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2005
Gulf Island Pond Monitoring Program
and Status of Effluent Discharges
from Rumford Paper Company,
International Paper-Jay,
and the Town of Livermore Falls



Department of Environmental Protection
Augusta, Maine

April 2006

EXECUTIVE SUMMARY

The Department of Environmental Protection (Department) conducted weekly aerial observations and limited water quality sampling of Gulf Island Pond (GIP) on the Androscoggin River during the summer of 2005. The Gulf Island Pond Partnership (GIPOP) conducted continuous monitoring of dissolved oxygen (DO) during the same time period. This report summarizes this monitoring. This report also summarizes results of effluent monitoring at Rumford Paper Company, International Paper-Jay, and the Town of Livermore Falls for water quality based discharge permit limits.

- There were no observations of widespread algal blooms on GIP, but there appeared to be possible localized blooms in some coves.
- Total phosphorus concentrations were statistically significantly lower than in 2004 and resulting chlorophyll-a concentrations were marginally lower as well.
- Secchi disk transparency was similar to that of 2004 but is not a good measure of algae in colored waterbodies like GIP.
- DO concentrations documented at least 58 days of non-attainment of the instantaneous 60% saturation criterion and at least 47 days of non-attainment of the monthly average criterion of 6.5 ppm at the Deep Hole station.
- DO concentrations documented at least 13 days of non-attainment of the instantaneous 60% saturation or 5 ppm criterion and at least 6 days of non-attainment of the monthly average criterion of 6.5 ppm at the Dam Site station.

Compared to river flows of 2004, those of 2005 were significantly higher for the first third of the season, about the same for the middle third and marginally, but consistently lower for the last third of the summer. Average temperatures were slightly higher during 2005 than 2004. These conditions allow general comparisons between years, but some differences could be due to these conditions.

The sampling program will be continued and expanded in future years to ensure attainment of water quality standards. Sampling will continue as a condition of the discharge permits for International Paper and Rumford Paper Company. The Department will also conduct additional aerial and water quality monitoring as needed.

Introduction

Water quality monitoring of Gulf Island Pond (GIP) on the Androscoggin River continued in the summer of 2005. The primary goal was to continue monitoring initiated in 2004 and earlier to determine attainment of water quality standards (WQS), including compliance with dissolved oxygen (DO) criteria and the presence/absence of algal blooms. A second goal was to gather more data to help refine total phosphorus (TP) and chlorophyll-a (CHL) thresholds for algal blooms. A third goal was to determine how much increased attainment of WQS resulted from recent reductions in point source discharges.

An algae bloom in Maine lakes is currently defined as a planktonic growth of algae which causes Secchi disk (SD) transparency to be less than 2 meters (Department Regulation Chapter 581). However, in waters where color exceeds 30 PCU, (platinum cobalt units), which is the case in GIP, SD may be significantly influenced by color as well as the presence of algae. Therefore, for these waters, CHL is a better measure of blooms. In lakes, blooms have been associated with CHL concentrations greater than 8 ppb. Given higher current velocities, rivers may have higher thresholds of CHL for blooms. Also, observations of a bloom by the general public include an aspect of visibility, which is affected by light, sky cover, and turbulence (velocity, wind and wave action) on the surface of the water. Although GIP is legally classified as a river, it sometimes acts like a lake or a hybrid of the two where the algae are not uniformly distributed as would be expected in a lake. The CHL threshold for a bloom in GIP, then, may be different, likely in the range of 8-12 ppb. The Department's Total Maximum Daily Load (TMDL) for GIP, approved by EPA on July 18, 2005, sets a pond average value of 10 ppb CHL as the interim goal. For calculation of the pond average, CHL will be included at those stations where a bloom has been observed. The TMDL also specifies that annual monitoring will continue in order to further refine the CHL threshold for blooms.

Given the uncertainty in knowing the threshold for an algae bloom in GIP, in 2004 and 2005 water quality data specific to GIP were collected and correlated to observations of bloom conditions. Aerial observations of blooms were documented visually in conjunction with ambient monitoring of CHL. In 2004, pond average CHL was 10.3 ppb on August 4, when a widespread bloom was observed. Nevertheless, critical conditions of low flow and high temperature did not occur in 2004, making it difficult to determine a threshold. As the TMDL states, multiple years of data, including under low flow conditions, will be required to conclude water quality standards have been attained.

There were three parts to the 2005 monitoring program, 1) aerial flight observations by Department of the presence/absence of wide spread algal blooms, 2) water quality sampling at the Lower Narrows station during the aerial flights, and 3) continuous monitoring of temperature and dissolved oxygen at Turner (Center) Bridge, the deep hole station, and dam station by the GIPOP partnership. Each part will be discussed below.

1.A. Aerial Flight Observations-General

During the summer of 2005, the Department conducted weekly aerial monitoring of GIP and the Androscoggin River to determine the extent and conditions for algae blooms. The aerial monitoring was conducted by Department staff from a commercial seaplane base on the Androscoggin River in Turner. A 4-place seaplane was utilized and afforded the opportunity to land on the river to collect water chemistry data at the Lower Narrows (LN) monitoring station and to also collect water column samples at other locations if bloom conditions occurred. Observations were conducted weekly from June 1, through September 14th, 2005, with the exception of June 15th, July 6th, and August 31st when no flights were conducted due to weather conditions. The seaplane departed from Turner, scheduled for 1p.m. and proceeded to the LN station in order to collect water chemistry data.

There were eight (8) locations that were part of the aerial monitoring program. Moving from Gulf Island Dam upriver they have been denoted as:

- (1) Deep Hole-DH
- (2) Gulf Island Pond #4-GIP4;
- (3) Lower Narrows-LN;
- (4) Upper Narrows-UN;
- (5) Turner Center Bridge-TB;
- (6) Twin Bridges-TwB;
- (7) Androscoggin Lake-AL, and
- (8) Dead River Dam-DRD.

In addition, the monitoring effort included certain locations upriver from GIP in order to determine potential sources of nutrient loading to the watershed.

The route was northerly to the Upper Narrows monitoring station and northerly along the river to Center Bridge, Androscoggin Lake, Twin Bridges, and then to the International Paper-Jay mill and the Rumford Paper Company mill. A southerly route was then taken to the southerly-most monitoring stations (Gulf Island Pond monitoring station #4 and to the Deep Hole). At these locations photographs were taken from several aspects in order to collect representative images of the monitoring locations. Water samples were taken if needed based on observations. Digital photographs of the mill discharge outfalls were also taken. (see the Department's website at <http://www.maine.gov/Department/blwq/topic/gip/index.htm>) All data was recorded on a standard log sheet (Figure 1).

Based on the aerial monitoring observations, GIP did not experience any widespread algae blooms in 2005. Field notes for June 8 and August 17 mention the occurrence of pollen along some shorelines and in some coves. The June 8 date is within the normal period of release of pine pollen, which is the only pollen that accumulates on lakes to an observable extent. The August date is beyond the normal time for pine pollen, but in the period where local or widespread algal blooms have been observed in GIP in the past. Although not confirmed with a sample, this observation is likely not of pollen but most likely of the remnants of a local bloom or near bloom condition as in previous years.

In comparison, aerial observations in 2004 indicated a widespread bloom on August 4th and localized blooms on July 21st, August 25th, and September 8th. Pictures comparing widespread bloom conditions on August 4, 2004 and non bloom conditions at the same general location in 2005 are contained in Appendix A.

1.B. Aerial Flight Observations - Discharge Plumes

As part of the aerial monitoring program for GIP the Department also regularly flew upriver of GIP to Jay and Rumford to observe the outfall pipes for International Paper and Rumford Paper Company. This section summarizes aerial observations of those discharge points.

Rumford Paper: The primary discharge point for Rumford Paper is designated as Outfall #001A. Treated process wastewater is discharged from Outfall #001A into the Androscoggin River via a 36-inch steel pipe. The outfall is located between the lower hydroelectric station tailrace discharge points. There is no diffuser, mixer, or similar structure associated with this outfall. However, due to the turbulence and mixing of the tailrace discharge the effluent appears to achieve rapid mixing with the river. Aerial observations in 2005 indicated relatively little visible discharge plume below the discharge point.

International Paper: The primary discharge point for International Paper is designated as Outfall #001. The discharge is conveyed to the river through a submerged diffuser located on the westerly side of the Androscoggin River just upstream of the confluence with Allen Brook.

Aerial observations in 2005 indicated a consistently visible plume from this outfall. Of the 12 days that aerial observations were performed, the plume was visible on 11 days. The visibility of the plume varied over these days. On the most visible days the plume was observable to the Jay Dam approximately 3,200 feet below the outfall where it appeared to become completely mixed upon passing over the dam. On other days the plume appeared to dissipate prior to the Jay Dam. However, on August 3, 2005, one of the days the plume was most visible, the Department aerial observers noted that the Androscoggin River was discolored in some areas up to a distance of approximately 10 miles below the International Paper outfall. It is possible that this discoloration was not due to International Paper's discharge, but to some other factor such as stormwater runoff, as precipitation records for August 2nd and 3rd indicate localized rain events of up to 0.5 inches in the GIP area.

There has been concern voiced that these plumes could represent non-attainment of Maine's water quality standard for the designated use of recreation in and on the water. Maine law specifies that the discharge of pollutants may not cause the waters of the State to be unsuitable for their designated uses¹. However, Maine law allows for a reasonable opportunity for mixing with the receiving water prior to determination of attainment of water quality standards². This

¹ 38 M.R.S.A. §464.4. Discharge of pollutants to waters of the State that imparts color, taste, turbidity, toxicity, radioactivity or other properties that cause those waters to be unsuitable for the designated uses and characteristics ascribed to their class.

² 38 M.R.S.A. §451. After adoption of any classification by the Legislature for surface waters or tidal flats or sections thereof, it is unlawful for any person, firm, corporation, municipality, association, partnership, quasi-

reasonable opportunity for mixing is commonly referred to as the Zone of Initial Dilution (ZID). In the 1994 Waste Discharge Licensing action for International Paper, the Department concurred with an International Paper thermal discharge study that determined complete mixing of the effluent occurs at the USGS Monitoring Station approximately 2,200 feet downstream of outfall #001 (approximately 1,000 feet upstream of the Jay Dam), and accepted the area between outfall #001 and the USGS Monitoring Station as the ZID. Based on observations from the aerial flights it appears that the visible plume is generally contained within the area previously determined by the Department to be the ZID, however, on some occasions it appears that complete mixing did not occur until the Jay Dam.

It is believed that the plume is created by the presence of unsettled solids carried over from International Paper's wastewater treatment system. International Paper has identified projects in the *Mill Wide Phosphorus Study Final Report (12/30/05)* and the *Comprehensive Performance Evaluation (3/1/06)* the Department believes has the potential to minimize the visibility of the plume. These reports were required to evaluate options for complying with water quality based effluent limits³. While, these projects have been identified for compliance with water quality based effluent limitations, they have the potential to also reduce the visibility of the plume. At this point in time International Paper has not yet committed to undertaking these projects. The Department is currently reviewing both of these reports for compliance with Special Condition N, for approval, with or without conditions.

While it appears from aerial visual observations that the plume is generally contained within the accepted ZID, the Department is still concerned with the magnitude and visibility of the plume. The Department is currently researching water quality standards and regulations in other states to determine how visible plumes are regulated, and is evaluating whether or not modifications to Maine water quality standards or Department regulations are appropriate to address this issue.

During 2006 the Department will be conducting state wide public meetings followed by a public hearing as part of the triennial review of water quality standards. At that time the issue of visible discharge plumes will be brought before the public to solicit input about the level of public concern with the potential violation of recreational uses, and the possible need for revisions of water quality standards or Department regulations to address the concern.

The Department plans to continue the aerial observations of GIP and the discharge plumes in 2006 to monitor any changes. The Department also plans to conduct surface observations and water quality monitoring above and below International Paper's outfall to better characterize the plume as it is viewed from the water and from the land. Example photos of the plume from the 2005 aerial monitoring flights are contained in Appendix B.

municipal body, state agency or other legal entity to dispose of any pollutants, either alone or in conjunction with another or others, in such manner as will, after reasonable opportunity for dilution, diffusion or mixture with the receiving waters or heat transfer to the atmosphere, lower the quality of those waters below the minimum requirements of such classifications, or where mixing zones have been established by the Department, so lower the quality of those waters outside such zones, notwithstanding any exemptions or licenses which may have been granted or issued under sections 413 to 414-B.

³ Special Condition N *Schedule of Compliance* of the MEPDES/WDL issued 9/21/05.

Figure 1. Log Sheet Used in Recording the Monitoring Observations

**Gulf Island Pond Aerial Monitoring Pattern
(JUN-SEP 2005) Observations**

DATE: _____; STAFF: _____;
 ETD: _____; ETA: _____; SECCHI: _____ (M);
 WX: _____ (CLOUD); _____ (WINDS) _____ (misc)

Staff Schedule
 25May-Crowley-XWx
 01JUN-Harmon-AOK
 08JUN-Hahnel-AOK
 15JUN-Crowley-XWx
 22JUN-Hinkel-AOK
 29JUN-Harmon-AOK
 06JUL-Crowley-XWx
 13JUL-Garwood-AOK
 20JUL-Crowley-AOK
 27JUL-Crowley-AOK
 03AUG-Hinkel-AOK
 10AUG-Garwood-AOK
 17AUG-Hinkel-AOK
 24AUG-DeFranco-AOK
 31AUG-Harmon-xWx
 07SEP-Crowley-AOK
 14SEP-Harmon-AOK

Map Labels: Roxbury, Carmaux, Jay Mill, Rumford Mill, Inset View of Lower Androscoggin River, Twin Bridges, Center Bridge, GIPOP, Bubbling status, SPB, GIP #4, Deep Hole, Upper Narrows, Lower Narrows, AREA of DETAIL, Dead River Dam, Wayne, Leeds, Androscoggin Lake, Turner, Auburn, Lewiston, Sabattus, Greene, Livermore, Canton, Dixfield, Newington, Mill, Ford, Carmaux, Auburn, Lewiston, Sabattus, Greene, Livermore, Canton, Dixfield, Newington, Mill, Ford, Carmaux.

