IEUA Wastewater Facilities Master Plan
TM 4 Wastewater Flow and Loading Forecast

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DATE: August 21, 2014

Executive Summary

Analysis of the influent wastewater flow and quality data for each of the four treatment plants was conducted to establish average values and peaking factors. Results of the influent wastewater analysis presented in this Technical Memorandum (TM), as well as the results of the flow diversion alternatives analysis presented in TM 3 *Regional Trunk Sewer Analysis*, formed the basis of the treatment plant influent wastewater flow and loading forecast analysis presented herein. As discussed in TM 3, the Wastewater Facilities Master Plan (WFMP) planning effort will be based on the Inland Empire Utilities Agency (IEUA) preferred Flow Diversion Alternative 2, optimizing groundwater recharge by diverting flows from Whispering Lakes and Haven pump stations to Regional Water Recycling Plant (RWRP, or RP) RP-1. The corresponding influent wastewater flow and loading projections under this alternative for the planning year 2035, as well as for the 2060 ultimate buildout year, are presented in this TM and will form the basis of the master planning effort for each of the treatment plants.

The data analysis is based on two consecutive years of recent data provided by IEUA for influent flow and key wastewater quality constituents including biological oxygen demand (BOD), total organic carbon (TOC), total suspended solids (TSS), ammonia as nitrogen (NH3-N), and Total Kjehldahl Nitrogen (TKN). As discussed in TM 3, influent wastewater flows are projected to increase at the Carbon Canyon Water Recycling Facility (CCWRF) between 2020 and 2060 by about 15 percent, with more significant flow increases expected at RP-1, RP-4 and RP-5. The increase in flows to RP-4 by approximately 60 percent is largely attributable to the gradual incorporation of septic flows into the system beginning in 2020. RP-1 flows are projected to increase by 20 percent, and RP-5 flows are projected to more than double by year 2060 as a result of population growth in Chino and other areas served by RP-5.

1.0 Background and Objectives

IEUA owns and operates regional sewer pipelines and receives wastewater from the cities of Upland, Montclair, Ontario, Fontana, Chino, Chino Hills, and Cucamonga County Water District servicing the City of Rancho Cucamonga. Wastewater collected within these service areas is treated at one of the four regional water recycling plants. RP-1 and RP-4 serve the northern parts of the service area, while RP-5 and CCWRF serve the southern parts. Both RP-4 and CCWRF are designed to be scalping plants for RP-1 and RP-5, respectively.

The four RWRPs are interconnected in a regional network. IEUA staff routinely use the bypass and diversion facilities, such as the San Bernardino Lift Station, the Montclair Lift Station and Diversion Structure, and the Carbon Canyon bypass to optimize flow and capacity utilization within the system. For instance, RP-5 can receive bypassed flows from RP-1 (primary effluent) and CCWRF, in addition to receiving recycle flows from RP-2, the solids handling facility, and the RP-2 lift station flows. In general, flows are routed between RWRPs in order to optimize recycled water deliveries while minimizing overall pumping and treatment cost.

The objective of this TM is to summarize current influent wastewater flow and quality data for each of the four RWRPs, establish peaking factors, and develop flow and loading projections for the WFMP. The analysis is based on two consecutive years of recent data provided by IEUA for key wastewater quality constituents including

BOD, TOC, TSS, NH3-N, and TKN. Peaking factors are established for maximum month, maximum week, and maximum day conditions. Influent wastewater flow projections were developed by the IRP Consultant as part of the flow monitoring program, while the load projections are calculated based on these flow projections and analysis of the influent wastewater characteristics.

2.0 Overview of IEUA Wastewater System

Each of the four regional reclamation facilities is interconnected through an intricate network of diversion points within the member agency wastewater collection systems to enable plant influent flows to be shifted between the facilities in order to efficiently treat the wastewater and meet recycled water demands within the IEUA service area. A schematic of this network is depicted in Figure 4-1.

In order to effectively deliver recycled water to users in the north, IEUA uses both the San Bernardino Lift Station and the Montclair Lift Station to route additional wastewater to RP-1 and RP-4 where the groundwater recharge basins are located. A diversion structure located upstream of RP-1 allows IEUA to divert raw wastewater to RP-4 by way of the San Bernardino Lift Station. The RP-4 Influent Diversion Structure offers flexibility within the system to divert RP-4 influent flows downstream towards RP-1, thus enabling IEUA to control the volume of influent flow to RP-4.

The Montclair Lift Station intercepts raw wastewater from the cities of Montclair, Upland, and Chino and pumps them to RP-1 for treatment. A portion of the flows from Upland and Montclair can also be diverted to CCWRF by way of the Montclair Diversion Structure. Similar to RP-4, the CCWRF Influent Diversion Structure offers flexibility within the system to divert CCWRF influent flows to RP-5, thus enabling IEUA to control the influent flow to CCWRF. In addition, the Primary Effluent Diversion Structure at RP-1 offers IEUA flexibility to divert primary effluent from RP-1 to RP-5.

With bypassed and diverted flows ultimately reaching RP-5 from each of the upstream facilities as well as from the RP-2 Lift Station to the south, RP-5 is a critical treatment facility within the IEUA system. The flow diversion alternatives analysis presented in TM 3 evaluated options for diverting flow between the facilities to achieve greater reliability and redundancy within the system. The results of the flow diversion analysis, as well as the analysis of the current and projected influent wastewater flow and quality presented herein, will form the basis of the treatment plant capacity and expansion needs in subsequent TMs. A summary of the influent wastewater flow and quality for each RWRP and for the system as a whole is presented in the next section.

