		
3/4/2014	0.7395	0.1892	0.5503	715.5		
3/5/2014	0.7241	0.1896	0.5344	717.2		sampling date
3/6/2014	0.7299	0.1883	0.5416	712.1		
3/7/2014	0.7433	0.1889	0.5544	714.4		
3/8/2014	0.7523	0.1884	0.5639	712.5		
3/9/2014	0.7615	0.1879	0.5735	710.8		
3/10/2014	0.7728	0.1880	0.5848	711.1		
3/11/2014	0.7849	0.1883	0.5967	712.1		
3/12/2014	0.7956	0.1882	0.6074	711.8		sampling date
3/13/2014	0.7738	0.1833	0.5905	716.5		
3/14/2014	0.7490	0.1777	0.5713	718.7		
3/15/2014	0.7257	0.1724	0.5533	722.5		
3/16/2014	0.6928	0.1649	0.5279	716.7		
3/17/2014	0.6493	0.1548	0.4944	699.0		
3/18/2014	0.6217	0.1485	0.4732	697.7		
3/19/2014	0.5954	0.1426	0.4528	697.8		sampling date
3/20/2014	0.6236	0.1442	0.4794	699.9		
3/21/2014	0.6537	0.1462	0.5075	703.7		
3/22/2014	0.6817	0.1477	0.5340	705.3		
3/23/2014	0.7069	0.1486	0.5582	703.8		
3/24/2014	0.7204	0.1472	0.5732	691.3		
3/25/2014	0.7522	0.1495	0.6027	696.5		
3/26/2014	0.7688	0.1488	0.6200	687.8		sampling date
3/27/2014	0.7421	0.1498	0.5922	687.2		
3/28/2014	0.7165	0.1511	0.5654	687.5		
3/29/2014	0.6585	0.1452	0.5133	655.7		
3/30/2014	0.6389	0.1475	0.4914	661.0		
3/31/2014	0.6179	0.1496	0.4683	665.2		
4/1/2014	0.6060	0.1541	0.4519	680.1		
4/2/2014	0.5891	0.1576	0.4315	690.4		sample date
4/3/2014	0.5989	0.1551	0.4438	694.9		
4/4/2014	0.6068	0.1520	0.4548	697.1		
4/5/2014	0.6078	0.1472	0.4606	691.4		
4/6/2014	0.6147	0.1439	0.4708	692.5		
4/7/2014	0.6226	0.1407	0.4819	694.7		
4/8/2014	0.6282	0.1371	0.4911	694.3		

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# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
4/9/2014	0.6371	0.1341	0.5030	697.5		sampling date
4/10/2014	0.6406	0.1380	0.5025	705.3		
4/11/2014	0.6326	0.1395	0.4931	700.5		
4/12/2014	0.6298	0.1421	0.4877	701.4		
4/13/2014	0.6277	0.1449	0.4829	703.1		
4/14/2014	0.6208	0.1465	0.4743	699.4		
4/15/2014	0.6308	0.1522	0.4786	714.8		
4/16/2014	0.6325	0.1560	0.4765	720.9		sampling date
4/17/2014	0.6325	0.1544	0.4781	719.5		
4/18/2014	0.6348	0.1534	0.4814	720.8		
4/19/2014	0.6301	0.1508	0.4793	714.0		
4/20/2014	0.6293	0.1491	0.4802	711.7		
4/21/2014	0.6394	0.1499	0.4895	721.8		
4/22/2014	0.6376	0.1480	0.4896	718.3		
4/23/2014	0.6486	0.1490	0.4996	729.3		sampling date
4/24/2014	0.6321	0.1502	0.4819	729.1		
4/25/2014	0.6069	0.1493	0.4576	718.5		
4/26/2014	0.5782	0.1473	0.4310	703.1		
4/27/2014	0.5627	0.1485	0.4142	703.4		
4/28/2014	0.5524	0.1512	0.4012	710.3		
4/29/2014	0.5368	0.1525	0.3843	710.6		
4/30/2014	0.5176	0.1527	0.3649	706.1		sampling date
5/1/2014	0.5036	0.1506	0.3530	701.8		
5/2/2014	0.4891	0.1483	0.3408	696.5		
5/3/2014	0.4769	0.1466	0.3302	694.4		
5/4/2014	0.4650	0.1451	0.3199	692.7		
5/5/2014	0.4531	0.1435	0.3096	690.9		
5/6/2014	0.4403	0.1416	0.2986	687.5		
5/7/2014	0.4355	0.1424	0.2931	696.9		sampling date
5/8/2014	0.4484	0.1458	0.3026	713.5		
5/9/2014	0.4526	0.1464	0.3062	716.3		
5/10/2014	0.4539	0.1460	0.3079	714.6		
5/11/2014	0.4421	0.1414	0.3007	692.2		
5/12/2014	0.4349	0.1384	0.2965	677.3		
5/13/2014	0.4312	0.1365	0.2947	667.9		
5/14/2014	0.4362	0.1373	0.2989	672.2		sampling date
5/15/2014	0.4265	0.1331	0.2935	662.5		
5/16/2014	0.4161	0.1286	0.2875	651.5		
5/17/2014	0.3902	0.1195	0.2707	616.0		
5/18/2014	0.3853	0.1169	0.2684	613.2		
5/19/2014	0.3705	0.1112	0.2592	594.4		
5/20/2014	0.3423	0.1017	0.2405	553.8		
5/21/2014	0.3494	0.1028	0.2466	570.0		sampling date
5/22/2014	0.3503	0.1033	0.2470	573.2		
5/23/2014	0.3451	0.1021	0.2430	566.2		
5/24/2014	0.3391	0.1006	0.2385	557.9		
5/25/2014	0.3204	0.0953	0.2251	528.7		

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Wolff Ditch TP Reduction & Operations Report						
for the period	7/1/2013	through	6/30/2014	365	days in period	

# of Days On-Line:	364	# Days On-Line Flow > 0.0000	364	# Days in Period Flow > 0.0000 Less Non-Controllable Down Time:	364	% Time On-Line vs. Available Days Excl. Uncontrollable Downtime:	100%