Scale: 0 0.5 1 2 Miles

Scale: 0 0.5 1 2 3 4 5 Miles

COMMENTS:

***ALGAE BLOOM? Y/N**
UNUSUAL COND? Y/N
PLUMES? Y/N

STAFF INITIALS _____

***COMMENTS:** _____
OTHER: _____

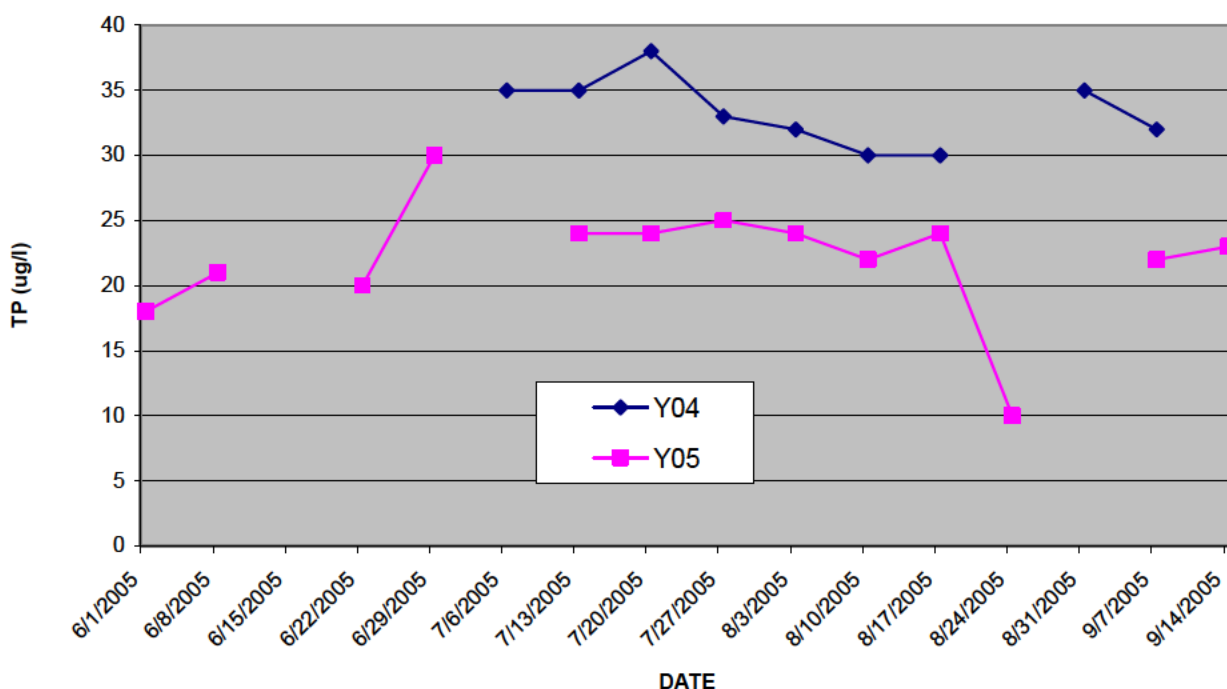
Androscoggin River 08AUG05 Flight Overview/DEP/DWRR/DS

2. Water Quality Samples

Water quality samples were collected each week by landing the seaplane at the LN monitoring station. Secchi disk (SD) transparency readings were taken and water samples were collected from a depth integrated core to twice the SD depth for chemical analysis for CHL and TP.

In 2005, at LN over the sampling timeframe TP ranged from 10-30 ug/l (Figure 2) and mean TP (22 ug/l) was significantly ($p=0.05$) lower than that of 2004 (33 ug/l).

Figure 2. TOTAL PHOSPHORUS AT LOWER NARROWS, GIP 2004-5

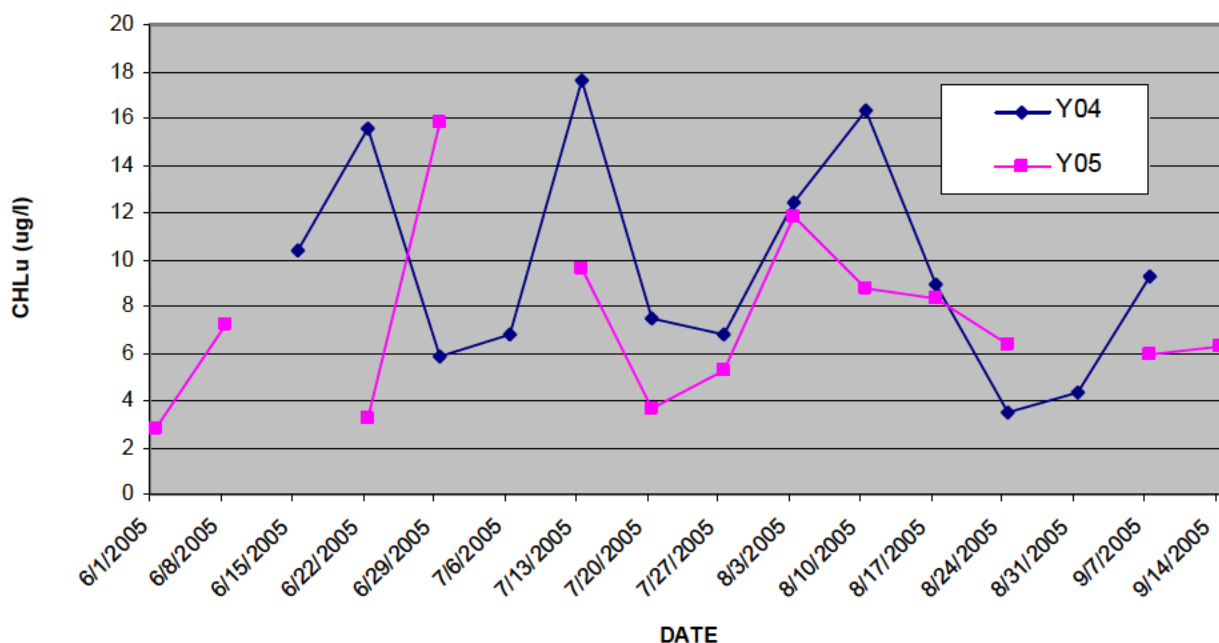


Uncorrected chlorophyll a (CHLu) concentrations may overestimate viable algal pigment by inclusion of degradation products but correlate better with transparency measurements than chlorophyll corrected (CHLc). Consequently both CHLc and CHLu are often measured. In 2005, at LN, uncorrected CHL concentrations (CHLu) ranged from 2.8-15.8 ug/l and appeared to be lower than those of 2004 for all but two dates (Figure 3). Mean CHLu in 2005 at LN (7.3 ug/l) appeared lower than that in 2004 (9.6 ug/l) but the difference was not significant ($p=0.168$). Corrected CHL (CHLc) was measured in 2004 but not in 2005 for most samples. Applying a ratio of corrected:uncorrected (0.77) found in 2004 to the 2005 samples and then comparing CHLc between years resulted in the difference being marginally significant ($p=0.082$).

There was a widespread bloom in 2004 (mean summer CHLu = 9.6 ug/l at LN) but not in 2005 (mean CHLu = 7.3 ug/l at LN). Actual CHLu and CHLc at LN during the pond wide bloom on

August 4, 2004 were 12.4 ug/l and 10.9 ug/l respectively, and the pond wide average CHLc was 10.3 ug/l. Both CHLu and CHLc were actually higher (16.3 ug/l and 13.6 ug/l respectively) at LN the following week on August 11, 2004, when only remnants of the bloom were observed in coves, but the pond wide average CHLc was lower (7.5 ug/l) than that of the previous week.

Figure 3. Uncorrected Chlorophyll a (CHLu) at Lower Narrows, GIP, 2004-2005

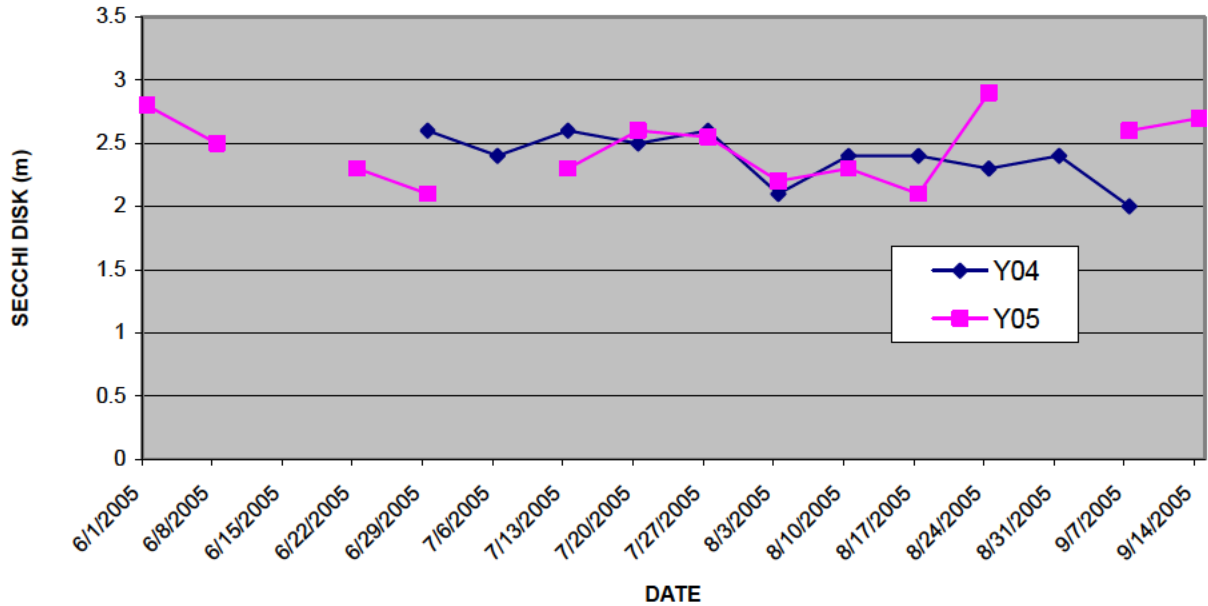


In 2005 CHLu at the LN site exceeded 8 ug/l four times, and ranged from 3-12 ug/l, yet there was no widespread bloom. The observation of what was probably a remnant of a local bloom or near bloom occurred on August 17 downstream of LN in coves near GIP 4 and DH at a CHLu of 8 ug/l at LN, although CHLu was 12 ug/l and 9 ug/l the previous two weeks, which is roughly the time of travel through GIP during low flow and the incubation time needed to develop a bloom.

These results point out that there is not a simple instantaneous relationship between CHL and algal blooms. Other factors like temperature, light, turbulence and residence time are important for creating observable blooms. From these limited data for 2004-2005, it appears the threshold for blooms in GIP continue to likely be in the range of 8-12 ug/l CHLu (7-10 ug/l CHLc). More data are needed for an accurate determination.

SD transparency ranged from 2.1-2.9 m in 2005 and was similar to that in 2004 (Figure 4). Since the color of the river, from 2004 data, at GIP is ~50 CPU, SD is not the best measure of algal blooms. Thus it is not surprising that SD was not different between these two years and TP and CHL did show marginal statistical differences.

Figure 4. SECCHI DISK TRANSPARENCY AT LOWER NARROW, GIP 2004-2005

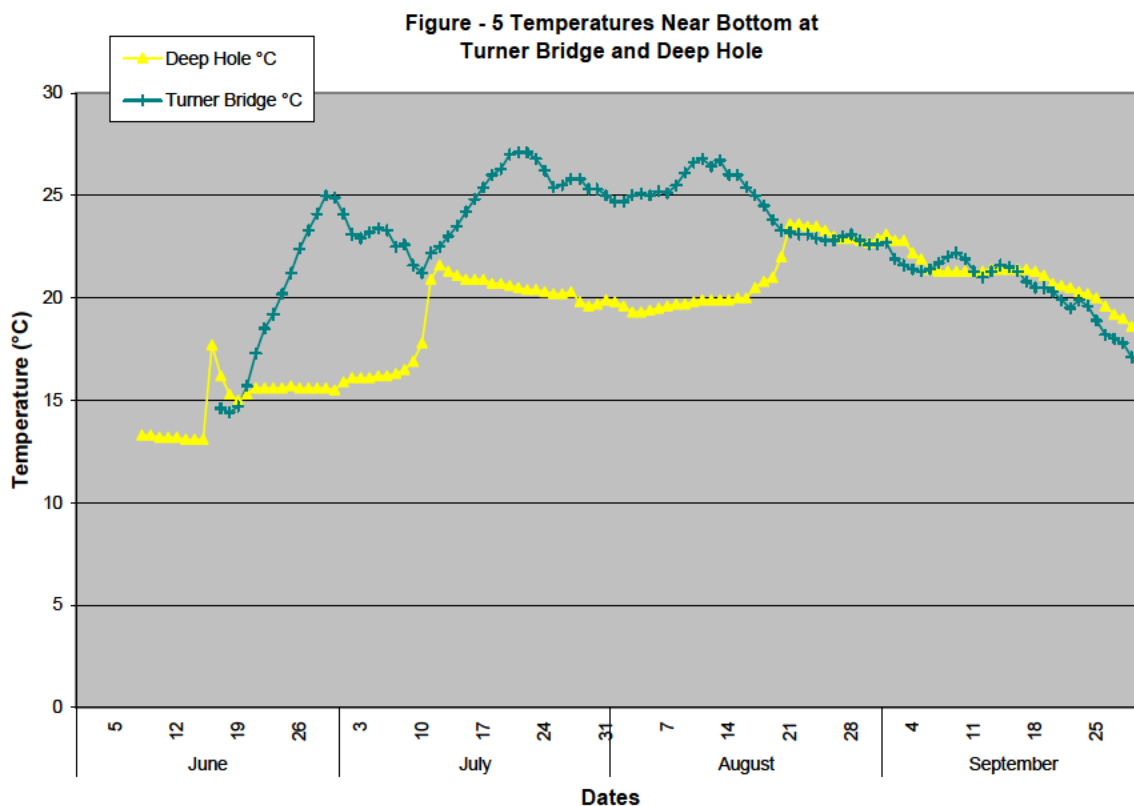


The ambient river flows in 2005 were characterized as generally similar to those of 2004 during the middle of the summer but slightly higher earlier and lower later. Average temperatures were slightly higher during 2005 than 2004. The similarity in conditions means that the data from the two years can be roughly compared.

3. Continuous Temperature and Dissolved Oxygen Monitoring

Continuous monitors for temperature, dissolved oxygen, and conductivity have been operated by Water Monitoring Services, Inc., a consultant to the GIPOP partnership at Turner Bridge, Deep Hole, and the Dam site for several years continuing through 2005 using YSI monitoring devices. Single depths near the bottom are monitored at the first two stations, whereas depths at 5, 20, 35, and 50 feet are monitored at the Dam.

For 2005, maximum temperature at the Turner Bridge was 28.0°C on July 22nd and the maximum 30 day average was 25.8°C, both of which are higher than 2004. In 2004, the daily maximum was 26.4 °C on August 4th and the maximum 30 day average was 23.9°C (2004 Data Report), which is almost two degrees cooler than 2005. On August 21, 2005, the temperatures at Turner Bridge and in the Deep Hole are essentially the same, indicating that the pond down to the depth of the probe is fully mixed and that the thermocline, if present, is at a depth lower than 50 feet (Figure 5). A similar event appears to have happened on July 10th & 11th, before the temperatures once again diverge.



During periodic maintenance of the floating monitoring platforms, vertical profiles were taken with measurements at 5 foot intervals at both the Deep Hole and the Gulf Island Pond Dam. The measurements were temperature, dissolved oxygen and specific conductance at the same interval. A total of ten sampling events were accomplished, covering the entire summer.

Monitors at Turner Center Bridge

There were two monitors labeled Turn I and Turn II at the Turner Center Bridge, located 2.7 miles downstream of the Nezinscot River and 3.1 miles above the oxygen system in Greene. The Turn I monitor was installed on June 1st, 2005 while the Turn II monitor did not begin monitoring until June 17th. The monitoring point for both probes is located 75 feet streamward from the right bank and 5 feet above the river bed. The Turn II monitor is located at the same monitoring point as Turn I to validate data recorded at Turn I. During the sampling season, the river was in attainment in this area.