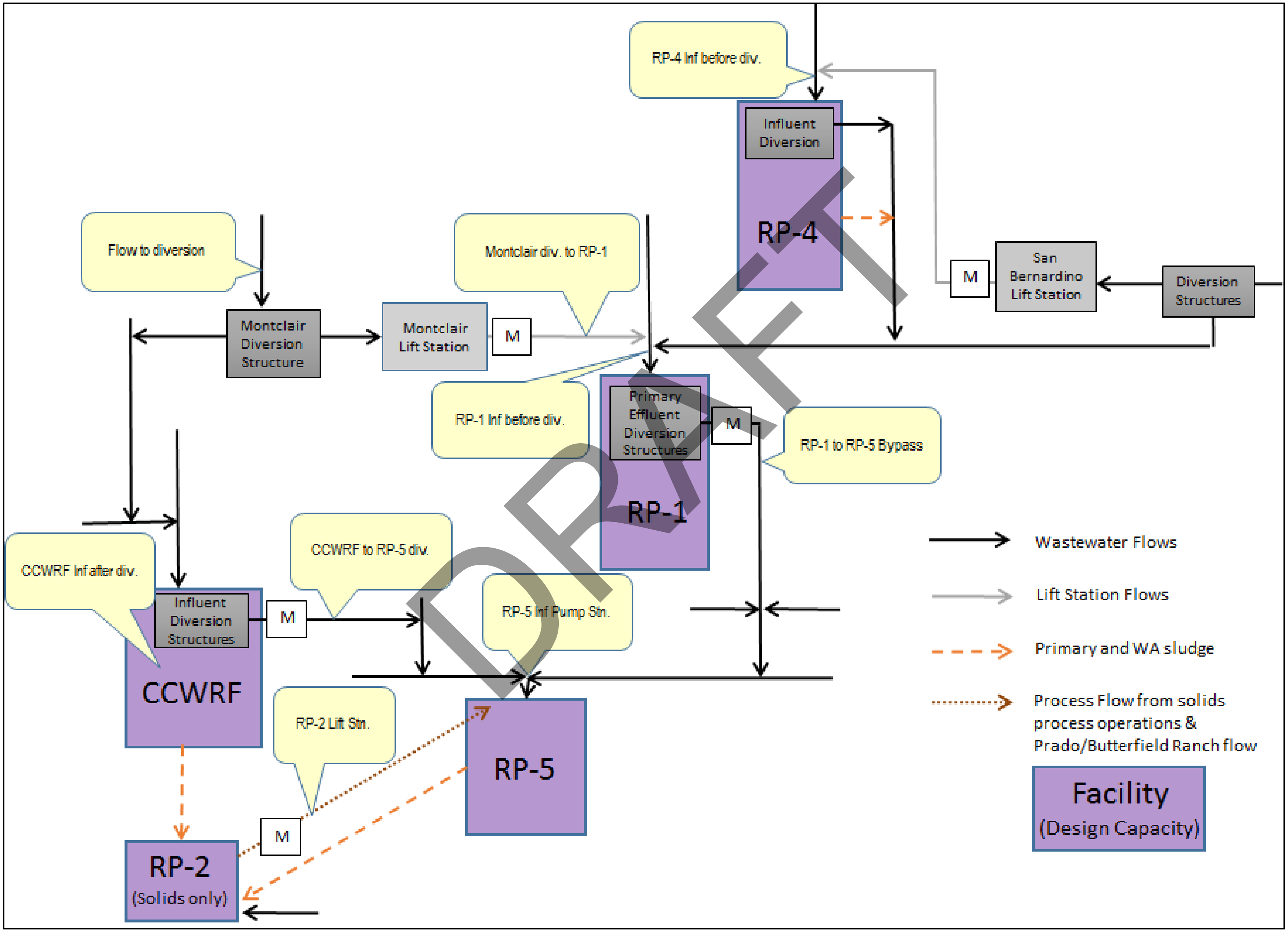
3.0 Influent Wastewater Flow and Quality

The Consultant Team reviewed the most recent two years of treatment plant flow and quality data to establish influent wastewater characteristics for each RWRP, which will form the basis of the treatment plant capacity evaluation conducted as part of the WFMP effort as well as the wastewater flow and loading projections presented in the next section. The recent data was analyzed to determine the annual average, maximum month, maximum week, and maximum day flows and corresponding peaking factors for each plant. Peaking factors are ratios of the particular flow or load event to the corresponding average values during the same time period. The same was done for the concentrations and loads for key constituents.

Plant influent flow data for the period of October 15, 2011 through October 15, 2013 was available on a daily basis for each of the RWRPs. Influent data for key parameters such as TOC, BOD, TSS, NH3-N, and TKN was also available for each plant. Constituent concentrations at each RWRP were measured using 24-hour composite samples collected and analyzed by plant personnel. The frequency at which these key parameters were measured during this time period varied from one time per week to three times per week depending on the plant and the constituent. Where BOD data was limited or unavailable, BOD concentrations were calculated using the measured influent TOC values and the parameter correlation currently employed by IEUA as provided in Equation 1. Review of the data indicated that this correlation is a good representation of influent BOD and was therefore used for this WFMP.