	TP MASS (lbs.)		TP (lbs.)	AVERAGE	On-Line Unless	
	INFLOW	OUTFLOW	REMOVAL	DAILY FLOW	Otherwise Noted	
TOTAL	485.3842	80.2928	405.0914	gpm On-Line Flow > 0	Operational/	
PER DAY	1.3335	0.2206	1.1129	762.2	Flow Status	Comments
5/26/2014	0.3172	0.0946	0.2226	524.8		
5/27/2014	0.2894	0.0866	0.2028	480.3		
5/28/2014	0.2774	0.0832	0.1942	461.6		sampling date
5/29/2014	0.2799	0.0857	0.1942	458.0		
5/30/2014	0.2973	0.0928	0.2045	478.4		
5/31/2014	0.2724	0.0866	0.1858	431.2		
6/1/2014	0.2568	0.0831	0.1737	399.9		
6/2/2014	0.3486	0.1147	0.2339	534.4		
6/3/2014	0.5488	0.1834	0.3654	828.1		
6/4/2014	0.5619	0.1906	0.3713	834.9		sampling date
6/5/2014	0.5543	0.1829	0.3714	819.5		
6/6/2014	0.5359	0.1719	0.3640	788.2		
6/7/2014	0.5363	0.1671	0.3692	784.9		
6/8/2014	0.5346	0.1617	0.3729	778.5		
6/9/2014	0.5497	0.1613	0.3883	796.4		
6/10/2014	0.5618	0.1599	0.4019	809.9		
6/11/2014	0.5576	0.1538	0.4038	800.0		sampling date
6/12/2014	0.8394	0.1636	0.6758	781.0		
6/13/2014	1.1283	0.1760	0.9522	776.8		
6/14/2014	1.4202	0.1892	1.2310	776.0		
6/15/2014	1.7244	0.2038	1.5206	781.0		
6/16/2014	2.0297	0.2183	1.8114	785.0		
6/17/2014	2.3516	0.2343	2.1172	793.6		
6/18/2014	2.6993	0.2525	2.4469	807.9		sampling date
6/19/2014	2.8363	0.2605	2.5758	811.4		
6/20/2014	3.1025	0.2802	2.8223	850.0		
6/21/2014	3.2011	0.2846	2.9165	841.4		
6/22/2014	3.2928	0.2884	3.0044	831.7		
6/23/2014	3.3320	0.2879	3.0442	810.0		
6/24/2014	3.4759	0.2964	3.1795	814.4		
6/25/2014	8.1676	0.6880	7.4796	1846.8		sampling date
6/26/2014	11.4477	0.9643	10.4833	2588.4		
6/27/2014	11.3521	0.9563	10.3958	2566.8		
6/28/2014	11.2954	0.9515	10.3439	2554.0		
6/29/2014	11.4523	0.9647	10.4876	2589.5		
6/30/2014	11.6139	0.9783	10.6355	2626.0		

Key Parameters Sites 1-3, 5-7
Periods 1-6 (See Notes & Assumptions)
***Projected Full Capacity Utilization**

Site	Parameter	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Nubbin Slough	Cost per Day*	$1,294	$895	$818	$ 720	$ 818	$ 1,592
Nubbin Slough	P Removal per Day*	25.34	27.52	27.18	23.81	23.93	22.26
Nubbin Slough	Cost/Benefit $/lb. PV*	$51	$33	$30	$ 30	$ 34	$ 72
Nubbin Slough	Cost/Benefit $/lb. Amortized Loan*	N/A	N/A	N/A	$ 70	$ 80	$ 166
Nubbin Slough	# Days in Period	365	365	206	274	365	365
Nubbin Slough	On-line Days Flow>0	319	241	125	194	355	348
Nubbin Slough	Flow Average per day in cfs	1.2	0.5	1.9	1.5	1.1	1.0
Nubbin Slough	Capacity per day in cfs	7.4	7.4	7.4	7.4	7.4	7.4
Nubbin Slough	% Capacity Utilization	16%	7%	26%	20%	15%	14%
Nubbin Slough	Total Flow in millions of gallons	245.1	81.0	154.7	183.5	255.8	235.7
Nubbin Slough	Ave. FW TP Conc. In µg/L	905	794	792	819	775	799
Nubbin Slough	Ave. FW TP Conc. Out µg/L	274	73	109	231	169	247
Nubbin Slough	% Change TP Conc. In vs. Out	70%	91%	86%	72%	78%	69%
Nubbin Slough	Total TP Removal in lbs.	1,299	466	879	914	1,280	1,097
Nubbin Slough	Comments	Trials	Limerock				Limerock
Ideal Grove	Cost per Day*	$284	$144	$227	$ 454	$ 284	$ 383
Ideal Grove	P Removal per Day*	1.49	1.71	2.10	2.79	4.21	5.71
Ideal Grove	Cost/Benefit $/lb. PV*	$191	$85	$108	$ 163	$ 67	$ 67
Ideal Grove	Cost/Benefit $/lb. Amortized Loan*	N/A	N/A	N/A	$ 379	$ 157	$ 156
Ideal Grove	# Days in Period	365	365	206	274	365	365
Ideal Grove	On-line Days Flow>0	N/A	253	148	261	341	362
Ideal Grove	Flow Average per day in cfs	0.3	0.3	0.2	0.1	0.1	0.1
Ideal Grove	Capacity per day in cfs	1.3	1.3	1.3	1.3	1.3	1.3
Ideal Grove	% Capacity Utilization	24%	19%	14%	10%	8%	9%
Ideal Grove	Total Flow in millions of gallons	18	18	18	21	23	27
Ideal Grove	Ave. FW TP Conc. In µg/L	N/A	258	347	421	623	862
Ideal Grove	Ave. FW TP Conc. Out µg/L	N/A	16	50	19	24	48
Ideal Grove	% Change TP Conc. In vs. Out	N/A	94%	86%	96%	96%	94%
Ideal Grove	Total TP Removal in lbs.	83	84	45	71	117	183
Ideal Grove	Comments	Trials					
Mosquito Creek	Cost per Day*	$746	$609	$927	$ 1,112	$ 1,684	$ 1,408
Mosquito Creek	P Removal per Day*	13.89	8.78	11.56	11.38	13.68	15.93
Mosquito Creek	Cost/Benefit $/lb. PV*	$54	$69	$80	$ 98	$ 123	$ 88
Mosquito Creek	Cost/Benefit $/lb. Amortized Loan*	N/A	N/A	N/A	$ 228	$ 287	$ 206
Mosquito Creek	# Days in Period	365	365	206	274	365	365
Mosquito Creek	On-line Days Flow>0	N/A	312	131	229	335	302
Mosquito Creek	Flow Average per day in cfs	1.2	1.5	2.3	1.5	1.6	1.7

Key Parameters Sites 1-3, 5-7
Periods 1-6 (See Notes & Assumptions)
***Projected Full Capacity Utilization**