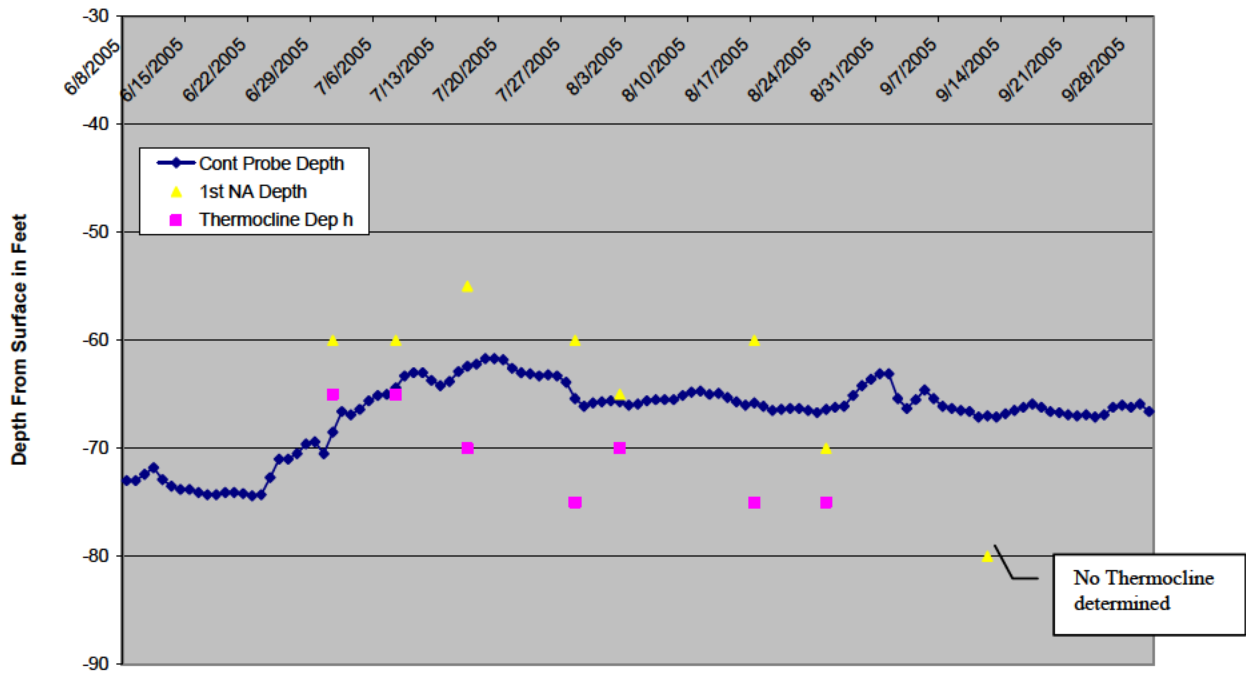
During this sampling season, minimum oxygen content was 5.9 mg/l, at 70% of saturation for Turn I on August 7th and 6.0 mg/l, at 72% of saturation at Turn II on August 6th. Maximum temperatures seen were 28.0°C at Turn I and 27.9°C at Turn II both on July 22nd. Minimum temperatures were recorded on June 1st at 12.2°C (Turn I) and on June 19 at 14.0°C (Turn II).

Deep Hole Data

The Deep Hole probe is anchored off the bottom of the river bed with the intent of having the probe at 65 feet below the surface. High flows in the early part of the summer caused the probe depth to be deeper than optimal with the probe being located below the thermocline. By early July the probe depth approached 65 feet, where it was above the thermocline and remained until it was removed. (Figure 6)

From the temperature data at Turner Bridge and the Deep Hole data, the location of the thermocline can be determined. The July 1st instantaneous data shows the presence of a thermocline. We estimate the thermocline was established about three days prior on June 28th. The June 24th profile shows that the pond is transitioning to a stratified state, but was not yet completely thermally stratified. Although the July 8th and July 16th data show the presence of a thermocline, there is evidence from the dissolved oxygen in the Deep Hole and the temperature readings from the monitors at the Deep Hole and Turner Bridge, that show the river was more or less completely mixed. This mixing only lasted a short time. Other events (September 12th and October 1st) show evidence of mixing, and do not meet the criteria of thermal stratification. It is estimated that the Deep Hole was fully mixed by September 3rd. There was no further evidence of thermal stratification.

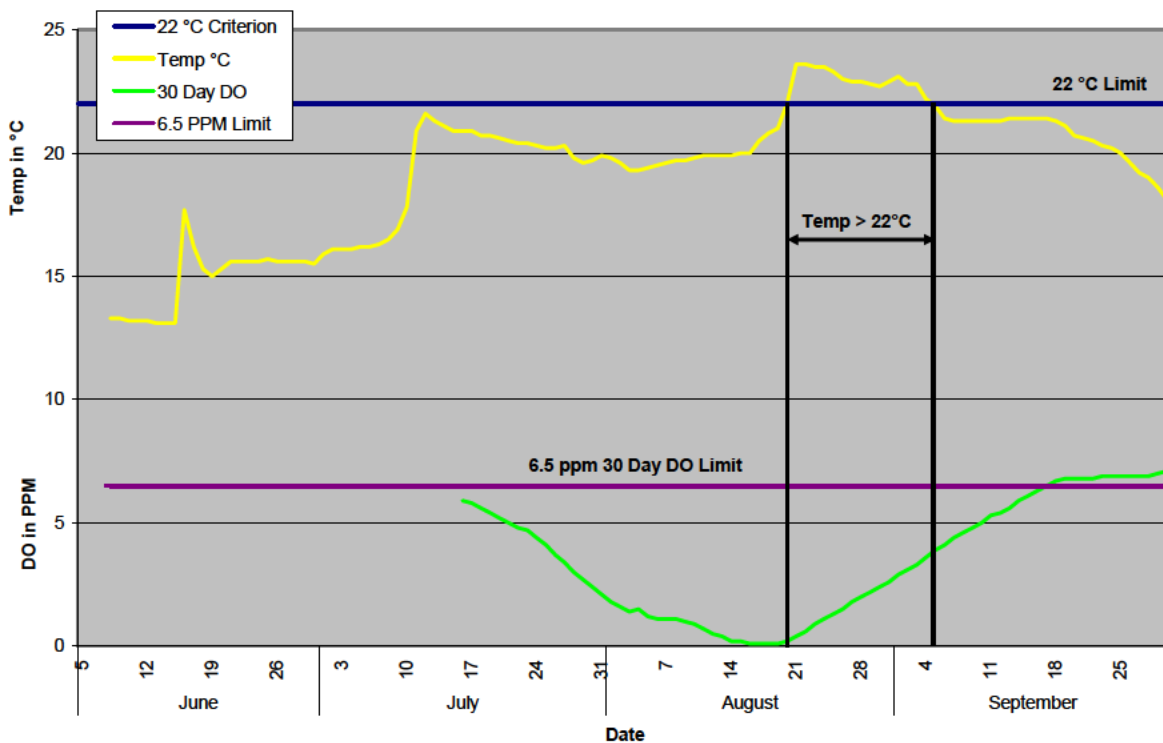
**Figure - 6 Trend Line Showing Deep Hole Monitor
Depth in Relation to Thermocline Depth and DO Non Attainment**



The depth of the thermocline varied as the summer progressed, ranging from 65 feet below the surface in the early part of the summer, to 75 feet below the surface in August. (Figure 6) The thermocline depth and the DO data shows that on most of these sampling days the Deep Hole was in non-attainment above the thermocline. It also, shows that after July 5th the probe was above the thermocline, so any continuous monitoring data collected after that date reflects non-attainment, although non-attainment above the thermocline but below the probe would not be detected.

Using the continuous monitoring data, there were at least 47 days of DO non-attainment based on the 30-day 6.5 ppm 22°C rolling average criterion. However, the data indicate that the actual number of days is higher, since from the start of the 30-day average, it never reaches attainment of 6.5 ppm. (Figure 7)

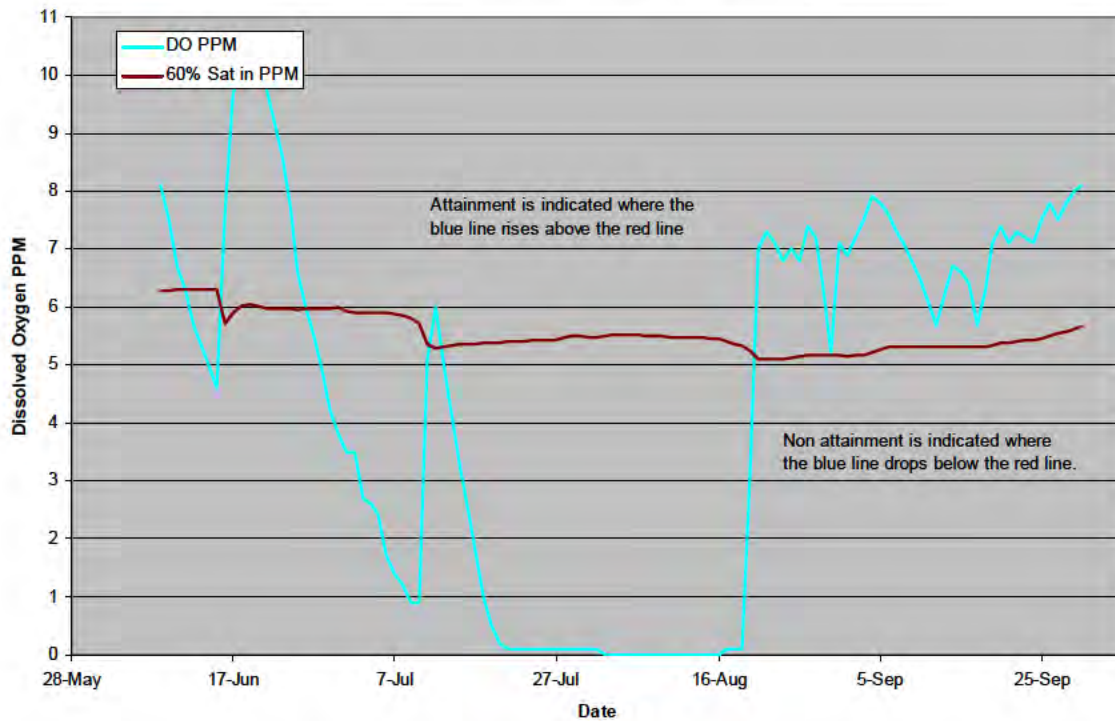
Figure - 7 Deep Hole Temperature and DO Using 22°C Criterion



38 M.R.S.A. §465.4.B specifies, “The dissolved oxygen content of Class C water may be not less than 5 parts per million (ppm) or 60% of saturation, whichever is higher.” Saturation levels vary based on water temperature because colder water holds higher levels of dissolved oxygen than warmer water. At temperatures exceeding 24.5 °C, the 5 ppm limit becomes the threshold and below that temperature, 60% saturation is higher. There were 58 days of non-attainment, all of the 60% criterion, because there were no days where the temperature reached 24.5°C in the Deep Hole. At no point during the summer did the water temperature increase to the point where 60% saturation was below 5.0 ppm, so the percent saturation criterion, not the 5.0 ppm criterion governed attainment (Figure 8).

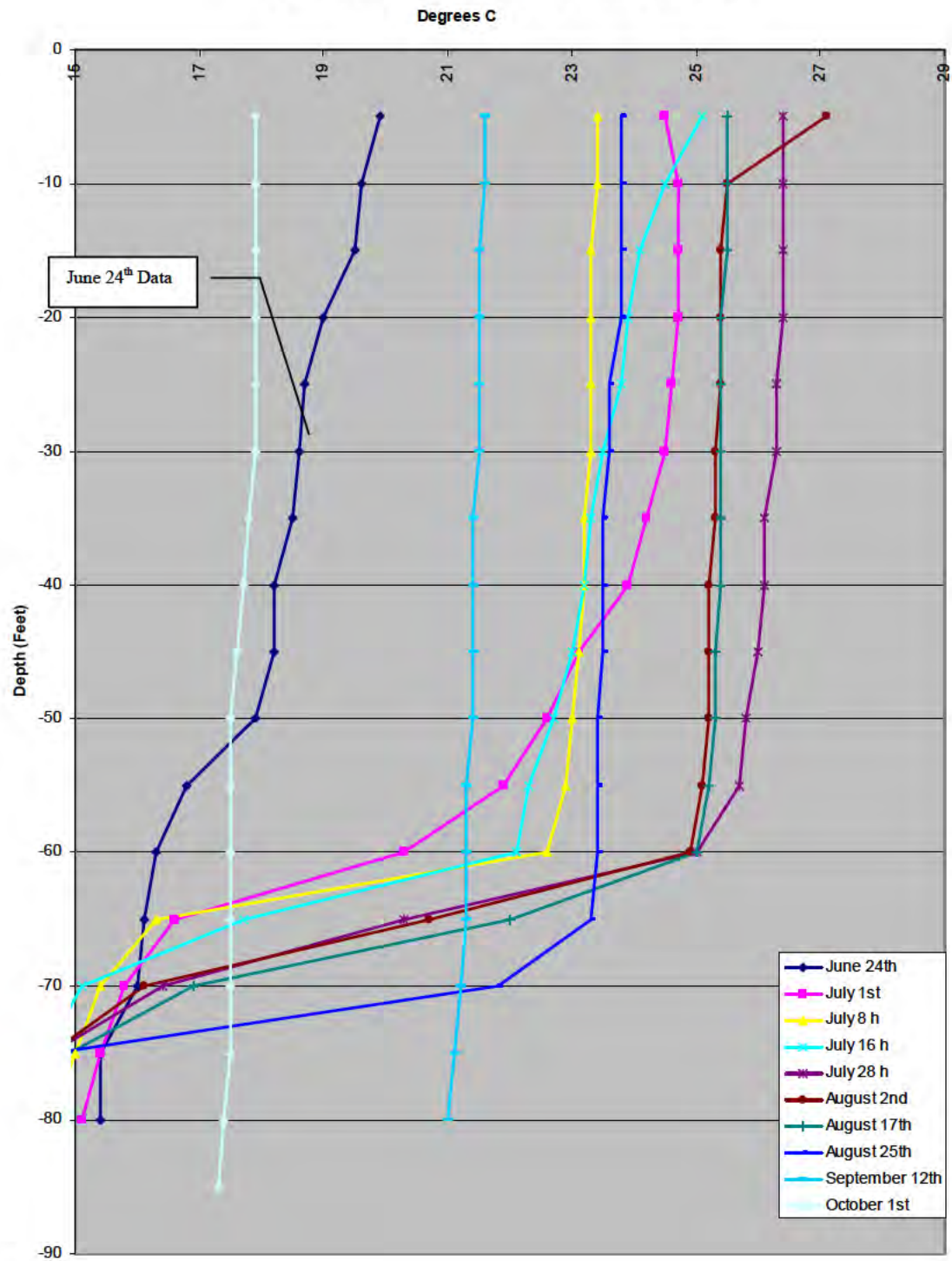
As discussed above, it is estimated that the thermocline was established on June 28th. The continuous monitoring probe was most likely below the thermocline as indicated by the July 1 & 8th data points (Figure 6). However, the vertical profile sampling event on July 1st does show non-attainment due to low DO. Since the data from the continuous probe on June 27th and July 6th are also non-attaining, we estimate that the days in between are also, non-attaining.