Influent BOD (mg/L) = 1.92 x TOC – 13.19 *Equation 1*

FIGURE 4-1
IEUA Existing Wastewater System Schematic



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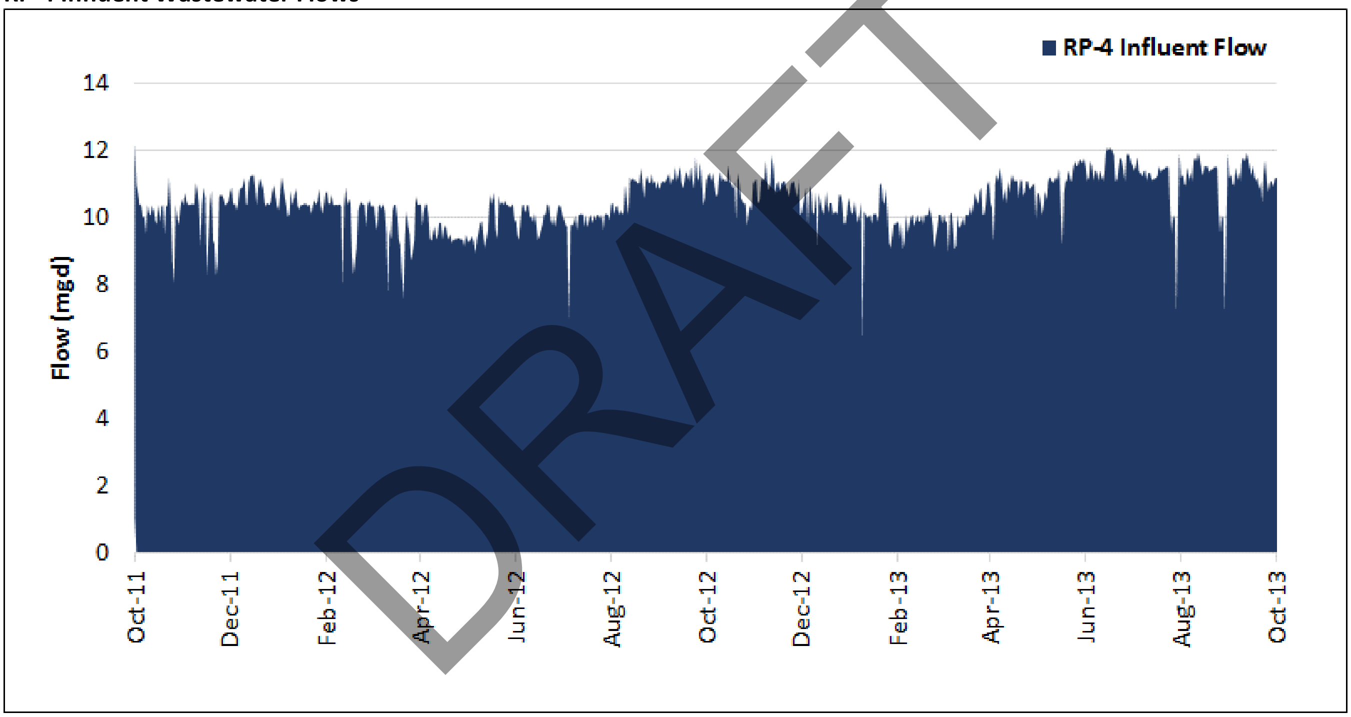
Observations for each plant are discussed below. In general, plant influent flows and constituent concentrations have remained relatively constant over the two year period. A discussion of these observations is presented herein for each RWRP, from upstream-most plant to downstream-most plant. A summary of the influent flows, concentrations, and loads in terms of annual average, maximum month, maximum week, maximum day, and corresponding peaking factors is presented in Tables 4-1, 4-2, and 4-3 for all RWRPs at the end of this section.

3.1 RP-4 Influent Wastewater Flow and Quality

With the ability to divert northern flows to either RP-1 or RP-4, and to bypass influent RP-4 flows to RP-1, IEUA is able to control the influent flow to RP-4. As shown in Figure 4-2, the daily average influent flow values reported at RP-4 have been fairly stable over the last two year period, generally ranging between 8 and 12 mgd with an annual average of 10.5 mgd. Because RP-4 serves as a scalping plant for RP-1, routine flow diversions occurred during the analysis period but are not depicted in the figure due to the fact that RP-4 influent flows are measured after flow diversion has taken place. A summary of the average and maximum influent flows is presented in Table 4-1 at the end of this section.