Site	Parameter	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Mosquito Creek	Capacity per day in cfs	6.0	6.0	6.0	6.0	6.0	6.0
Mosquito Creek	% Capacity Utilization	20%	24%	39%	26%	27%	28%
Mosquito Creek	Total Flow in millions of gallons	103.6	293.1	198.3	228.0	344.3	330.4
Mosquito Creek	Ave. FW TP Conc. In µg/L	N/A	345	506	435	541	640
Mosquito Creek	Ave. FW TP Conc. Out µg/L	N/A	61	149	85	118	150
Mosquito Creek	% Change TP Conc. In vs. Out	N/A	82%	70%	81%	78%	77%
Mosquito Creek	Total TP Removal in lbs.	373	664	591	669	1,214	1,357
Mosquito Creek	Comments	Trials	Limerock				
Lemkin Creek	Cost per Day*		$382	$527	$ 391	$ 460	$ 333
Lemkin Creek	P Removal per Day*		1.46	1.47	1.51	1.62	1.97
Lemkin Creek	P Removal per Day So. Pond*					1.74	2.30
Lemkin Creek	Cost/Benefit $/lb. PV*		$261	$359	$ 259	$ 283	$ 169
Lemkin Creek	Cost/Benefit $/lb. Amortized Loan*		N/A	N/A	$ 604	$ 659	$ 393
Lemkin Creek	Cost/Benefit $/lb. PV So. Pond*					$ 264	$ 145
Lemkin Creek	Cost/Benefit $/lb. Amortized Loan So. Pond*					$ 614	$ 337
Lemkin Creek	# Days in Period		365	206	274	365	365
Lemkin Creek	On-line Days Flow>0		338	129	267	361	358
Lemkin Creek	Flow Average per day in cfs		1.6	1.3	1.8	1.9	1.8
Lemkin Creek	Capacity per day in cfs		5.0	5.0	5.0	5.0	5.0
Lemkin Creek	% Capacity Utilization		31%	26%	37%	38%	36%
Lemkin Creek	Total Flow in millions of gallons		342.9	109.9	318.9	444.6	415.5
Lemkin Creek	Ave. FW TP Conc. In µg/L		85	76	87	85	101
Lemkin Creek	Ave. FW TP Conc. Out µg/L		30	22	31	24	29
Lemkin Creek	% Change TP Conc. In vs. Out		64%	71%	64%	71%	71%
Lemkin Creek	Ave. FW TP Conc. Out µg/L So. Pond					20	20
Lemkin Creek	% Change TP In vs. Out So. Pond					76%	80%
Lemkin Creek	Total TP Removal in lbs.		155	50	149	223	254
Lemkin Creek	Comments			Low Flows			
Wolff Ditch	Cost per Day*		$469	$577	$ 742	$ 1,188	$ 1,507
Wolff Ditch	P Removal per Day*		9.24	2.29	6.52	11.29	13.11
Wolff Ditch	P Removal per Day So. Pond*					14.42	13.86
Wolff Ditch	Cost/Benefit $/lb. PV*		$51	$252	$ 114	$ 105	$ 115
Wolff Ditch	Cost/Benefit $/lb. Amortized Loan*		N/A	N/A	$ 265	$ 245	$ 268
Wolff Ditch	Cost/Benefit $/lb. PV So. Pond*					$ 82	$ 109
Wolff Ditch	Cost/Benefit $/lb. Amortized Loan So. Pond*					$ 192	$ 253
Wolff Ditch	# Days in Period		365	206	274	365	365
Wolff Ditch	On-line Days Flow>0		350	155	262	357	364

Key Parameters Sites 1-3, 5-7
Periods 1-6 (See Notes & Assumptions)
*Projected Full Capacity Utilization

Site	Parameter	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Wolff Ditch	Flow Average per day in cfs		2.4	3.2	3.3	2.3	1.7
Wolff Ditch	Capacity per day in cfs		20.0	20.0	20.0	20.0	20.0
Wolff Ditch	% Capacity Utilization		12%	16%	17%	12%	8%
Wolff Ditch	Total Flow in millions of gallons		550.8	323.2	565.0	540.1	399.5
Wolff Ditch	Ave. FW TP Conc. In µg/L		114	44	95	156	146
Wolff Ditch	Ave. FW TP Conc. Out µg/L		28	23	35	52	24
Wolff Ditch	% Change TP Conc. In vs. Out		75%	48%	63%	66%	83%
Wolff Ditch	Ave. FW TP Conc. Out µg/L So. Pond					23	17
Wolff Ditch	% Change TP In vs. Out So. Pond					85%	88%
Wolff Ditch	Total TP Removal in lbs.		393	57	285	472	405
Wolff Ditch	Comments			Low Flows			
Grassy Island	Cost per Day*			$2,017	$ 1,457	$ 3,858	$ 3,763
Grassy Island	P Removal per Day*			22.12	16.17	63.43	64.26
Grassy Island	Cost/Benefit $/lb. PV*			$91	$ 90	$ 61	$ 59
Grassy Island	Cost/Benefit $/lb. Amortized Loan*			N/A	$ 210	$ 142	$ 136
Grassy Island	# Days in Period			206	231	365	365
Grassy Island	On-line Days Flow>0			125	120	314	362
Grassy Island	Flow Average per day in cfs			6.9	5.0	6.8	8.6
Grassy Island	Capacity per day in cfs			10.0	10.0	15.8	20.0
Grassy Island	% Capacity Utilization			69%	50%	62%	43%
Grassy Island	Total Flow in millions of gallons			554.2	388.3	1,373.6	2,012.8
Grassy Island	Ave. FW TP Conc. In µg/L			575	327	442	490
Grassy Island	Ave. FW TP Conc. Out µg/L			165	27	50	93
Grassy Island	% Change TP Conc. In vs. Out			71%	92%	89%	81%
Grassy Island	Total TP Removal in lbs.			1,897	971	4,493	6,670
Grassy Island	Comments			Start-Up	Construction	Construction	PAC
Total Systems	Total TP Removal in lbs.	1,754	1,763	3,519	3,058	7,799	9,965
Total Systems	Total Flow in millions of gallons					2,982	3,421
Sites 1-3, 5-6	Period Start	11/21/2008	3/9/2010	3/9/2011	10/1/2011	7/1/2012	7/1/2013
Sites 1-3, 5-6	Period End	11/20/2009	3/8/2011	9/30/2011	6/30/2012	6/30/2013	6/30/2014
Site 7	Period Start			7/11/2011	11/13/2011	7/1/2012	7/1/2013
Site 7	Period End (Period 3 Extended)			11/12/2011	6/30/2012	6/30/2013	6/30/2014

HWTT

Estimated Replacement Costs Order of Magnitude Excluding Labor & Overhead
in 2010 - 2013 dollars (See Note)

System Life in Years 50

Net Discount Rate Compounded Annually
(6% ROR less 2% inflation) 4%

RC = Replacement Cost

Item	Average Estimated Life	Estimated RC* in 2010 - 2013 Dollars	PV* in 2010 - 2013 Dollars	Year 2020	Year 2030	Year 2040	Year 2050	# of Replace-ments
Site 1 Nubbin Slough								
Pumps	10	$ 14,000	$ 23,100	$ 9,500	$ 6,400	$ 4,300	$ 2,900	4
Limerock (projected life 5-10 years)	10	34,110	56,200	23,000	15,600	10,500	7,100	4
Monitoring & Control Equipment	10	20,000	33,000	13,500	9,100	6,200	4,200	4
Total Replacement Cost		$ 68,110	$ 112,300	$ 46,000	$ 31,100	$ 21,000	$ 14,200	
Site 2 Ideal Grove								
Pumps	10	$ 4,000	$ 6,500	$ 2,700	$ 1,800	$ 1,200	$ 800	4
Limerock (projected life 5-10 years)	10	-	-	-	-	-	-	4
Monitoring & Control Equipment	10	8,000	13,300	5,400	3,700	2,500	1,700	4
Total Replacement Cost		$ 12,000	$ 19,800	$ 8,100	$ 5,500	$ 3,700	$ 2,500	
Site 3 Mosquito Creek								
Pumps	10	$ 16,000	$ 26,300	$ 10,800	$ 7,300	$ 4,900	$ 3,300	4
Limerock (projected life 5-10 years)	10	35,000	57,700	23,600	16,000	10,800	7,300	4
Monitoring & Control Equipment	10	13,000	21,400	8,800	5,900	4,000	2,700	4
Total Replacement Cost		$ 64,000	$ 105,400	$ 43,200	$ 29,200	$ 19,700	$ 13,300	
Site 5 Lemkin Creek								
Pumps	10	$ 32,000	$ 52,800	$ 21,600	$ 14,600	$ 9,900	$ 6,700	4
Limerock (projected life 5-10 years)	10	8,750	14,400	5,900	4,000	2,700	1,800	4
Monitoring & Control Equipment	10	16,000	26,300	10,800	7,300	4,900	3,300	4
Total Replacement Cost		$ 56,750	$ 93,500	$ 38,300	$ 25,900	$ 17,500	$ 11,800	
Site 6 Wolff Ditch								
Pumps	10	$ 59,000	$ 97,300	$ 39,900	$ 26,900	$ 18,200	$ 12,300	4
Limerock (projected life 5-10 years)	10	8,750	14,400	5,900	4,000	2,700	1,800	4
Monitoring & Control Equipment	10	18,000	29,600	12,200	8,200	5,500	3,700	4
Total Replacement Cost		$ 85,750	$ 141,300	$ 58,000	$ 39,100	$ 26,400	$ 17,800	
Site 7 Grassy Island through Phase III								
Pumps	10	212,450	$ 350,300	$ 143,500	$ 97,000	$ 65,500	$ 44,300	4
Limerock (projected life 5-10 years)	10	77,050	127,100	52,100	35,200	23,800	16,000	4
Monitoring & Control Equipment	10	81,450	134,300	55,000	37,200	25,100	17,000	4
Total Replacement Cost		$ 370,950	$ 611,700	$ 250,600	$ 169,400	$ 114,400	$ 77,300	
Total Replacement Costs		$ 657,560	$ 1,084,000					