Figure - 8 Deep Hole Instantaneous DO Levels and 60% Saturation



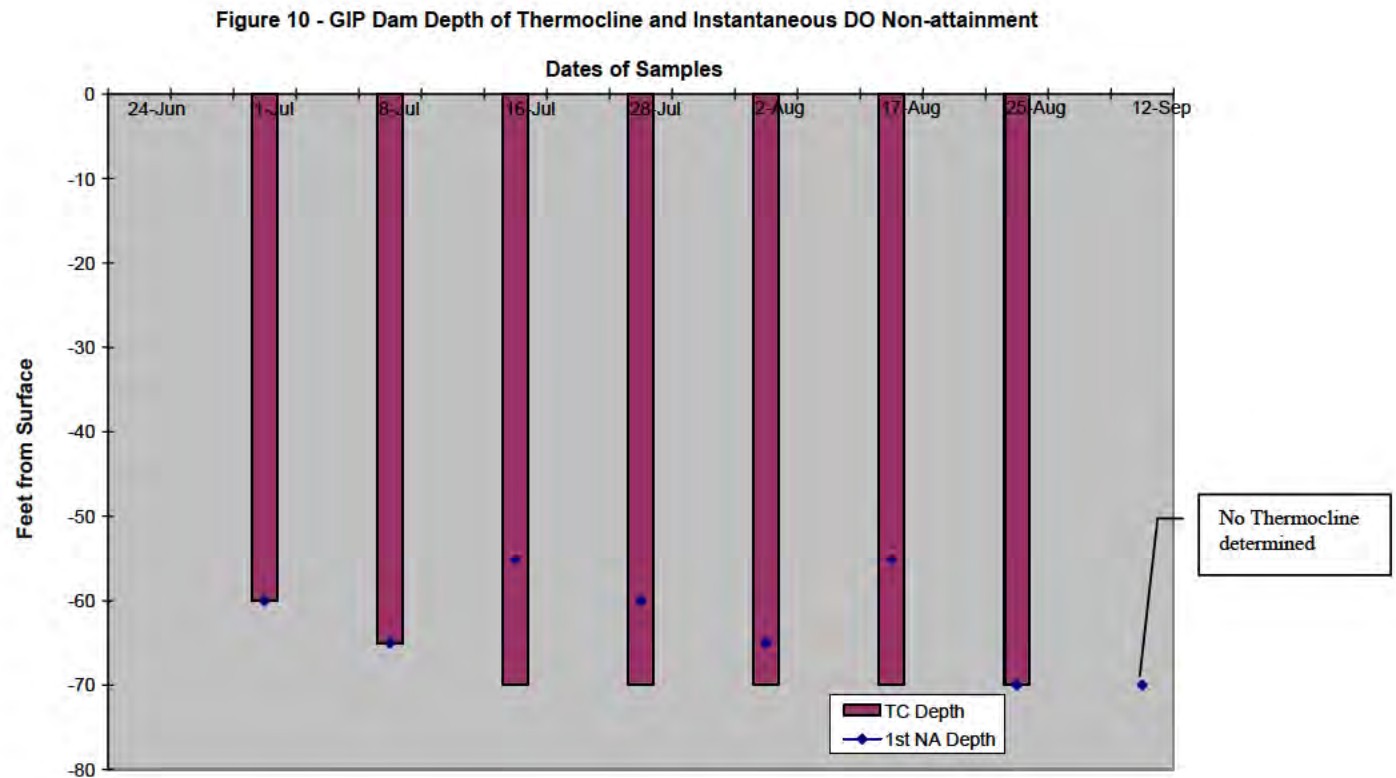
While the temperature profile (Figure 9) on June 24th does not indicate a thermocline, it does show that Gulf Island Pond at the Deep Hole was transitioning to the typical summer stratification as the trend line indicates. The sampling on June 24th does not show any non-attainment based on low DO levels.

Figure - 9 Deep Hole Temperature Profile at Depths



At Gulf Island Dam

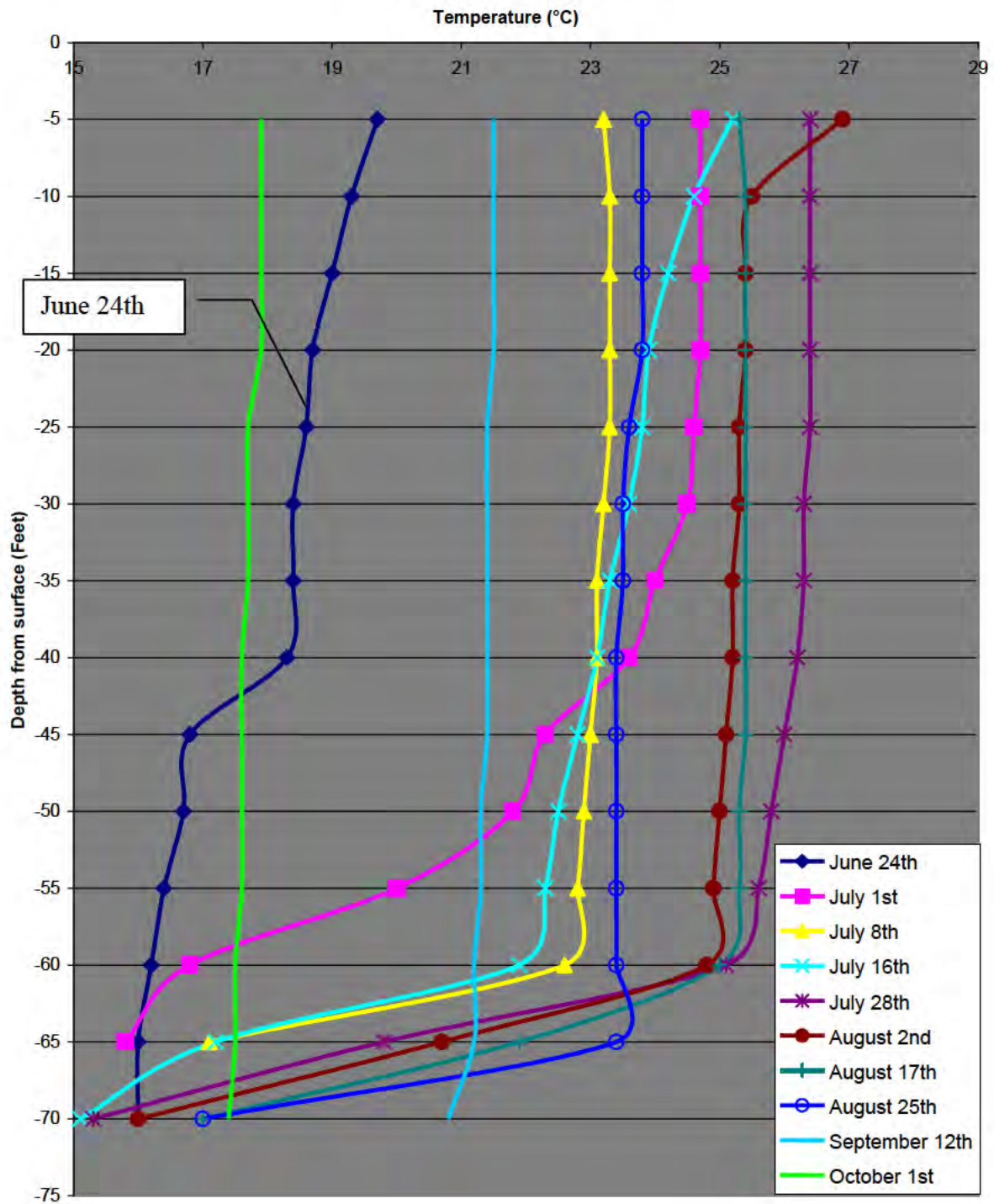
The sampling platform was located at a point 0.2 miles above Gulf Island Dam, 7.7 miles downstream of Turner Bridge and 4.6 miles below the oxygen injection system in Greene.



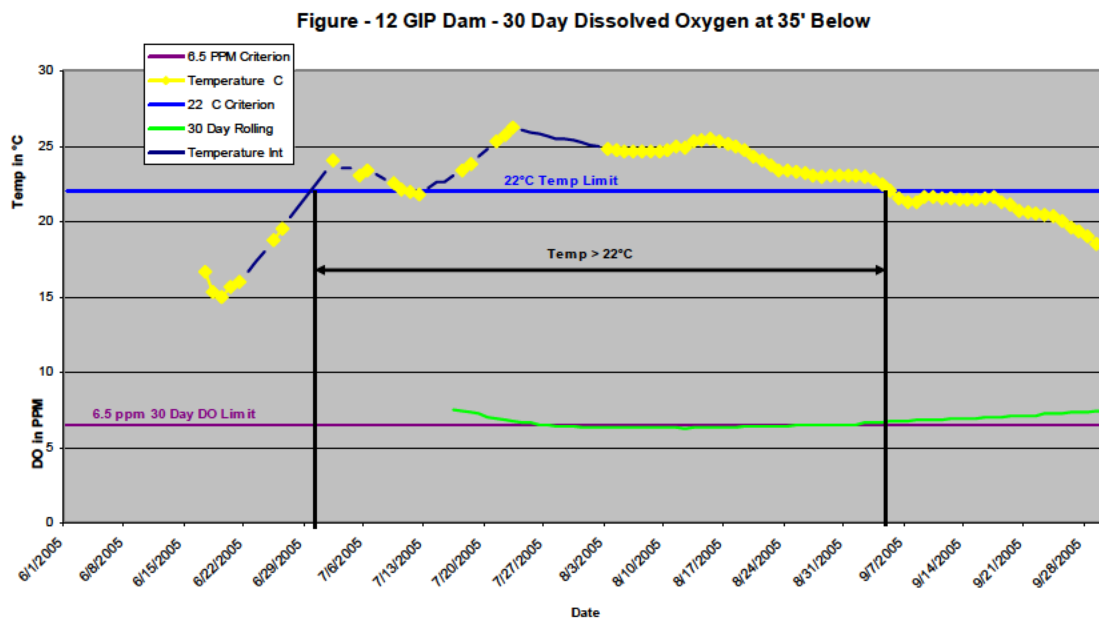
During the specific events where a thermocline was present, dissolved oxygen criteria were not met at a depth above the thermocline from mid-July to mid-August in the deeper portions of the sampling site (Figure 10).

The temperature profiles at the Dam site look similar to that at the Deep Hole. Measurements show that a thermocline was formed here by July 1st (Figure 11).

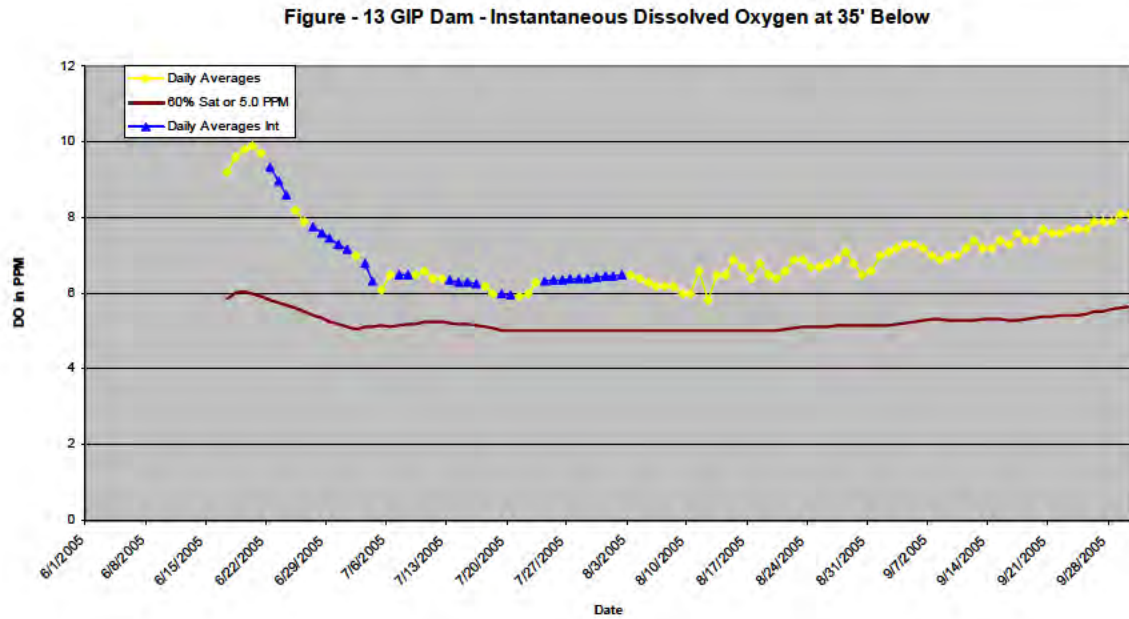
Figure - 11 Temperature Profile GIP Dam



Based on the continuous monitoring data and with some interpolation for the days where the monitor malfunctioned, at 35 feet there were no days of non-attainment based on the 30 day rolling average and using the 22 degree criterion. From July 2nd to September 5th, the data shows that the temperature was for the most part above 22° C. The only exception was July 11th and 12th, which can be attributed to a nearly 2” rain storm on July 10th. Because of the extensive time above 22° C, the water was in attainment for the entire summer at 35 feet (Figure 12).

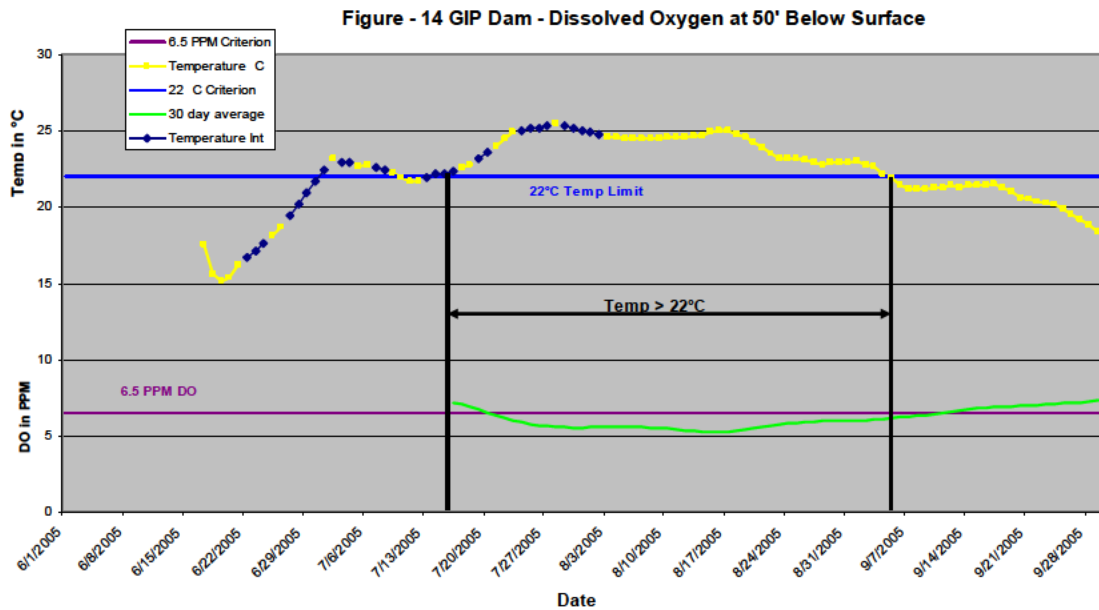


There were no days of non-attainment of the 60% saturation or 5 ppm instantaneous dissolved oxygen criterion at a depth to 35 feet (Figure 13).