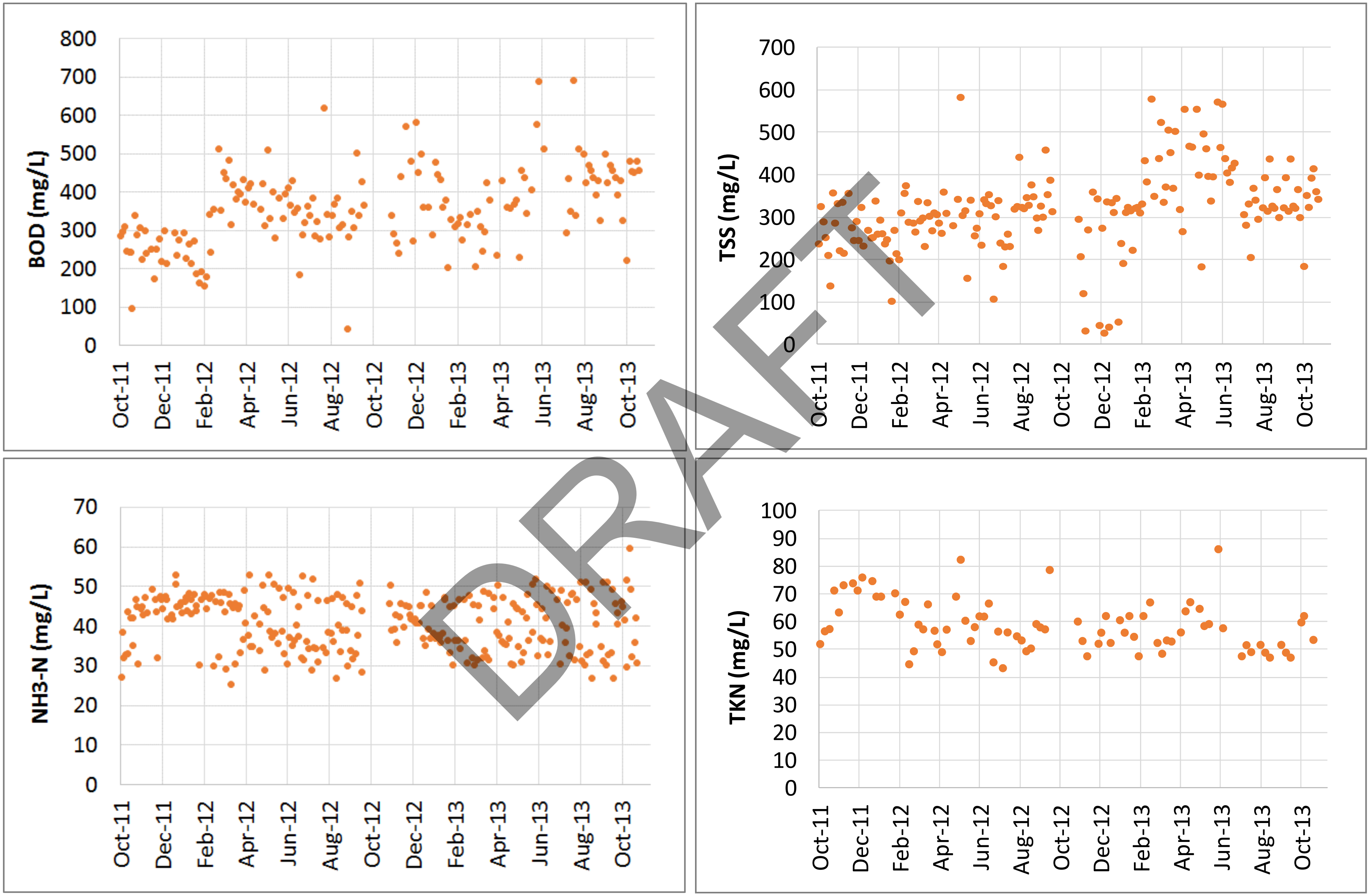
FIGURE 4-2
RP-4 Influent Wastewater Flows



The RP-4 influent wastewater quality for BOD, TSS, NH3-N, and TKN concentrations over the recent two year period is presented in Figure 4-3. Concentrations for TKN, TSS, and NH3-N were reported once, twice, and three times per week, respectively. TOC data was also available twice per week, as well as limited BOD data. For those months where BOD was measured, BOD data was available twice per week. For dates when both TOC and BOD data were available, BOD measurements were used. For dates when only TOC data was available, BOD concentrations were calculated using IEUA's equation derived from the correlation between TOC and BOD.

As shown in the concentration plots, influent BOD, TSS, NH3-N, and TKN concentrations have remained fairly constant during the two year period. A summary of the average and maximum concentrations and calculated loads for each of these constituents is presented in Tables 4-2 and 4-3 at the end of this section.

FIGURE 4-3
RP-4 Influent Wastewater Quality



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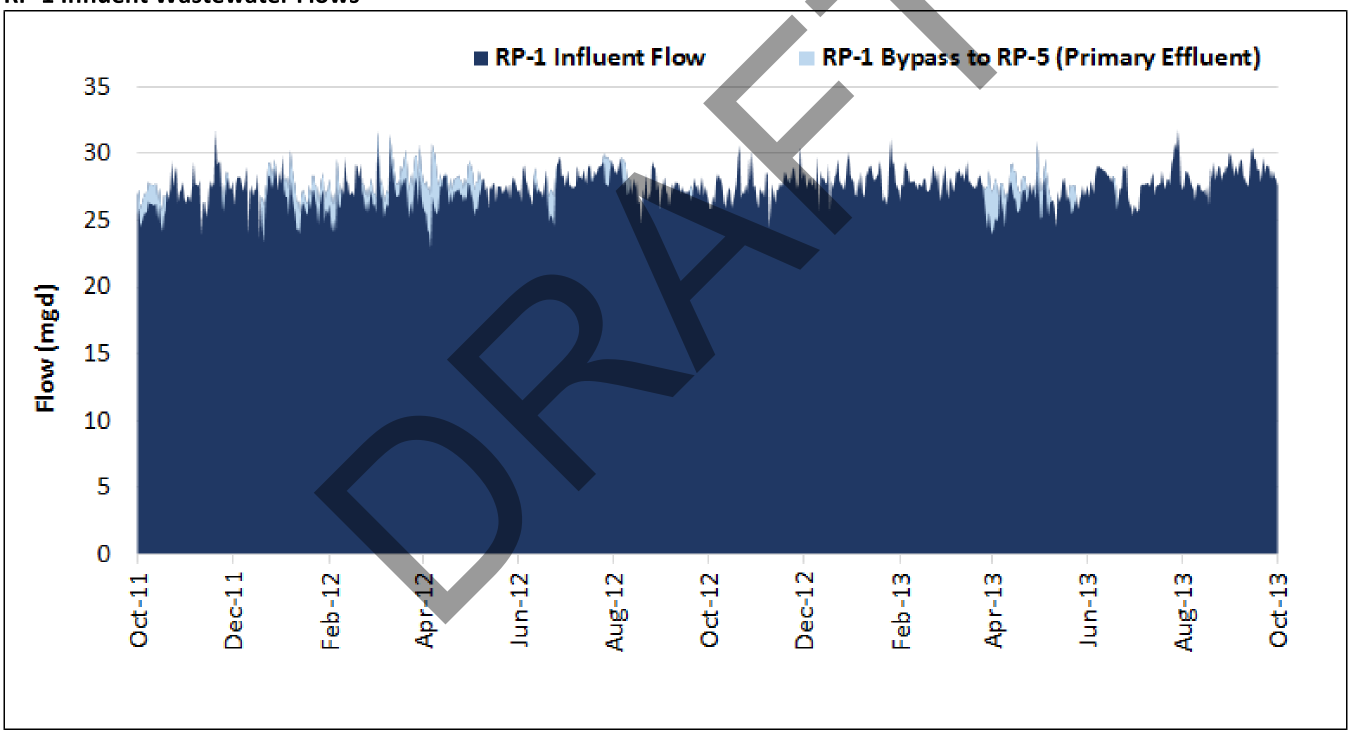
3.2 RP-1 Influent Wastewater Flow and Quality