Note: The information contained herein is based upon a set of assumptions including estimated current year costs, life & discount rates.

HWTT

Estimated Replacement Costs Order of Magnitude Excluding Labor & Overhead

Determination of Future Value & Present Value in 2010 - 2013 dollars (See Note)

ROR	Inflation
6.0%	2.0%

2020		2030		2040		2050		50 years	
Future Value	Present Value	Future Value	Present Value	Future Value	Present Value	Future Value	Present Value	Total Present Value	Difference Net vs. 2 Step Calc.
$ 17,066	$ 9,500	$ 20,803	$ 6,500	$ 25,359	$ 4,400	$ 30,913	$ 3,000	$ 23,400	
41,580	23,200	50,686	15,800	61,786	10,800	75,316	7,300	57,100	
24,380	13,600	29,719	9,300	36,227	6,300	44,161	4,300	33,500	
$ 83,026	$ 46,300	$ 101,208	$ 31,600	$ 123,372	$ 21,500	$ 150,390	$ 14,600	$ 114,000	$ (1,700)
$ 4,876	$ 2,700	$ 5,944	$ 1,900	$ 7,245	$ 1,300	$ 8,832	$ 900	$ 6,800	
-	-	-	-	-	-	-	-	-	
9,752	5,400	11,888	3,700	14,491	2,500	17,664	1,700	13,300	
$ 14,628	$ 8,100	$ 17,831	$ 5,600	$ 21,736	$ 3,800	$ 26,496	$ 2,600	$ 20,100	$ (300)
$ 19,504	$ 10,900	$ 23,775	$ 7,400	$ 28,982	$ 5,000	$ 35,329	$ 3,400	$ 26,700	
42,665	23,800	52,008	16,200	63,398	11,000	77,281	7,500	58,500	
15,847	8,800	19,317	6,000	23,548	4,100	28,705	2,800	21,700	
$ 78,016	$ 43,500	$ 95,101	$ 29,600	$ 115,927	$ 20,100	$ 141,315	$ 13,700	$ 106,900	$ (1,500)
$ 39,008	$ 21,800	$ 47,550	$ 14,800	$ 57,964	$ 10,100	$ 70,657	$ 6,900	$ 53,600	
10,666	6,000	13,002	4,100	15,849	2,800	19,320	1,900	14,800	
19,504	10,900	23,775	7,400	28,982	5,000	35,329	3,400	26,700	
$ 69,178	$ 38,700	$ 84,328	$ 26,300	$ 102,795	$ 17,900	$ 125,306	$ 12,200	$ 95,100	$ (1,600)
$ 71,921	$ 40,200	$ 87,671	$ 27,300	$ 106,870	$ 18,600	$ 130,274	$ 12,700	$ 98,800	
10,666	6,000	13,002	4,100	15,849	2,800	19,320	1,900	14,800	
21,942	12,300	26,747	8,300	32,605	5,700	39,745	3,900	30,200	
$ 104,529	$ 58,500	$ 127,420	$ 39,700	$ 155,324	$ 27,100	$ 189,339	$ 18,500	$ 143,800	$ (2,500)
$ 258,975	$ 144,600	$ 315,690	$ 98,400	$ 384,824	$ 67,000	$ 469,098	$ 45,600	$ 355,600	
93,924	52,400	114,492	35,700	139,565	24,300	170,129	16,500	128,900	
99,287	55,400	121,030	37,700	147,535	25,700	179,845	17,500	136,300	
$ 452,186	$ 252,400	$ 551,212	$ 171,800	$ 671,925	$ 117,000	$ 819,072	$ 79,600	$ 620,800	$ (9,100)
								$ 1,100,700	$ (16,700)

Note: The information contained herein is based upon a set of assumptions including estimated current year costs, life & discount rates

HWTT
Estimated Replacement Costs Order of Magnitude Excluding Labor & Overhead
in 2010 - 2013 dollars (See Note)
System Life in Years 50
Net Discount Rate Compounded Annually
(7% ROR less 2% inflation) 3%
RC = Replacement Cost

Item	Average Estimated Life in Years	Estimated RC* in 2010 - 2013 Dollars	Present Value* in 2010 - 2013 Dollars	Year 2020	Year 2030	Year 2040	Year 2050	# of Replace-ments
Site 1 Nubbin Slough								
Pumps	10	$ 14,000	$ 28,300	$ 10,400	$ 7,800	$ 5,800	$ 4,300	4
Limerock (projected life 5-10 years)	10	34,110	68,900	25,400	18,900	14,100	10,500	4
Monitoring & Control Equipment	10	20,000	40,300	14,900	11,100	8,200	6,100	4
Total Replacement Cost		$ 68,110	$ 137,500	$ 50,700	$ 37,800	$ 28,100	$ 20,900	
Site 2 Ideal Grove								
Pumps	10	$ 4,000	$ 8,000	$ 3,000	$ 2,200	$ 1,600	$ 1,200	4
Limerock (projected life 5-10 years)	10	-	-	-	-	-	-	4
Monitoring & Control Equipment	10	8,000	16,200	6,000	4,400	3,300	2,500	4
Total Replacement Cost		$ 12,000	$ 24,200	$ 9,000	$ 6,600	$ 4,900	$ 3,700	
Site 3 Mosquito Creek								
Pumps	10	$ 16,000	$ 32,300	$ 11,900	$ 8,900	$ 6,600	$ 4,900	4
Limerock (projected life 5-10 years)	10	35,000	70,500	26,000	19,400	14,400	10,700	4
Monitoring & Control Equipment	10	13,000	26,300	9,700	7,200	5,400	4,000	4
Total Replacement Cost		$ 64,000	$ 129,100	$ 47,600	$ 35,500	$ 26,400	$ 19,600	
Site 5 Lemkin Creek								
Pumps	10	$ 32,000	$ 64,500	$ 23,800	$ 17,700	$ 13,200	$ 9,800	4
Limerock (projected life 5-10 years)	10	8,750	17,600	6,500	4,800	3,600	2,700	4
Monitoring & Control Equipment	10	16,000	32,300	11,900	8,900	6,600	4,900	4
Total Replacement Cost		$ 56,750	$ 114,400	$ 42,200	$ 31,400	$ 23,400	$ 17,400	
Site 6 Wolff Ditch								
Pumps	10	$ 59,000	$ 119,000	$ 43,900	$ 32,700	$ 24,300	$ 18,100	4
Limerock (projected life 5-10 years)	10	8,750	17,600	6,500	4,800	3,600	2,700	4
Monitoring & Control Equipment	10	18,000	36,300	13,400	10,000	7,400	5,500	4
Total Replacement Cost		$ 85,750	$ 172,900	$ 63,800	$ 47,500	$ 35,300	$ 26,300	
Site 7 Grassy Island								
Pumps	10	$ 140,000	$ 282,300	$ 104,200	$ 77,500	$ 57,700	$ 42,900	4
Limerock (projected life 5-10 years)	10	77,050	155,300	57,300	42,700	31,700	23,600	4
Monitoring & Control Equipment	10	43,050	86,700	32,000	23,800	17,700	13,200	4
Total Replacement Cost		$ 260,100	$ 524,300	$ 193,500	$ 144,000	$ 107,100	$ 79,700	
Total Replacement Costs		$ 546,710	$ 1,102,400					