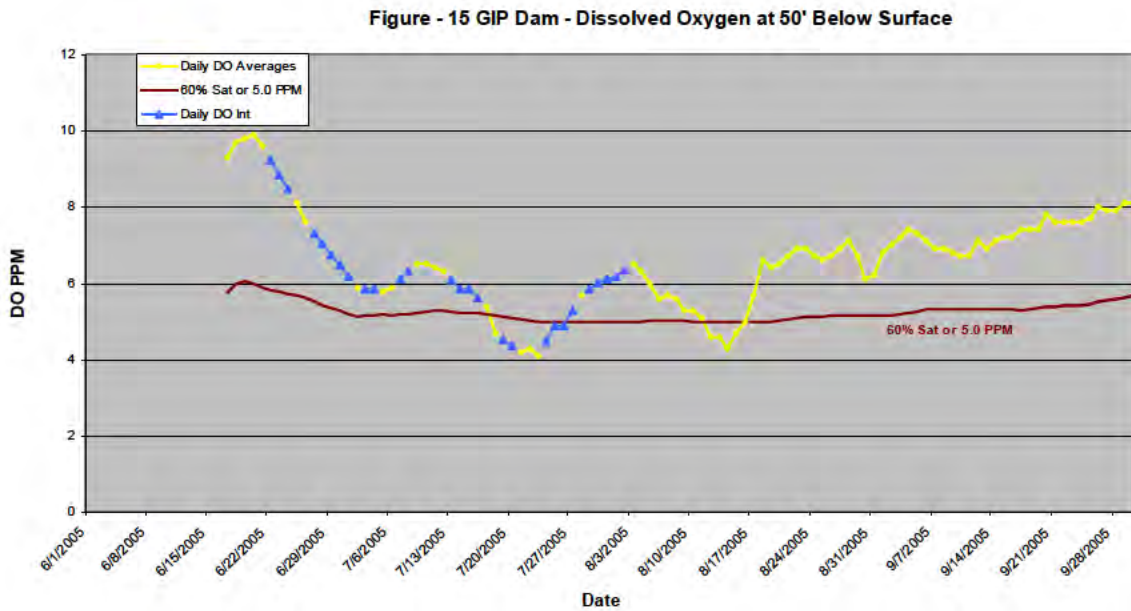


At the same monitoring location, but at a 50 foot depth, it can be inferred by looking at the figure that there would be comparable days of non-attainment to the Deep Hole. By interpolating between available data points, we can get a complete picture of the 30-day running average. Based on this data, there were six (6) days of non-attainment of the 6.5 ppm 30-day 22°C rolling average DO criterion. (Figure 14)

The temperature profile is similar to that at 35 feet with a comparable number of days when the temperature was over 22°C (Figure 11).



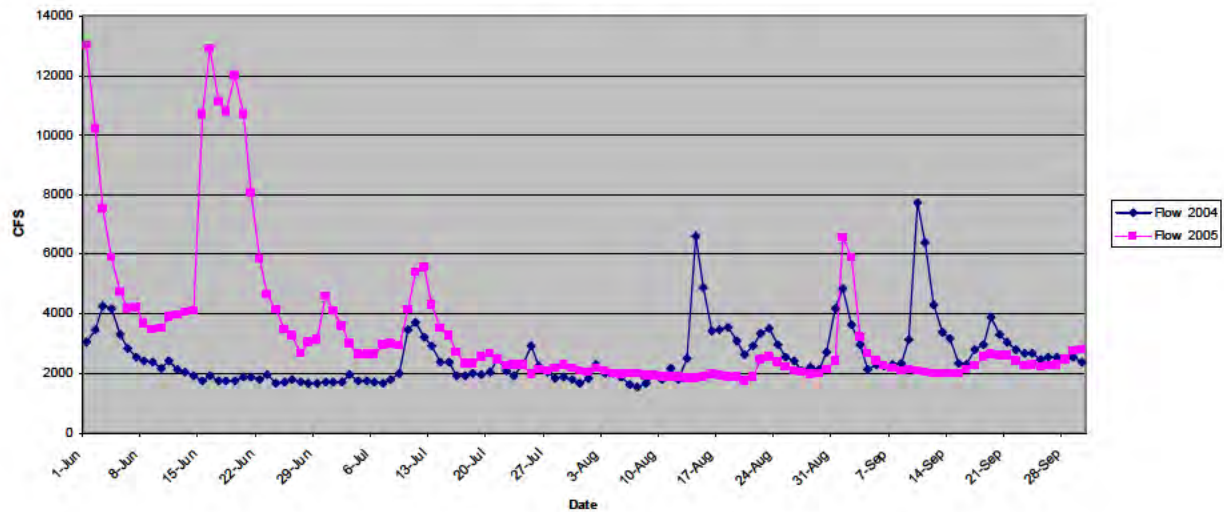
We estimate that there were thirteen days of non-attainment with the 60% of saturation or 5 ppm instantaneous dissolved oxygen criterion at the 50 foot depth. (Figure 15)



4. Flow Data

According to USGS data at Rumford, low seven day (7Q) flow was 1870 CFS, occurring on August 15th. From August 10th to the 22nd, the flows were fairly consistently low, all within 5% of the low flow. When comparing the data to last year, the flows were significantly higher for the first third of the season, the flows were about the same for the middle third and the last third was marginally, but consistently lower (Figure 16).

Figure - 16 Flow at Rumford Station



5. Effluent Monitoring

On September 21, 2005, the Department issued Maine Pollutant Discharge Elimination System/Waste Discharge Licenses (MEPDES/WDL) to International Paper, Rumford Paper Company, the Town of Livermore Falls, the Town of Bethel, the Rumford-Mexico Sewerage District (Main Facility), and the Rumford-Mexico Sewerage District (Rumford Point Facility). The International Paper, Rumford Paper Company and Livermore Falls licenses all contain water quality based limits designed to ensure that GIP will attain water quality standards. The International Paper and Rumford Paper Company licenses also contain water quality based limits to ensure that the Livermore Falls impoundment will meet water quality standards.

The remaining facilities (Bethel, and Rumford-Mexico) due to their size and or location to GIP have relatively little impact on GIP and contain only technology based limits and are not discussed further in this report.

This section summarizes the water quality based limits for International Paper, Rumford Paper Company, and Livermore Falls and historical performance and compliance with these water quality based limits since permit issuance.

The following tables summarize the types of water quality based limits for the dischargers. The associated charts indicate historical performance and current compliance in relation to the water quality based limits established in the new permits.

Water Quality Based Limits

International Paper MEPDES/WDL #W00623-5N-F-R
(Issued September 21, 2005)

Limit	Limit Type			Purpose of Limit	Compliance Status as of 12/31/05
	Monthly <u>Average</u> and as specified	Weekly <u>Average</u>	Daily <u>Maximum</u>		
<u>BOD₅</u> (June 1 – Sept. 30) Begin upon issuance	7,400 #/day	11,100 #/day	13,875 #/day	Attainment of DO standards in GIP.	Refer to Chart 1 & 2
<u>TSS</u> (60 day average) (June 1 – Sept. 30) Beginning June 1, 2006 Beginning June 1, 2010 Beginning June 1, 2015	12,000 #/day ⁽¹⁾ 11,060 #/day ⁽¹⁾ 10,000 #/day ⁽¹⁾			Attainment of aquatic life standards in Livermore Falls impoundment.	Refer to Chart 3
<u>TSS</u> (annual average) (Jan. 1 - Dec. 31) Beginning 2006 Beginning 2010 Beginning 2015	17,557 #/day ⁽²⁾ 16,000 #/day ⁽²⁾ 14,738 #/day ⁽²⁾			Attainment of DO standards in GIP.	Refer to Chart 4
<u>Total Phosphorus</u> (June 1 – September 30) Begin upon issuance Beginning June 1, 2010 Beginning June 1, 2015	193 #/day 160 #/day 130 #/day			Attainment of DO standards and prevention of algal blooms in GIP.	Refer to Chart 5
<u>Ortho-phosphorus</u> (June 1 – September 30) Begin upon issuance Beginning June 1, 2010 Beginning June 1, 2015	44 #/day 33 #/day 22 #/day			Attainment of DO standards and prevention of algal blooms in GIP.	Refer to Chart 6

Footnotes:

- (1) 60–day rolling average defined as the average of sixty consecutive daily TSS discharges between June 1st and September 30th to be reported in the July, August, and September DMRs. The 60-day rolling average limit of 12,000 lbs/day becomes effective on June 1, 2006.
- (2) Annual average defined as January 1st – December 31st of each year beginning calendar year 2006.

Water Quality Based Limits

Rumford Paper MEPDES/WDL #W000955-5N-G-R (Issued September 21, 2005)

Limit	Limit Type			Purpose of Limit	Compliance Status as of 12/31/05
	<u>Monthly Average</u> and as specified	<u>Weekly Average</u>	<u>Daily Maximum</u>		
<u>BOD₅</u> (June 1 – Sept. 30)	8,330 #/day	12,500 #/day	18,750 #/day	Attainment of DO standards in GIP.	Refer to Chart 7 & 8
<u>TSS</u> (60 day average) (June 1 – Sept. 30) Beginning June 1, 2006 Beginning June 1, 2010	12,200 #/day ⁽¹⁾ 11,000 #/day ⁽¹⁾			Attainment of aquatic life standards in Livermore Falls impoundment.	Refer to Chart 9
<u>TSS</u> (annual average) (Jan. 1 - Dec. 31) Beginning 2006	15,952 #/day ⁽²⁾			Attainment of DO standards in GIP.	Refer to Chart 10
<u>Total Phosphorus</u> (June 1 – September 30) Begin upon issuance Beginning June 1, 2008 Beginning June 1, 2010	168 #/day 160 #/day 152 #/day			Attainment of DO standards and prevention of algal blooms in GIP.	Refer to Chart 11
<u>Ortho-phosphorus</u> (June 1 – September 30) Begin upon issuance Beginning June 1, 2008 Beginning June 1, 2010	116 #/day 107 #/day 97 #/day			Attainment of DO standards and prevention of algal blooms in GIP.	Refer to Chart 12

Footnotes:

- (1) 60–day rolling average defined as the average of sixty consecutive daily TSS discharges between June 1st and September 30th to be reported in the July, August, and September DMRs. The 60-day rolling average limit of 12,200 lbs/day becomes effective on June 1, 2006.
- (2) Annual average defined as January 1st – December 31st of each year beginning calendar year 2006.

Water Quality Based Limits

**Town of Livermore Falls MEPDES/WDL #W002654-5L-G-R
(Issued September 21, 2005)**

Limit	Limit Type		Purpose of Limit	Compliance Status as of 12/31/05
	<u>Monthly Average</u>	<u>Weekly Average</u>		
Ortho-phosphorus (June 1 – September 30) <i>Beginning June 1, 2006⁴</i>	8.3 #/day		Attainment of DO standards and prevention of algal blooms in GIP.	Refer to Chart 13

⁴ By letter dated January 9, 2006, the Towns of Livermore Falls and Jay requested that the Board of Environmental Protection (BEP) stay this limit pending resolution of the appeals of the GIP MEPDES/WDL. This request was granted by BEP Chairman Scott by Procedural Order on February 22, 2006 (corrected copy issued February 28, 2006).