As described previously, RP-1 has the ability to bypass primary effluent flows to RP-5 to provide relief at RP-1 and/or to perform maintenance activities. Northern flows can also be diverted upstream of RP-1. As shown in Figure 4-4, the daily average flow values reported at RP-1 have been fairly stable over the last two year period, generally ranging between 25 and 30 mgd with an average of 28 mgd.

Periodic bypasses of primary effluent from RP-1 to RP-5 were observed during this period, primarily due to maintenance activities at RP-1. In addition, there were two instances during April 2012 and April 2013 when non-routine bypasses of RP-1 primary effluent flow to RP-5 occurred to allow IEUA to conduct maintenance activities at RP-1. Each of these occurrences was captured in the data and is represented in the figure. The Consultant Team analyzed the data with and without these unique occurrences and determined they did not affect analysis results. Therefore, the analysis presented herein represents the entire two year data set including routine and non-routine bypasses from RP-1 to RP-5. A summary of the average and maximum influent flows is presented in Table 4-1 at the end of this section.

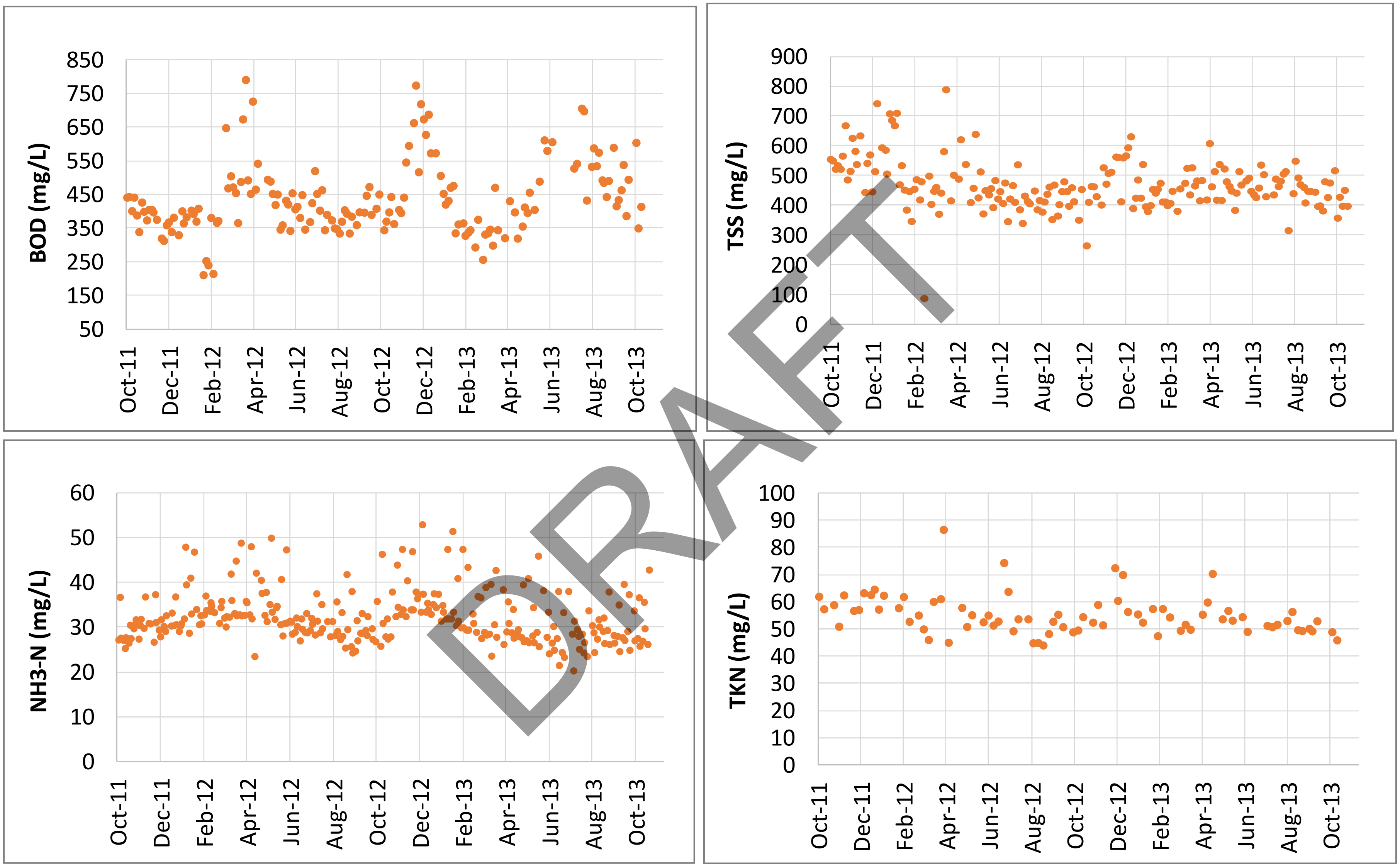
FIGURE 4-4
RP-1 Influent Wastewater Flows