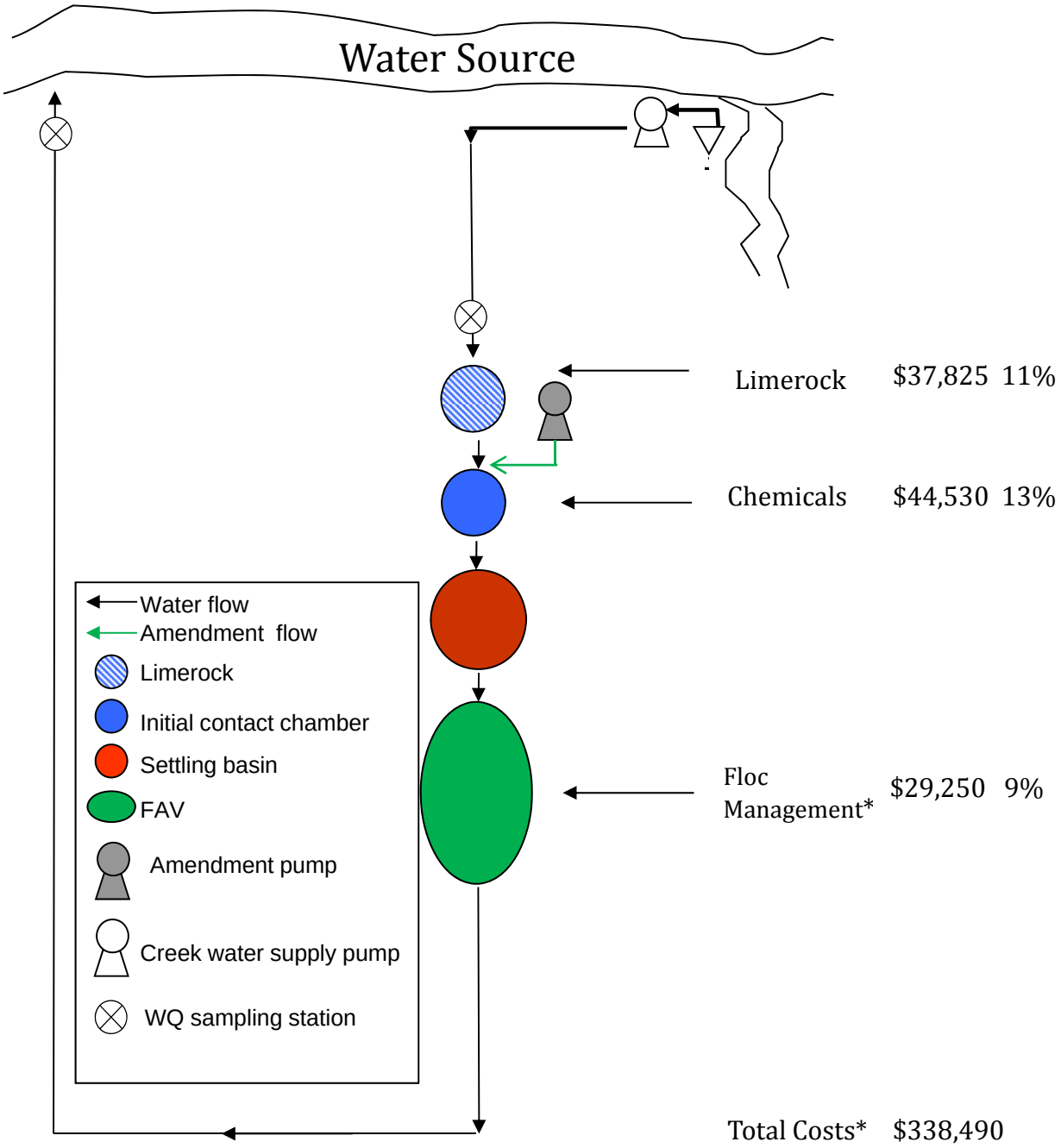
Note: The information contained herein is based upon a set of assumptions including estimated current year costs, life & discount rates

HWTT
Estimated Replacement Costs Order of Magnitude Excluding Labor & Overhead
in 2010 - 2013 dollars (See Note)
System Life in Years 50
Net Discount Rate Compounded Annually
(7% ROR less 2% inflation) 5%
RC = Replacement Cost

Item	Average Estimated Life in Years	Estimated RC* in 2010 - 2013 Dollars	Present Value* in 2010 - 2013 Dollars	Year 2020	Year 2030	Year 2040	Year 2050	# of Replace-ments
Site 1 Nubbin Slough								
Pumps	10	$ 14,000	$ 19,100	$ 8,600	$ 5,300	$ 3,200	$ 2,000	4
Limerock (projected life 5-10 years)	10	34,110	46,500	20,900	12,900	7,900	4,800	4
Monitoring & Control Equipment	10	20,000	27,200	12,300	7,500	4,600	2,800	4
Total Replacement Cost		$ 68,110	$ 92,800	$ 41,800	$ 25,700	$ 15,700	$ 9,600	
Site 2 Ideal Grove								
Pumps	10	$ 4,000	$ 5,500	$ 2,500	$ 1,500	$ 900	$ 600	4
Limerock (projected life 5-10 years)	10	-	-	-	-	-	-	4
Monitoring & Control Equipment	10	8,000	10,900	4,900	3,000	1,900	1,100	4
Total Replacement Cost		$ 12,000	$ 16,400	$ 7,400	$ 4,500	$ 2,800	$ 1,700	
Site 3 Mosquito Creek								
Pumps	10	$ 16,000	$ 21,800	$ 9,800	$ 6,000	$ 3,700	$ 2,300	4
Limerock (projected life 5-10 years)	10	35,000	47,800	21,500	13,200	8,100	5,000	4
Monitoring & Control Equipment	10	13,000	17,700	8,000	4,900	3,000	1,800	4
Total Replacement Cost		$ 64,000	$ 87,300	$ 39,300	$ 24,100	$ 14,800	$ 9,100	
Site 5 Lemkin Creek								
Pumps	10	$ 32,000	$ 43,600	$ 19,600	$ 12,100	$ 7,400	$ 4,500	4
Limerock (projected life 5-10 years)	10	8,750	11,900	5,400	3,300	2,000	1,200	4
Monitoring & Control Equipment	10	16,000	21,800	9,800	6,000	3,700	2,300	4
Total Replacement Cost		$ 56,750	$ 77,300	$ 34,800	$ 21,400	$ 13,100	$ 8,000	
Site 6 Wolff Ditch								
Pumps	10	$ 59,000	$ 80,500	$ 36,200	$ 22,200	$ 13,700	$ 8,400	4
Limerock (projected life 5-10 years)	10	8,750	11,900	5,400	3,300	2,000	1,200	4
Monitoring & Control Equipment	10	18,000	24,700	11,100	6,800	4,200	2,600	4
Total Replacement Cost		$ 85,750	$ 117,100	$ 52,700	$ 32,300	$ 19,900	$ 12,200	
Site 7 Grassy Island								
Pumps	10	$ 140,000	$ 191,000	$ 85,900	$ 52,800	$ 32,400	$ 19,900	4
Limerock (projected life 5-10 years)	10	77,050	105,000	47,300	29,000	17,800	10,900	4
Monitoring & Control Equipment	10	43,050	58,700	26,400	16,200	10,000	6,100	4
Total Replacement Cost		$ 260,100	$ 354,700	$ 159,600	$ 98,000	$ 60,200	$ 36,900	
Total Replacement Costs		$ 546,710	$ 745,600					