Chart 1

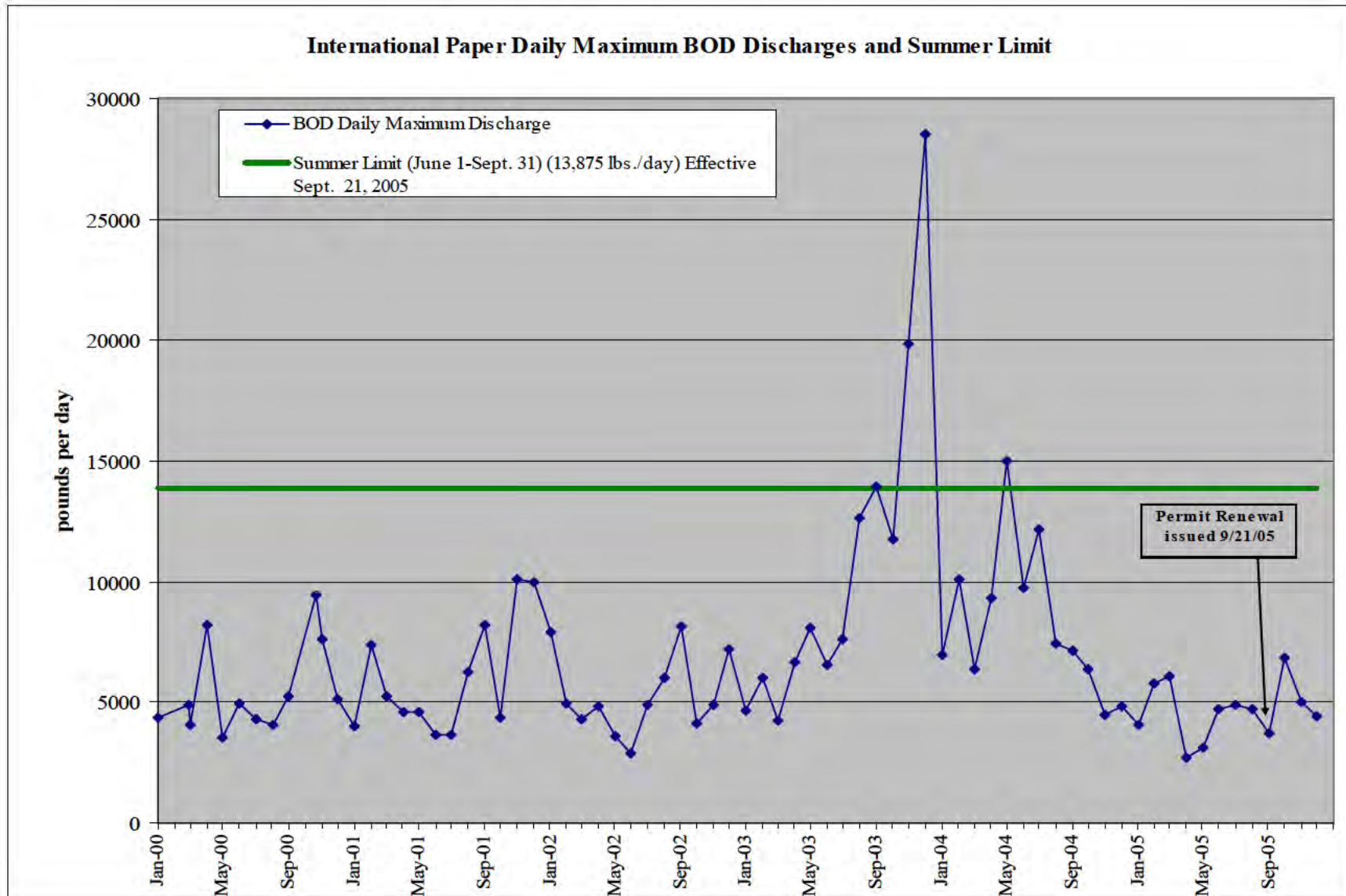


Chart 2

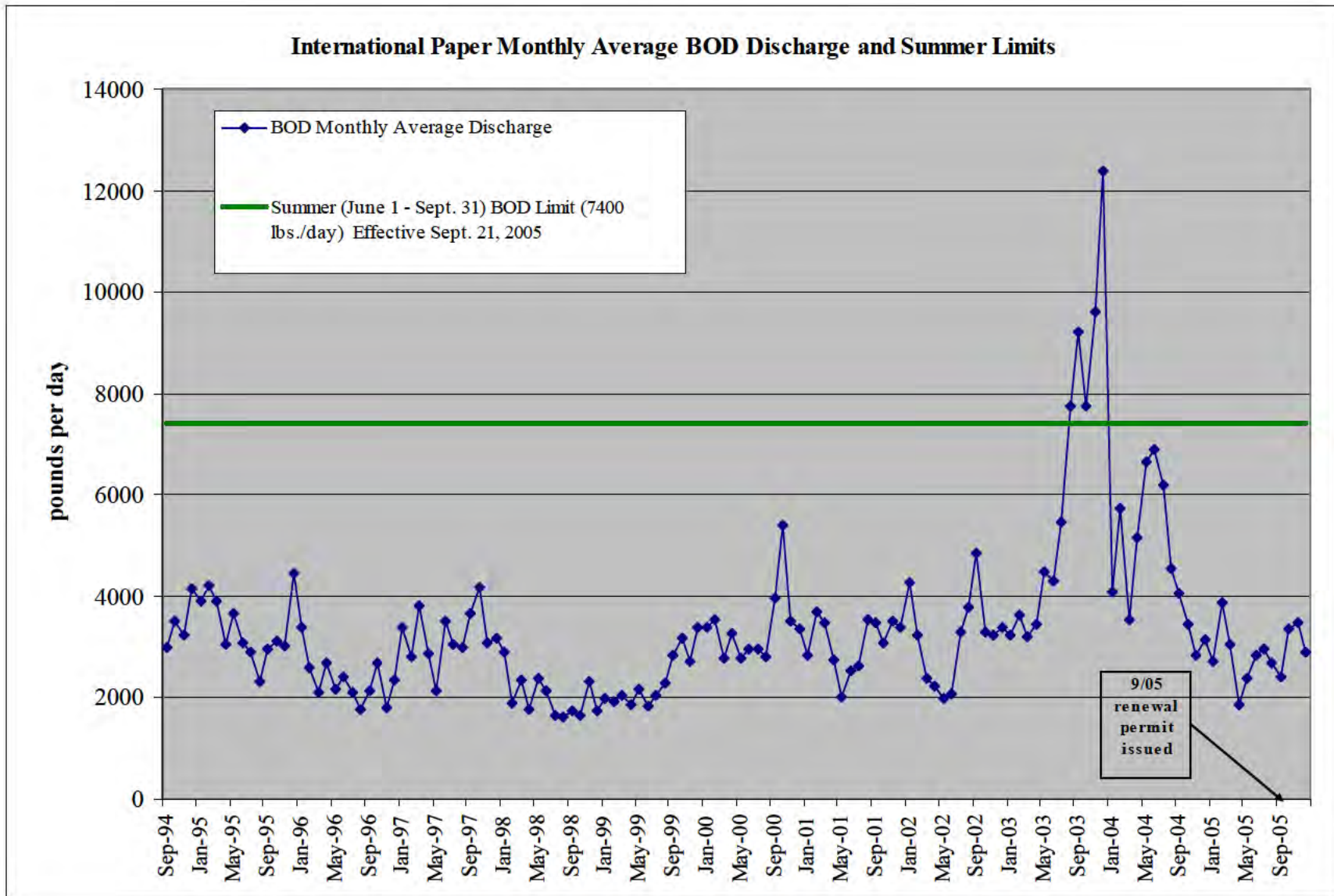


Chart 3

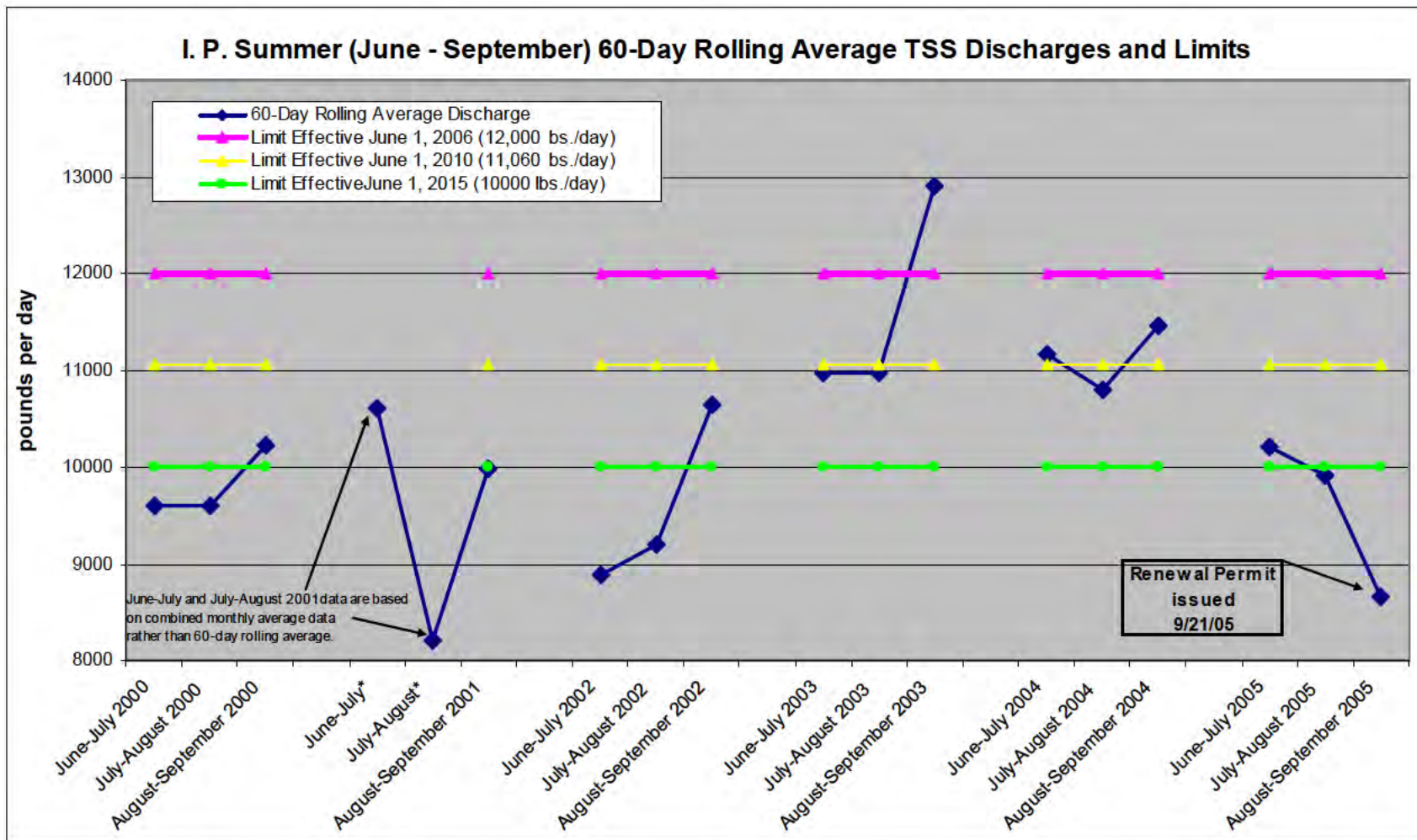


Chart 4

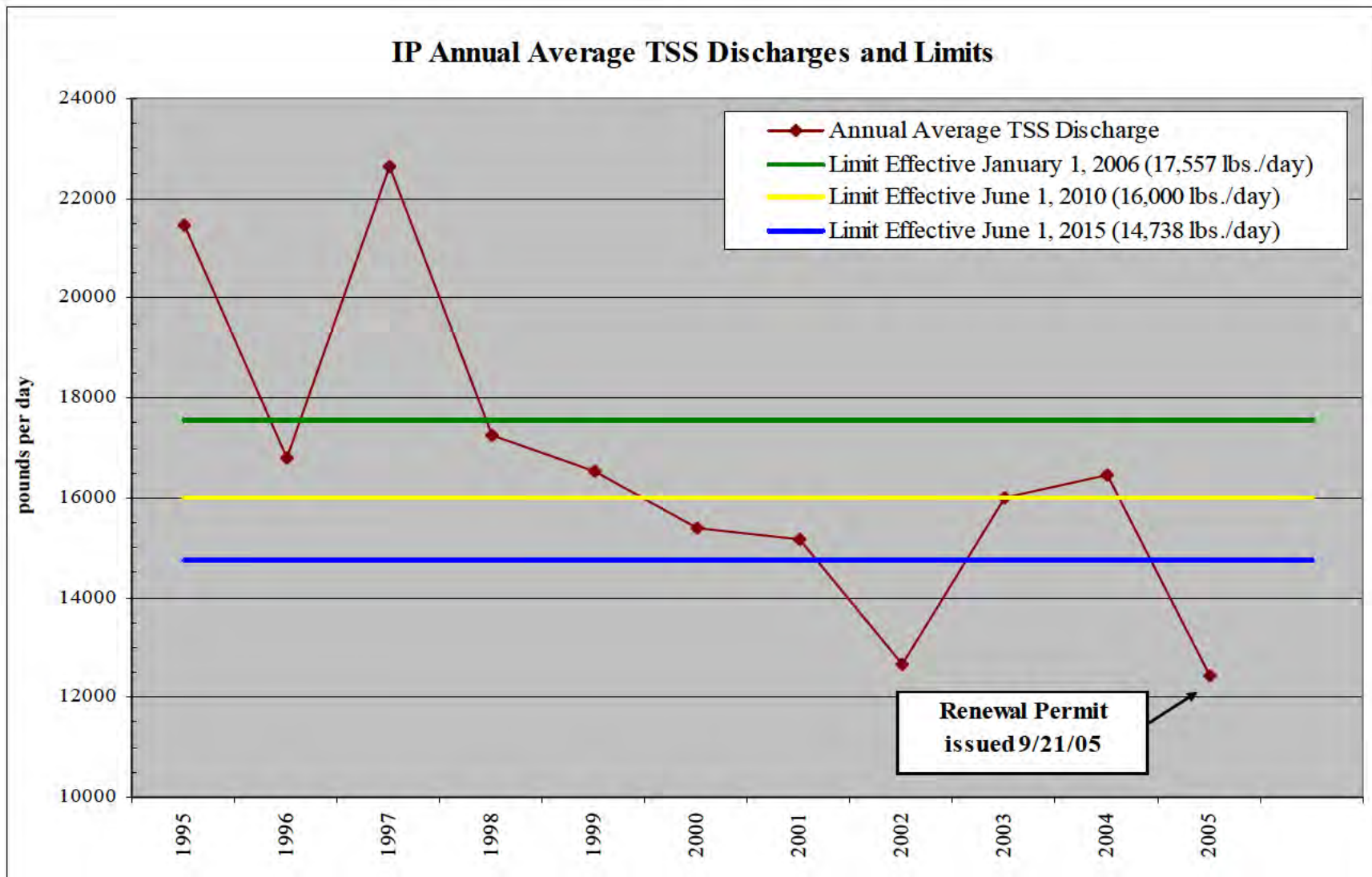


Chart 5

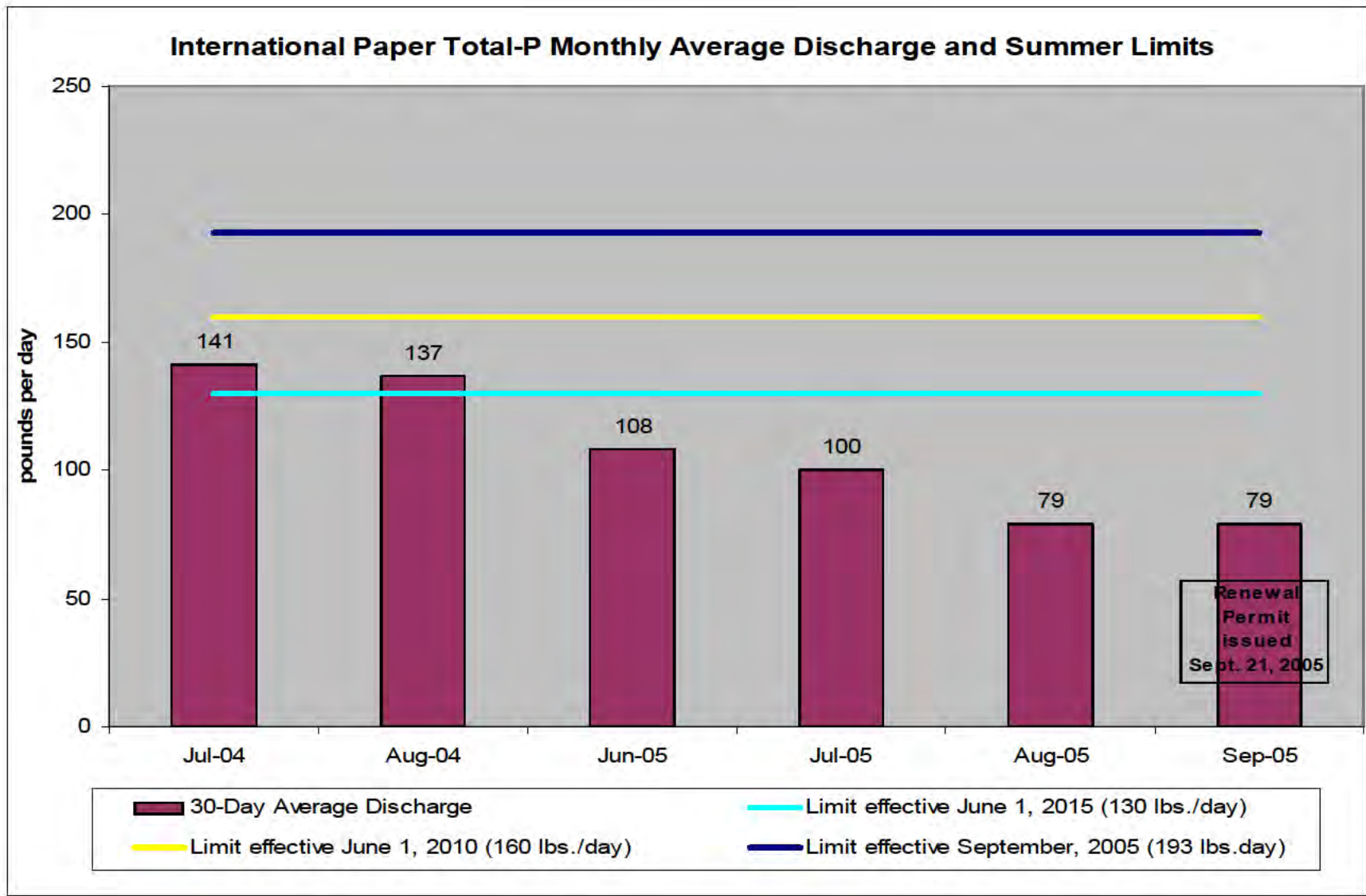


Chart 6

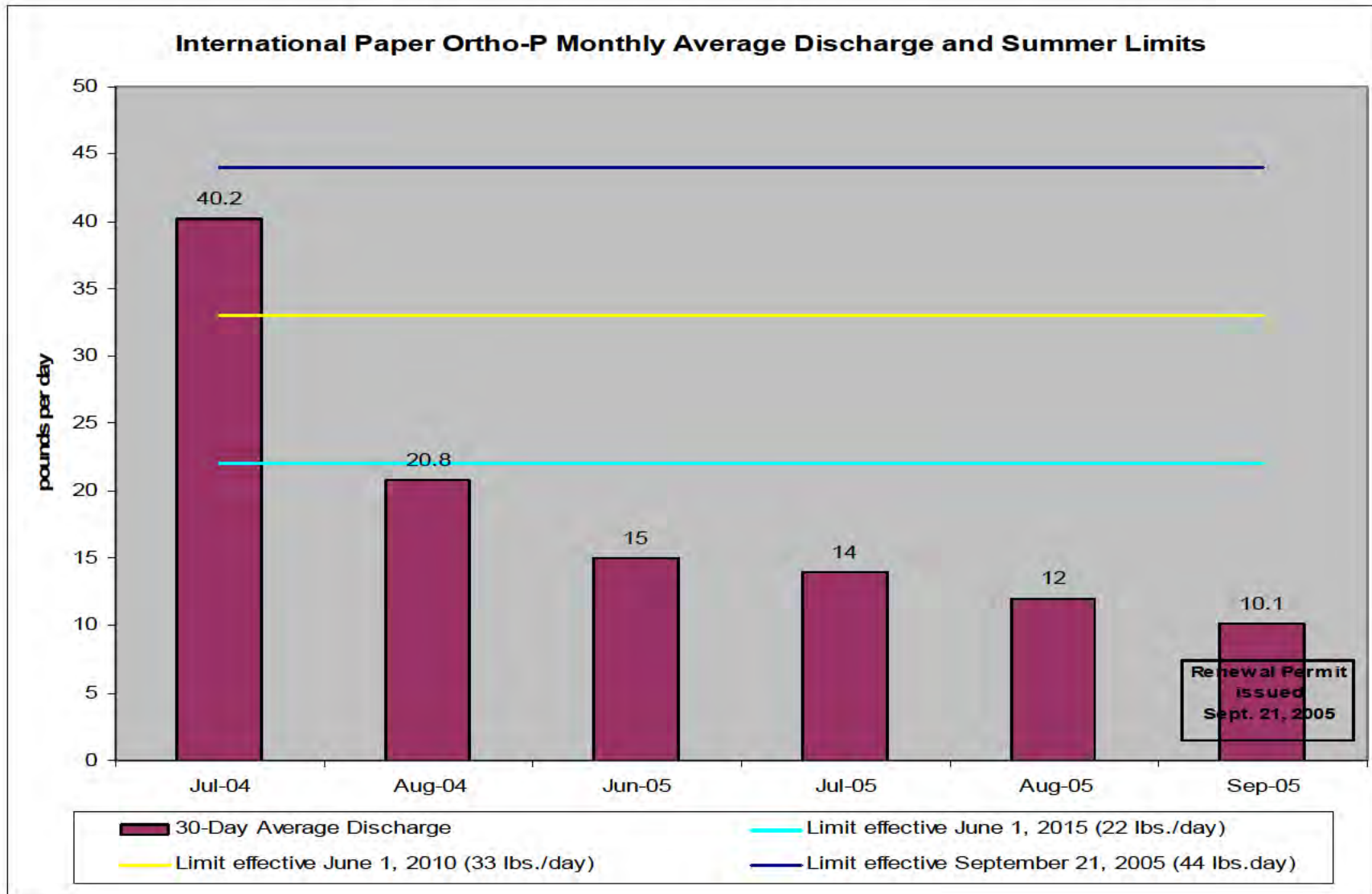


Chart 7

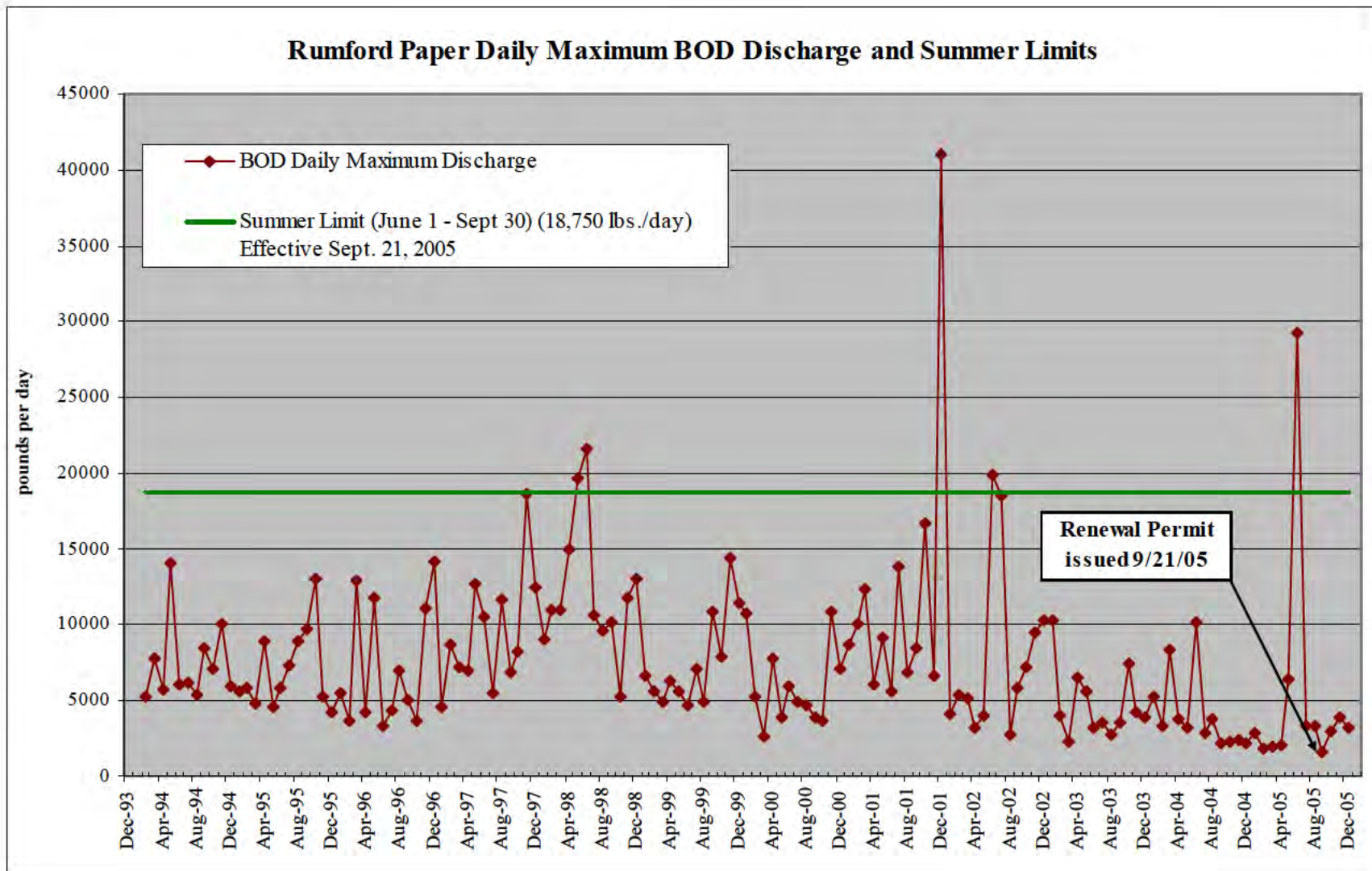


Chart 8