The RP-1 influent wastewater quality for BOD, TSS, NH3-N, and TKN concentrations over the recent two year period is presented in Figure 4-5. Concentrations for TKN, TSS, and NH3-N were reported once, twice, and three times per week, respectively. TOC data was also available twice a week, as well as limited BOD data. For those months where BOD was measured, BOD data was available twice a week. For dates when both TOC and BOD data were available, BOD measurements were used. For dates when only TOC data was available, BOD concentrations were calculated using IEUA's equation derived from the correlation between TOC and BOD.

As shown in the concentration plots, concentrations of BOD, TSS, NH3-N, and TKN have remained fairly constant over the two year period aside from a couple of peak events. A summary of the average and maximum concentrations and calculated loads for each of these constituents is presented in Tables 4-2 and 4-3 at the end of this section.

FIGURE 4-5
RP-1 Influent Wastewater Quality



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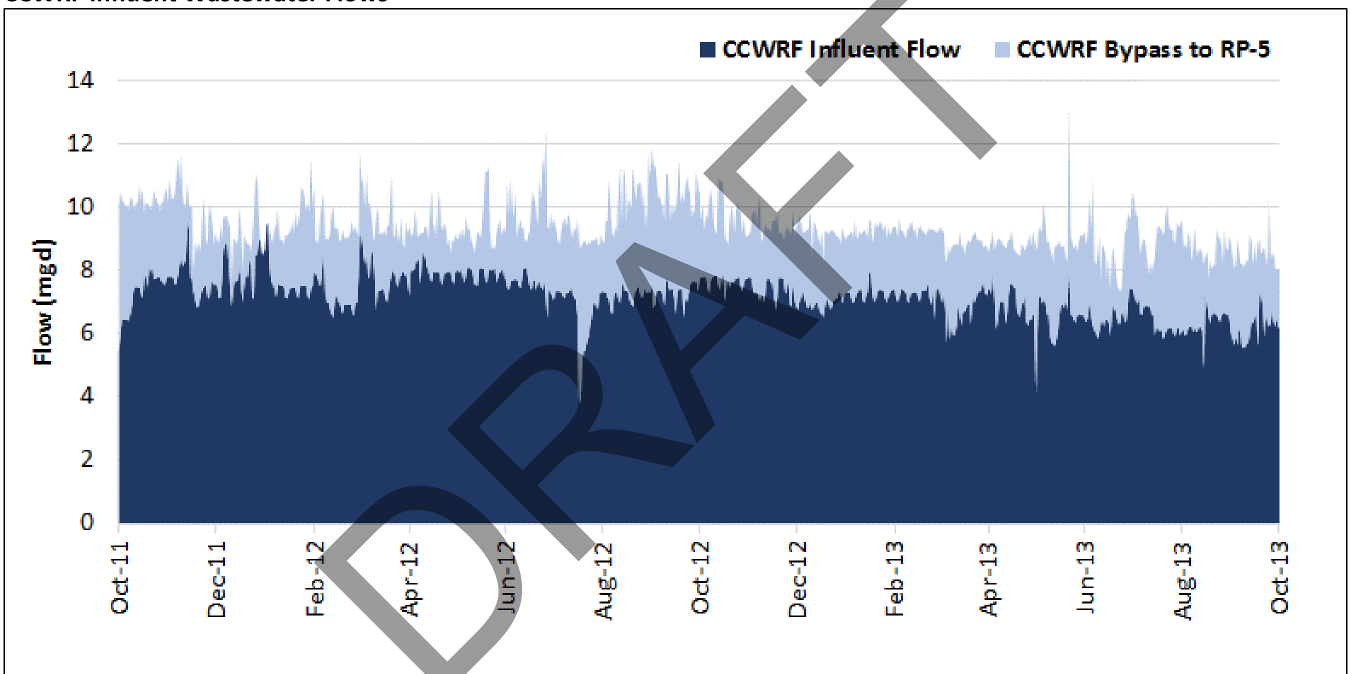
3.3 CCWRF Influent Wastewater Flow and Quality

The operational relationship between CCWRF and RP-5 in the south is similar to that between RP-4 and RP-1 in the north, with CCWRF and RP-4 operating as scalping plants for RP-5 and RP-1, respectively. As discussed previously, the Montclair Diversion Structure upstream of CCWRF allows IEUA to bypasses a portion of the northern flows south to CCWRF to provide relief capacity for the Montclair Lift Station and RP-1. The CCWRF Influent Diversion Structure at CCWRF also allows flows influent to CCWRF to be diverted south to RP-5, allowing IEUA to control the volume of influent flow to CCWRF.

As shown in Figure 4-6, the daily average flow values reported at CCWRF have been fairly stable over the last two year period, generally ranging between 6 and 8 mgd with an average of 7.2 mgd. Routine bypasses from CCWRF to RP-5 were observed during this two year period, averaging about 2.2 mgd. A summary of the average and maximum influent flows is presented in Table 4-1 at the end of this section.