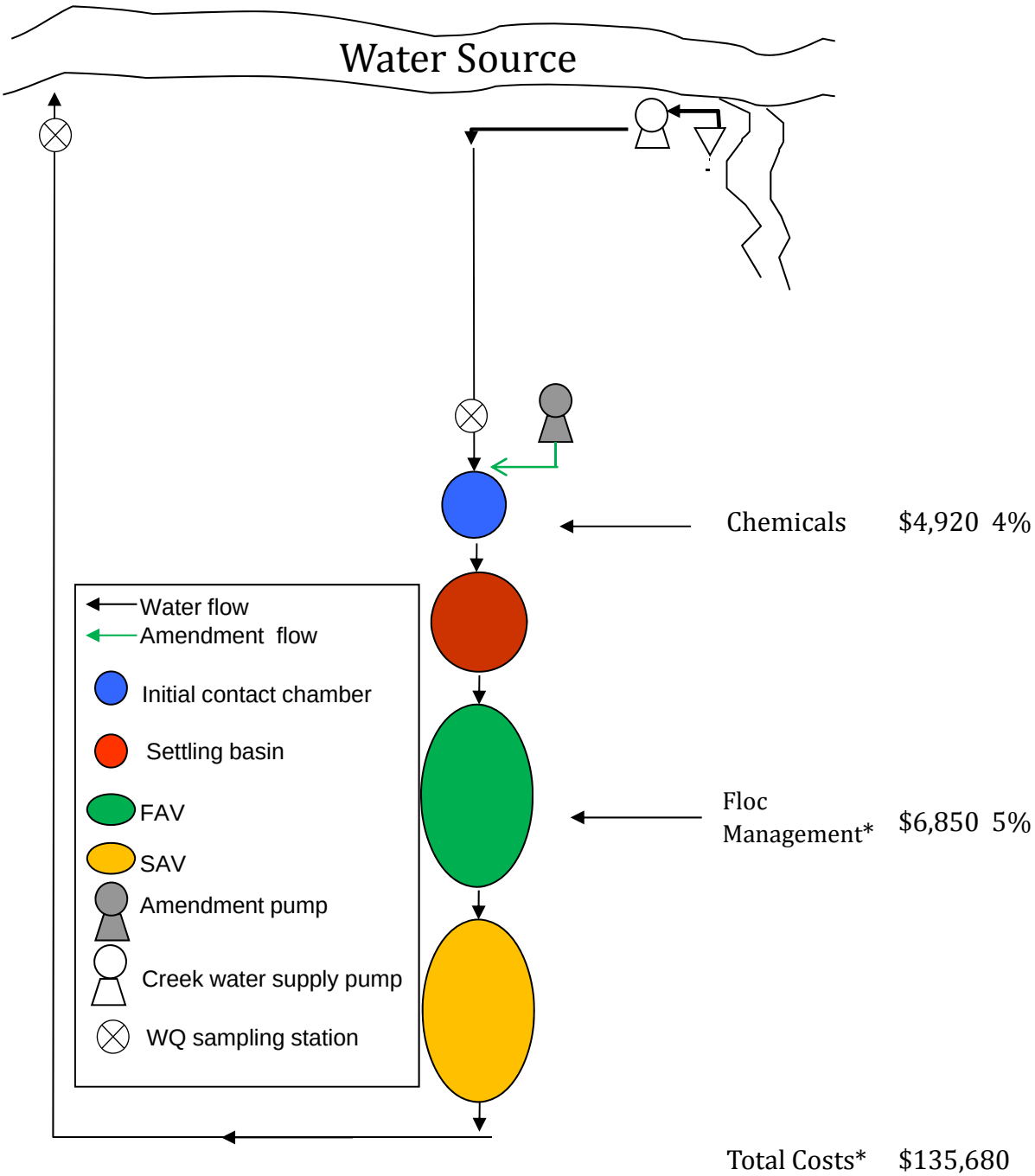
Note: The information contained herein is based upon a set of assumptions including estimated current year costs, life & discount rates