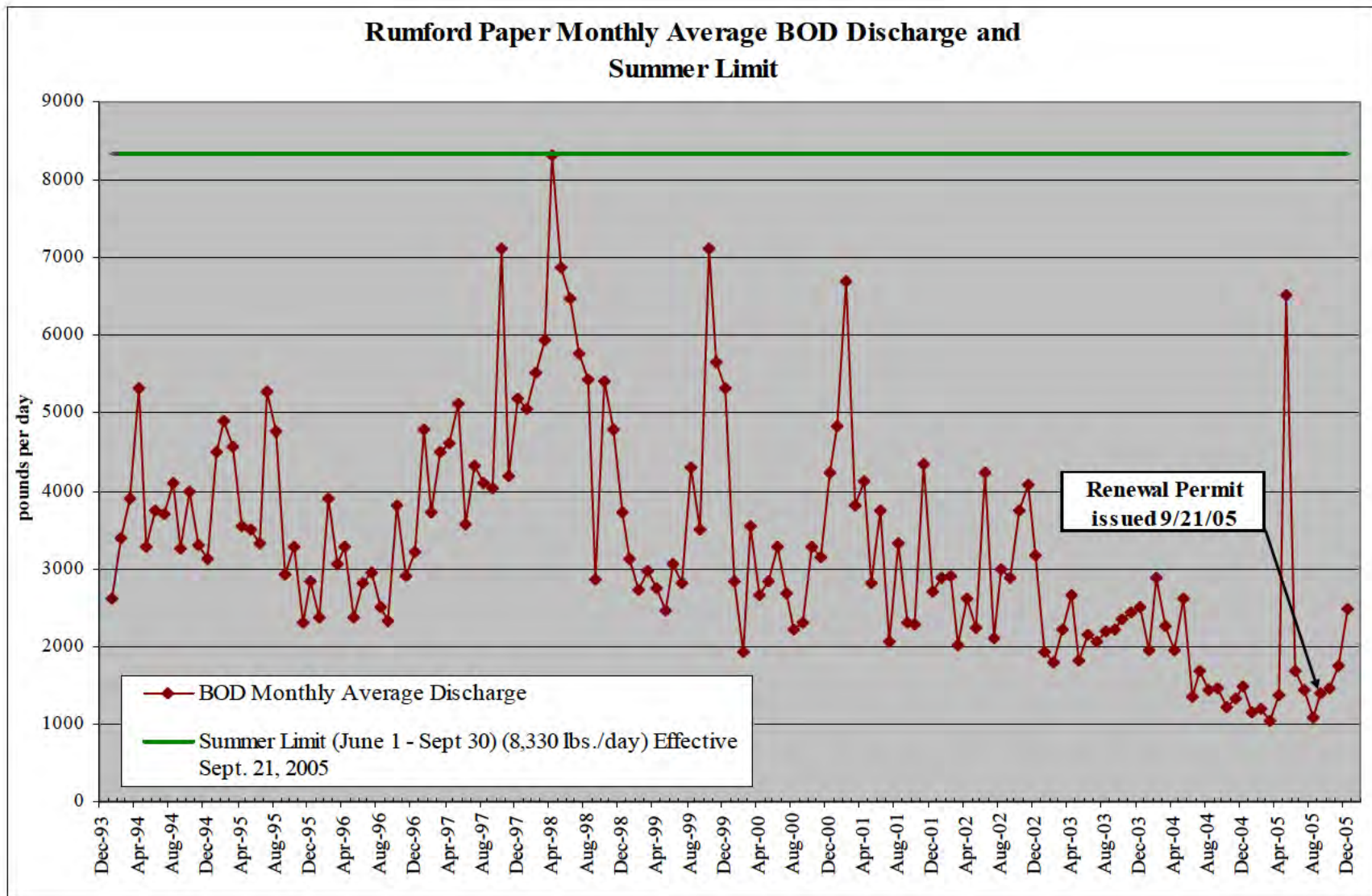


Chart 9

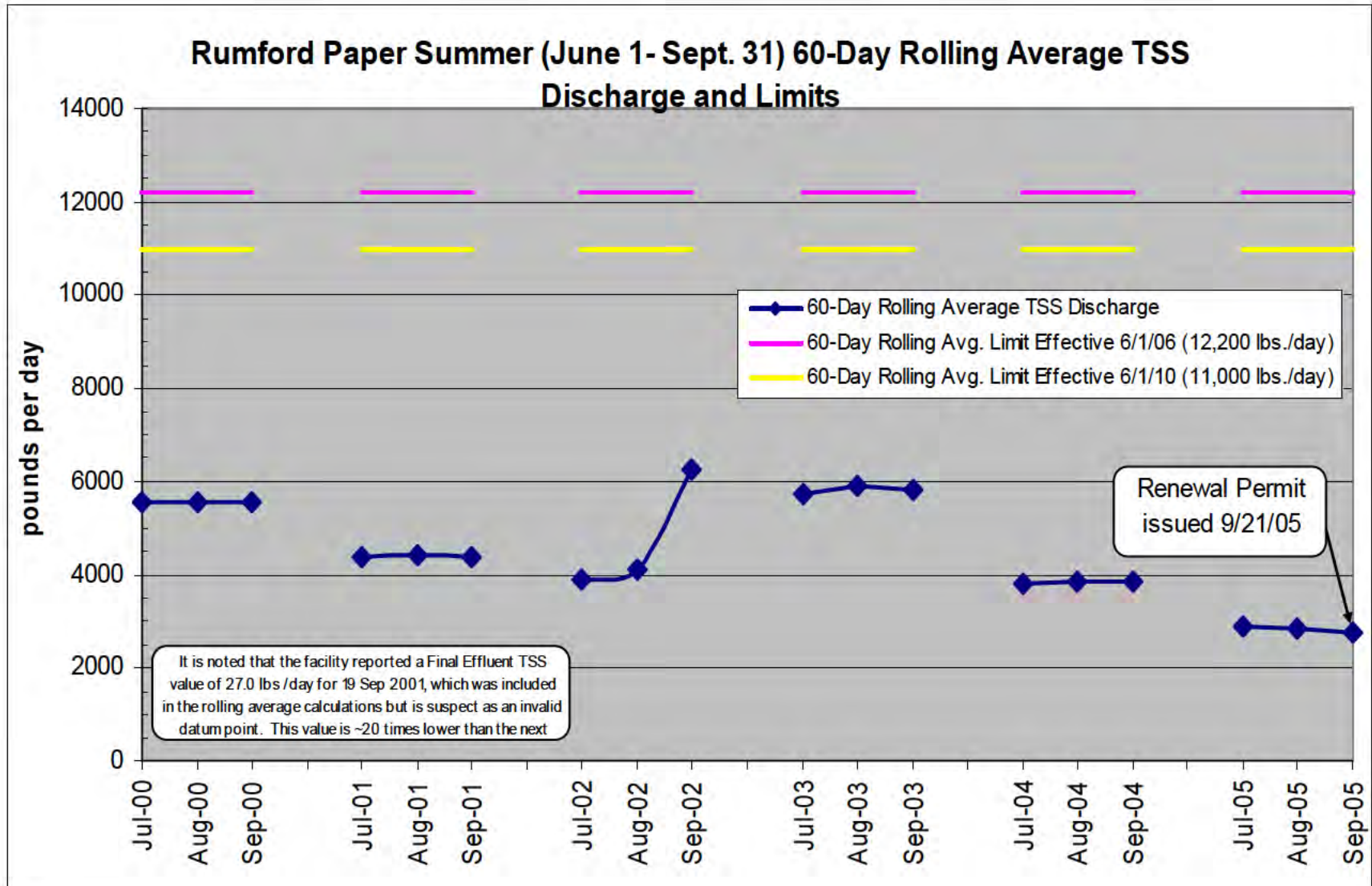


Chart 10

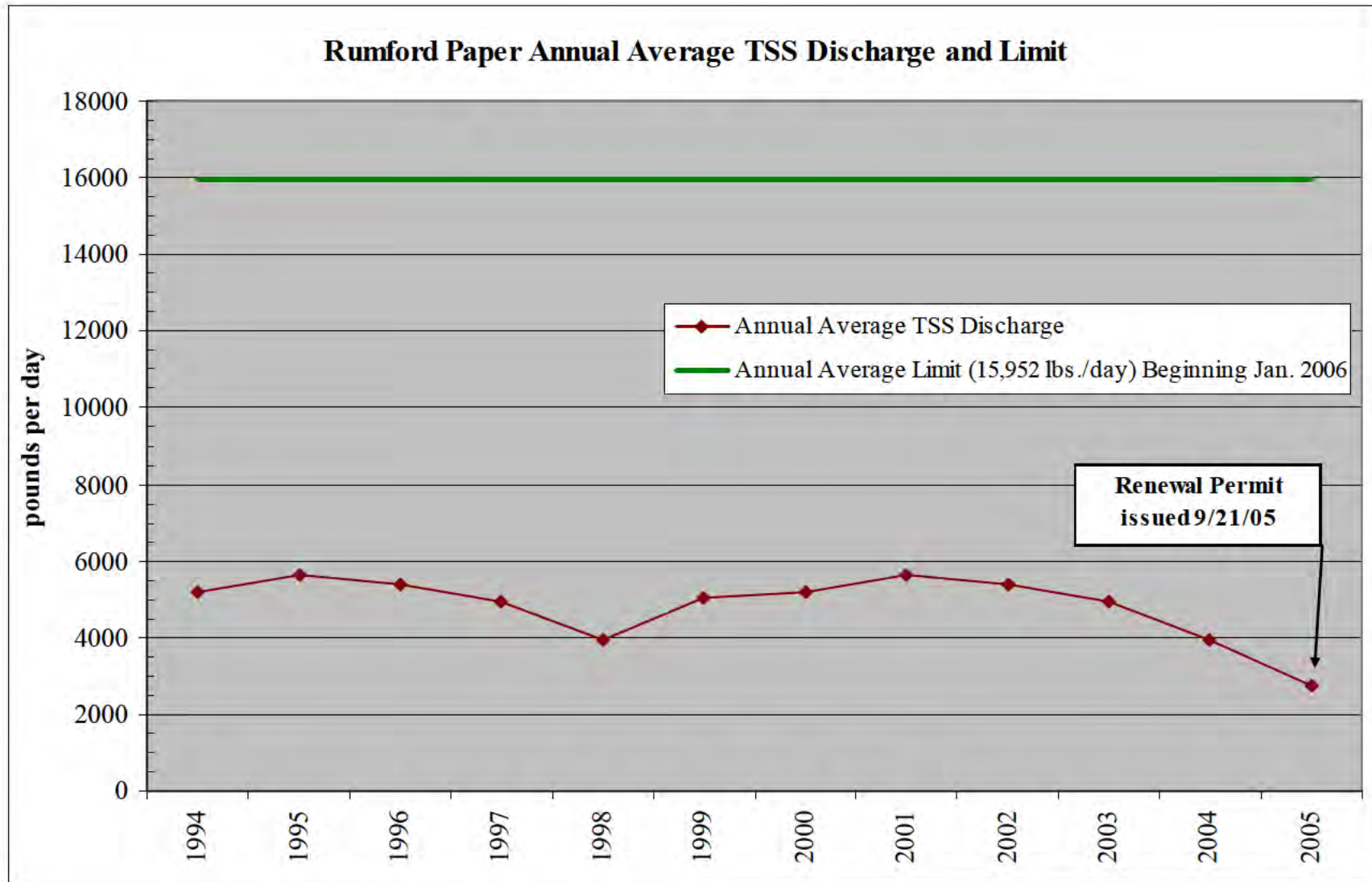


Chart 11

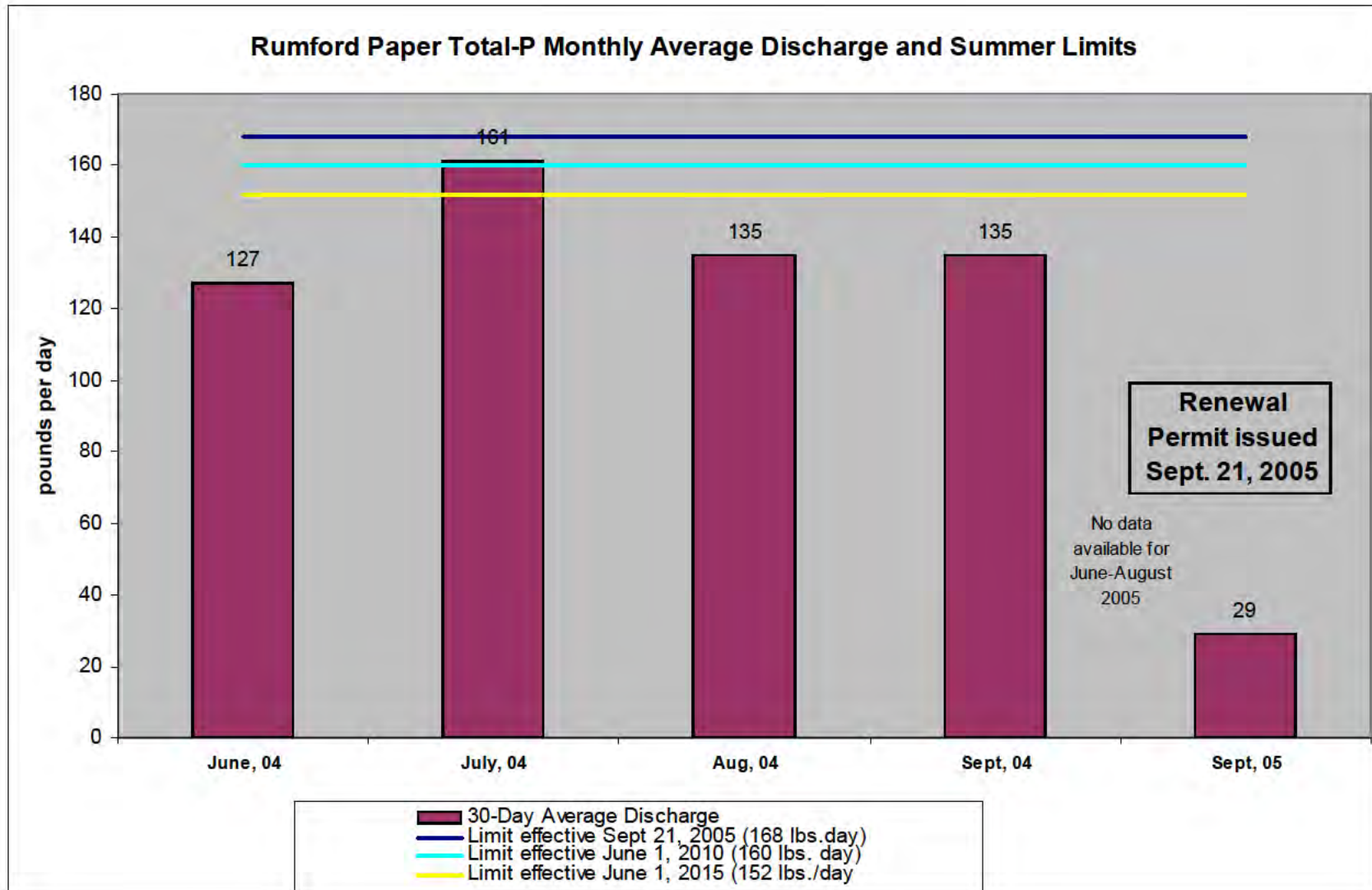


Chart 12

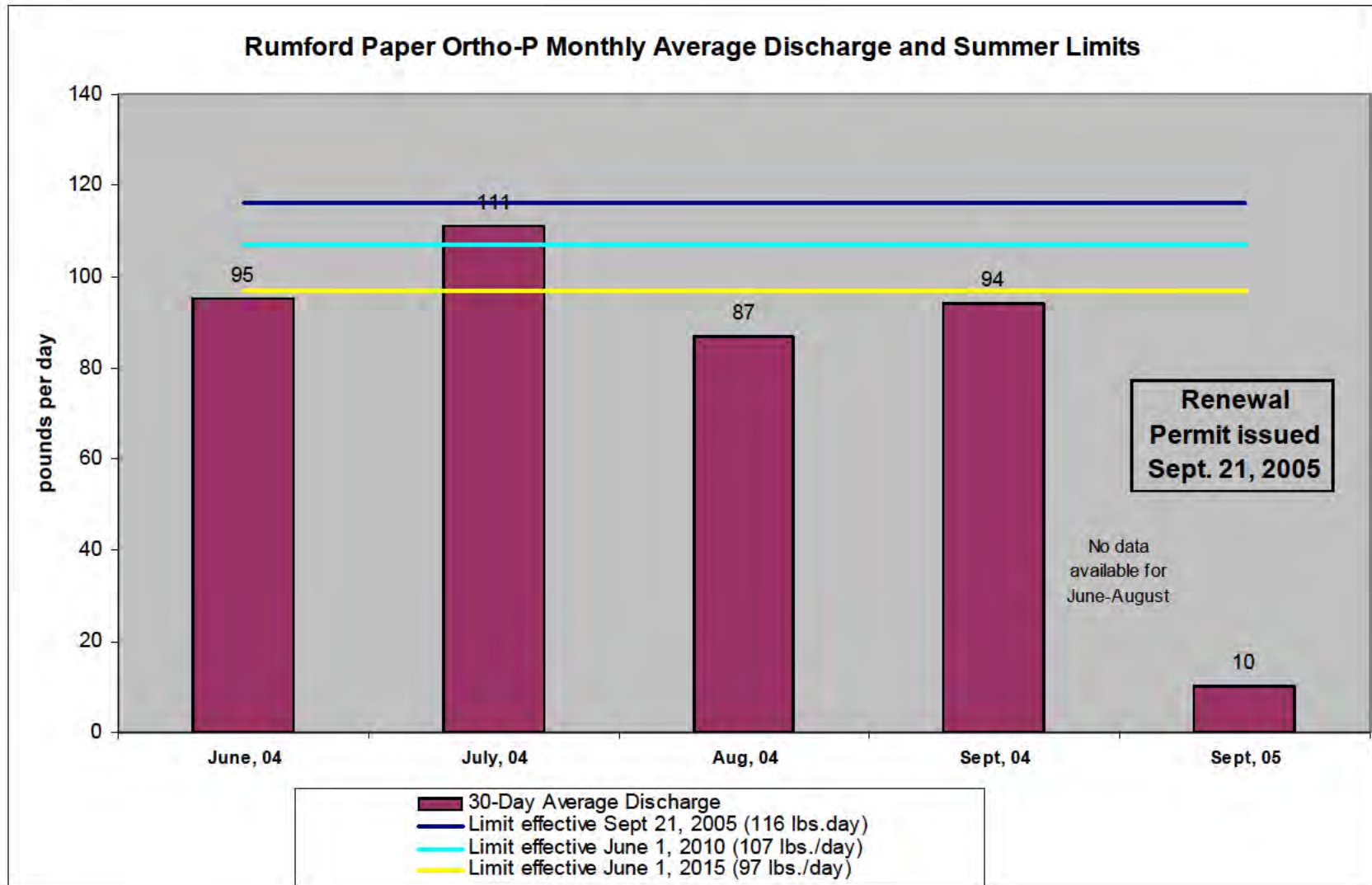
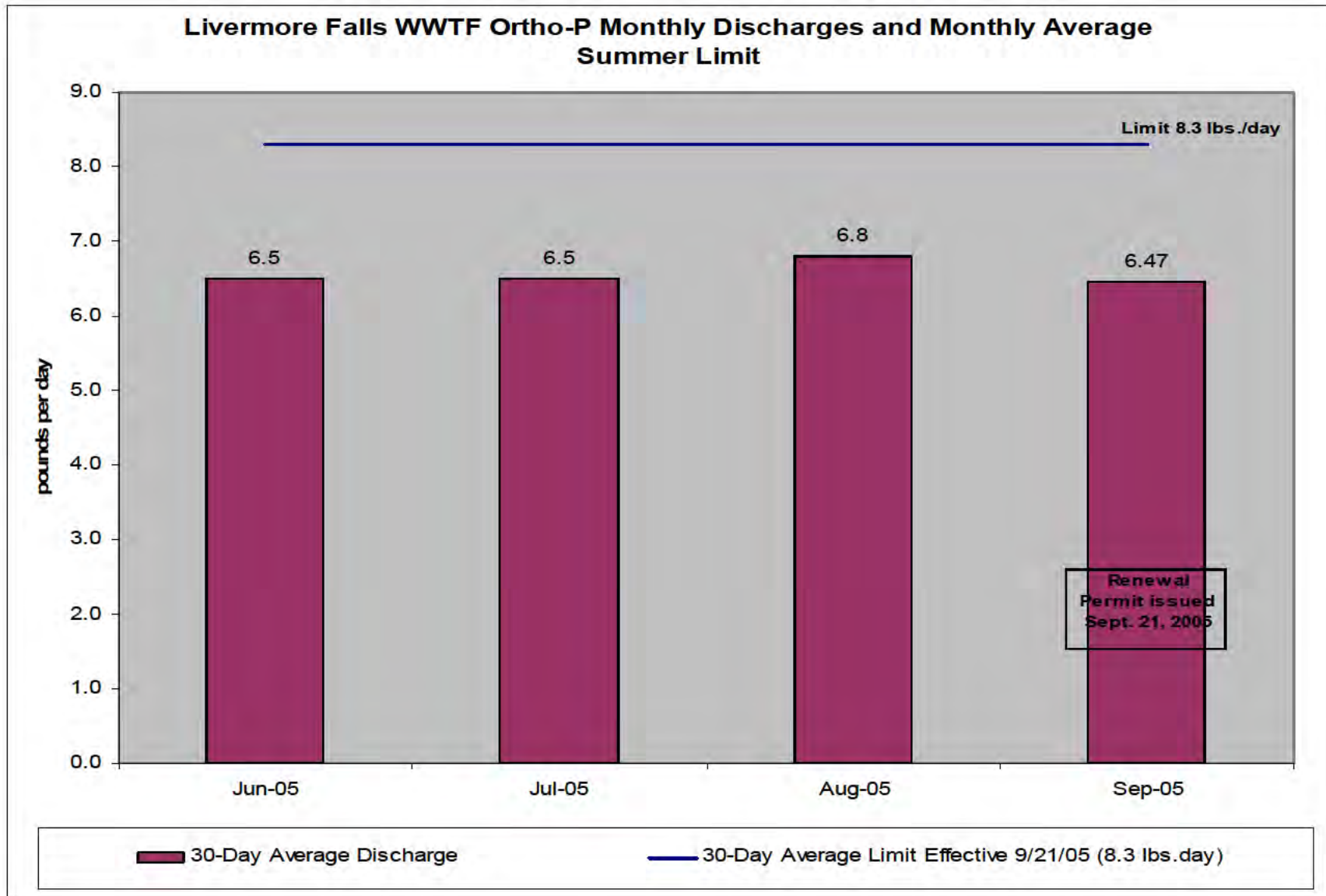


Chart 13



Appendix A

August 4, 2004

Example of widespread bloom conditions on GIP.

(Approximately 1.5 miles north of the Deep Hole monitoring station.)



June 30, 2005

Example of non bloom conditions on GIP.

(Approximately 1.5 miles north of the Deep Hole monitoring station.)



Appendix B

August 3, 2005

Example of a visible discharge plume at International Paper, Jay



Appendix B (cont.)

September 7, 2005

Example of a visible discharge plume at International Paper, Jay