FIGURE 4-6
CCWRF Influent Wastewater Flows

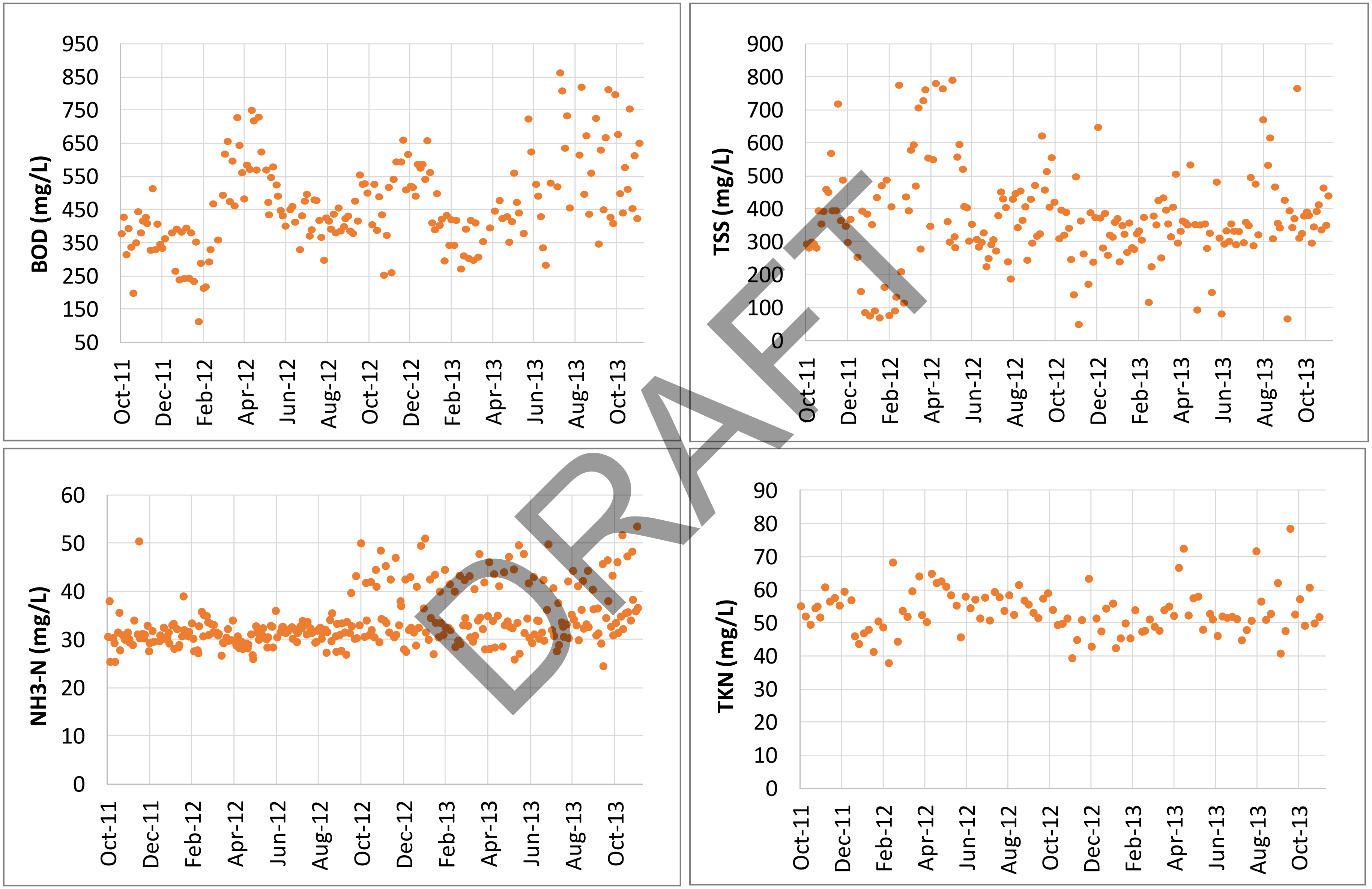


The CCWRF influent wastewater quality for BOD, TSS, NH3-N, and TKN concentrations over the recent two year period is presented in Figure 4-7. Concentrations for TSS and NH3-N were reported three times per week, while TKN was reported once per week. TOC data was also available three times per week, as well as limited BOD data. For those months where BOD was measured, BOD data was available three times per week. For dates when both TOC and BOD data were available, BOD measurements were used. For dates when only TOC data was available, BOD concentrations were calculated using IEUA's equation derived from the correlation between TOC and BOD.

Influent BOD, TSS, NH3-N, and TKN concentrations have remained fairly constant over the two year period. The high degree of variability in the CCWRF influent ammonia data is due to the sampling practices employed at the plant during this period. Beginning in October 2012, the reported ammonia concentrations were generally higher on Tuesdays because these represent grab samples rather than composite samples. A summary of the average and maximum concentrations and calculated loads for each of these constituents is presented in Tables 4-2 and 4-3 at the end of this section.

FIGURE 4-7

CCWRF Influent Wastewater Quality



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3.4 RP-5 Influent Wastewater Flow and Quality

With bypassed and diverted flows ultimately reaching RP-5 from each of the upstream facilities as well as from the RP-2 Lift Station to the south, RP-5 serves as the system sink with no ability to divert or bypass flows elsewhere within the system. RP-5 receives flows from its surrounding sewershed, as well as bypassed flows from CCWRF, RP-1, and the RP-2 Lift Station. Each of these sources is captured in the RP-5 data analysis and illustrated in Figure 4-8. The CCWRF bypass flows to RP-5 have been fairly constant over the two year period, except during October and November 2011 when greater flows from CCWRF and RP-1 were bypassed to RP-5 for maintenance related activities. RP-5 influent flows also spiked in April 2012 and April 2013 as a result of increased RP-1 bypass flows. However, the Consultant Team analyzed the data with and without these unique occurrences and determined they did not affect analysis results. Therefore, the analysis presented herein represents the entire two year data set including routine and non-routine bypasses to RP-5.