SITE 1 NUBBIN SLOUGH



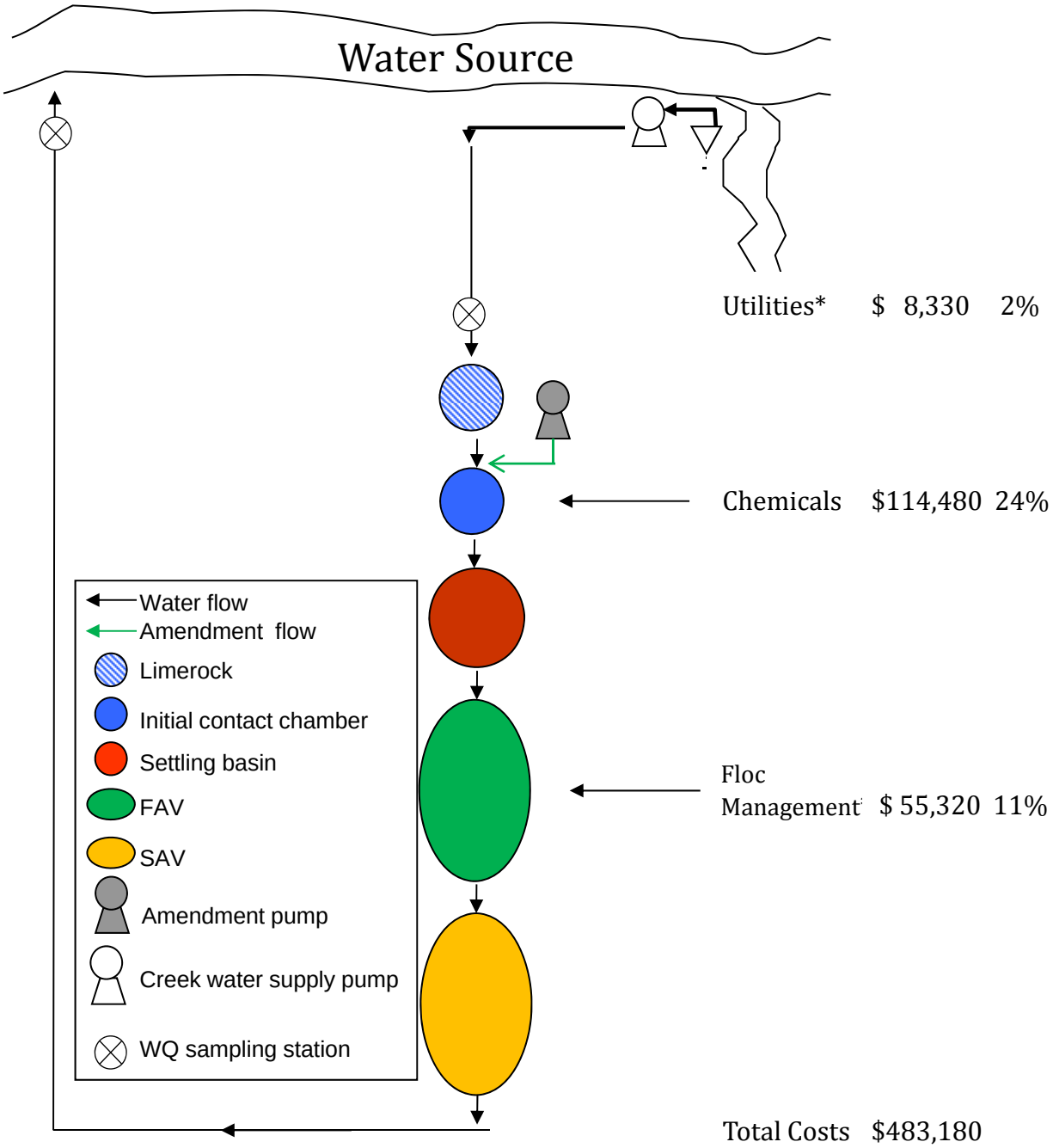
*Utilities paid by landowner. Limerock bed and floc management costs are semi-variable expenses.

SITE 2 IDEAL GROVE



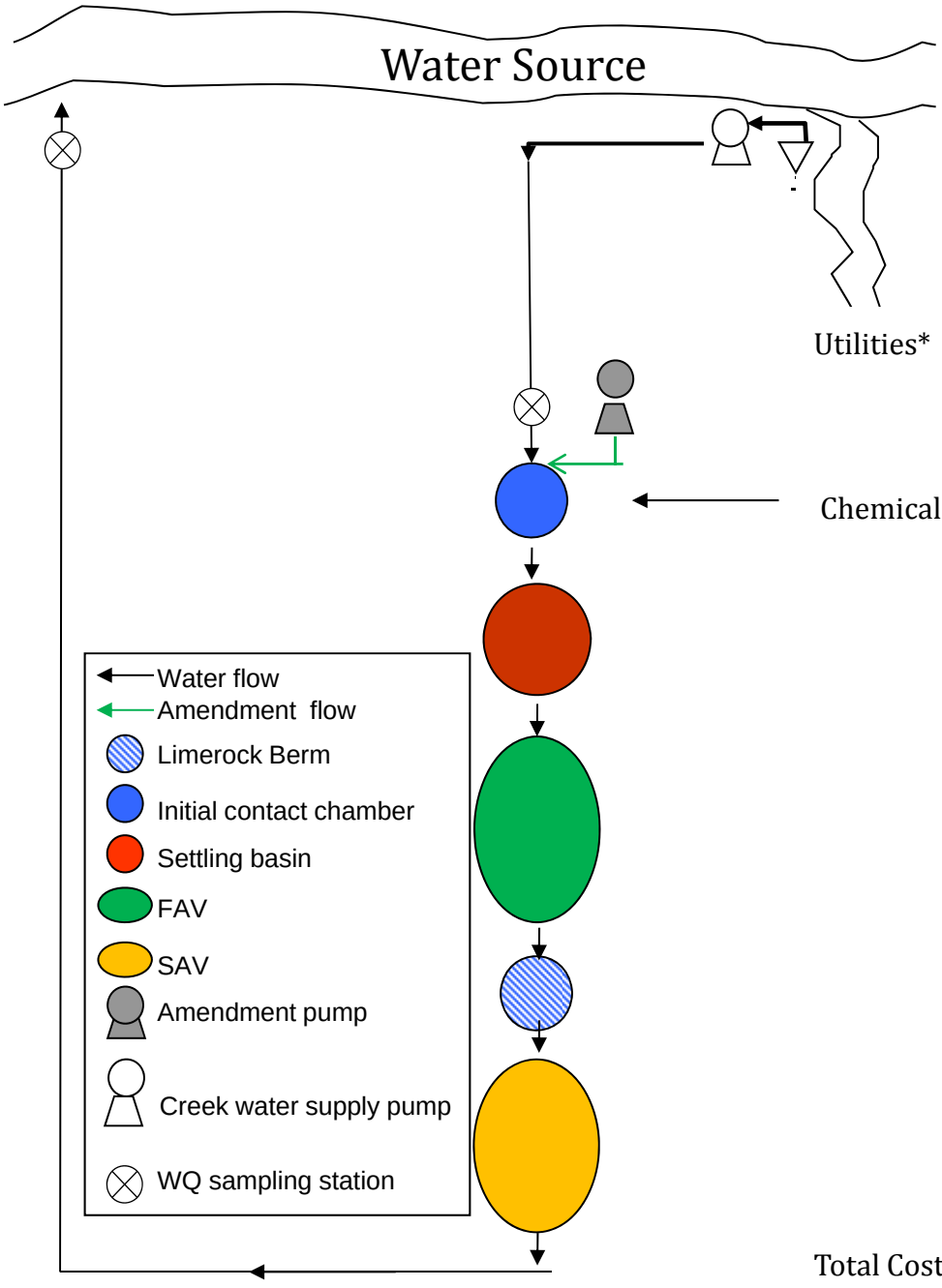
*Utilities paid by landowner. Floc management is a semi-variable expense.

SITE 3 MOSQUITO CREEK



*Utilities primarily associated with pump station, amendment injection & monitoring equipment. Floc management is a semi-variable expense.

SITE 5 LEMKIN CREEK



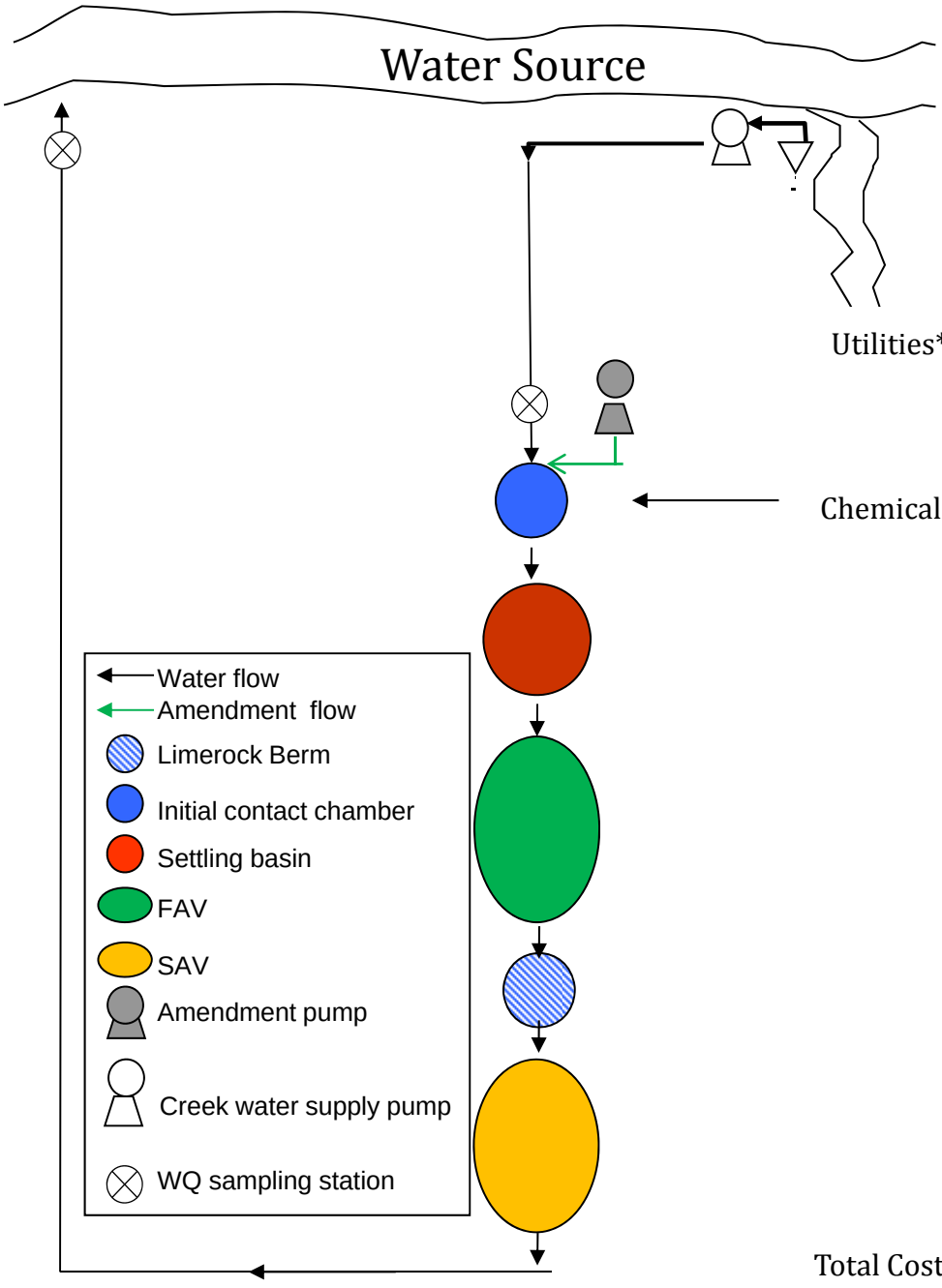
Utilities* $ 7,960 4%

Chemicals $14,085 7%

Total Costs $194,680

*Utilities primarily associated with pump station, amendment injection & monitoring equipment. Floc management costs have not been separately identified to date.

SITE 6 WOLFF DITCH



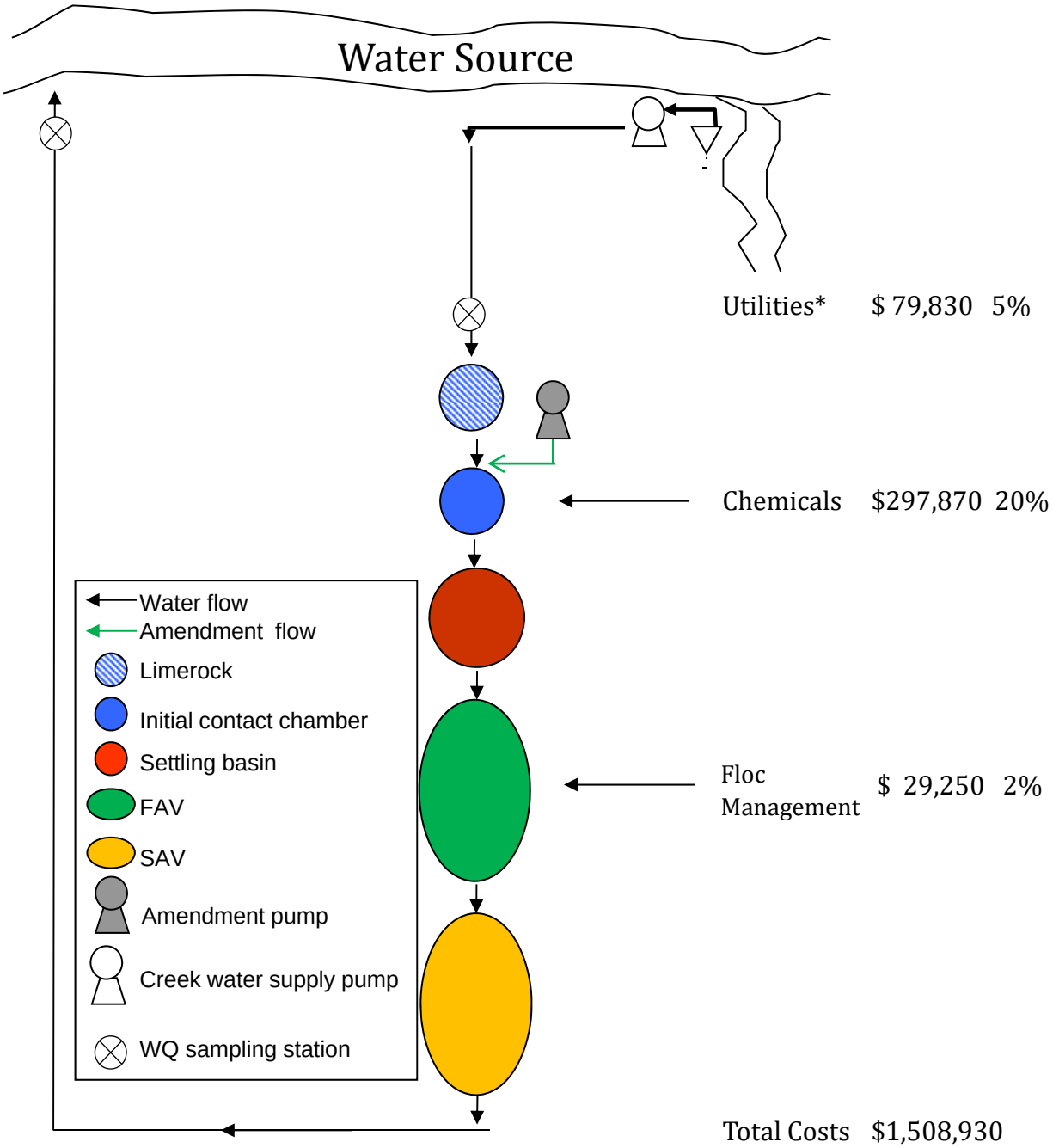
Utilities* $ 9,920 3%

Chemicals $ 47,960 14%

Total Costs $339,050

*Utilities primarily associated with pump station, amendment injection & monitoring equipment. Floc management costs have not been separately identified to date.

SITE 7 GRASSY ISLAND



*Utilities primarily associated with pump station, amendment injection & monitoring equipment. Floc management is a semi-variable expense.