Routine flow diversions from CCWRF and the RP-2 Lift Station were observed during the two year period, with periodic bypasses from RP-1. For conservative planning purposes, the RP-5 influent flows presented in this analysis include raw wastewater contributions from the surrounding sewershed as well as bypassed flows from CCWRF and RP-1, in addition to RP-2 recycles and other flows from the RP-2 Lift Station. In general, RP-5 influent flows from all sources, as measured downstream of all diversions and bypasses, ranged between 8 and 12 mgd, with an average influent flow of 10 mgd. A summary of the average and maximum influent flows is presented in Table 4-1 at the end of this section.

The RP-5 influent wastewater quality for BOD, TSS, NH3-N, and TKN concentrations over the recent two year period is presented in Figure 4-9. Concentrations for TKN, TSS, and NH3-N were reported once, twice, and three times per week, respectively. TOC data was also available twice a week, as well as limited BOD data. For those months where BOD was measured, BOD data was available twice a week. For dates when both TOC and BOD data were available, BOD measurements were used. For dates when only TOC data was available, BOD concentrations were calculated using IEUA's equation derived from the correlation between TOC and BOD.

Influent concentrations of BOD, TSS, NH3-N, and TKN have remained fairly constant over the last two years. Higher TSS concentrations were observed in October and November of 2011 due to a temporary diversion of RP-1 flows and sludge to RP-5. A summary of the average and maximum concentrations and calculated loads for each of these constituents is presented in Tables 4-2 and 4-3 at the end of this section.

FIGURE 4-8
RP-5 Influent Wastewater Flows

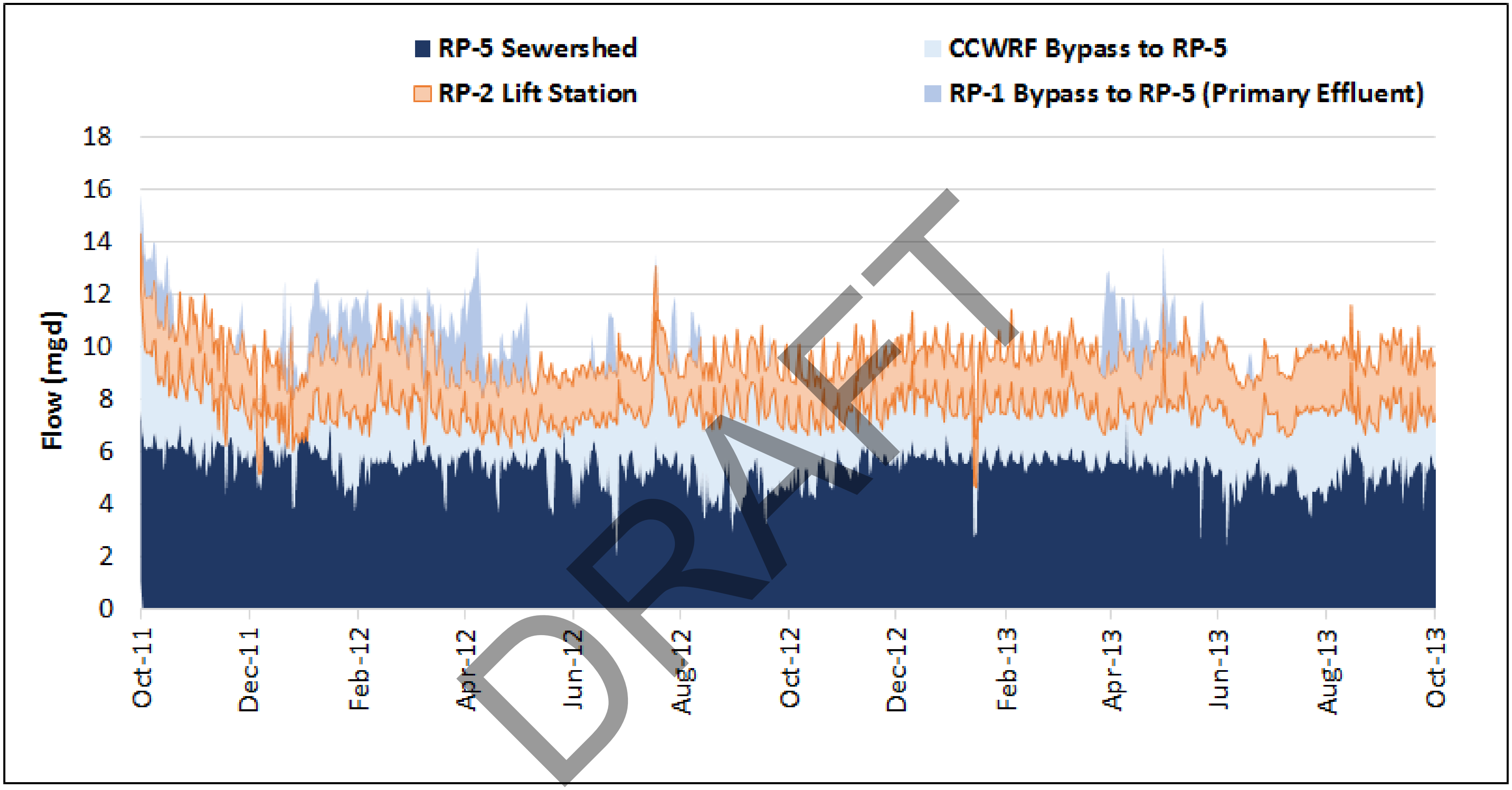
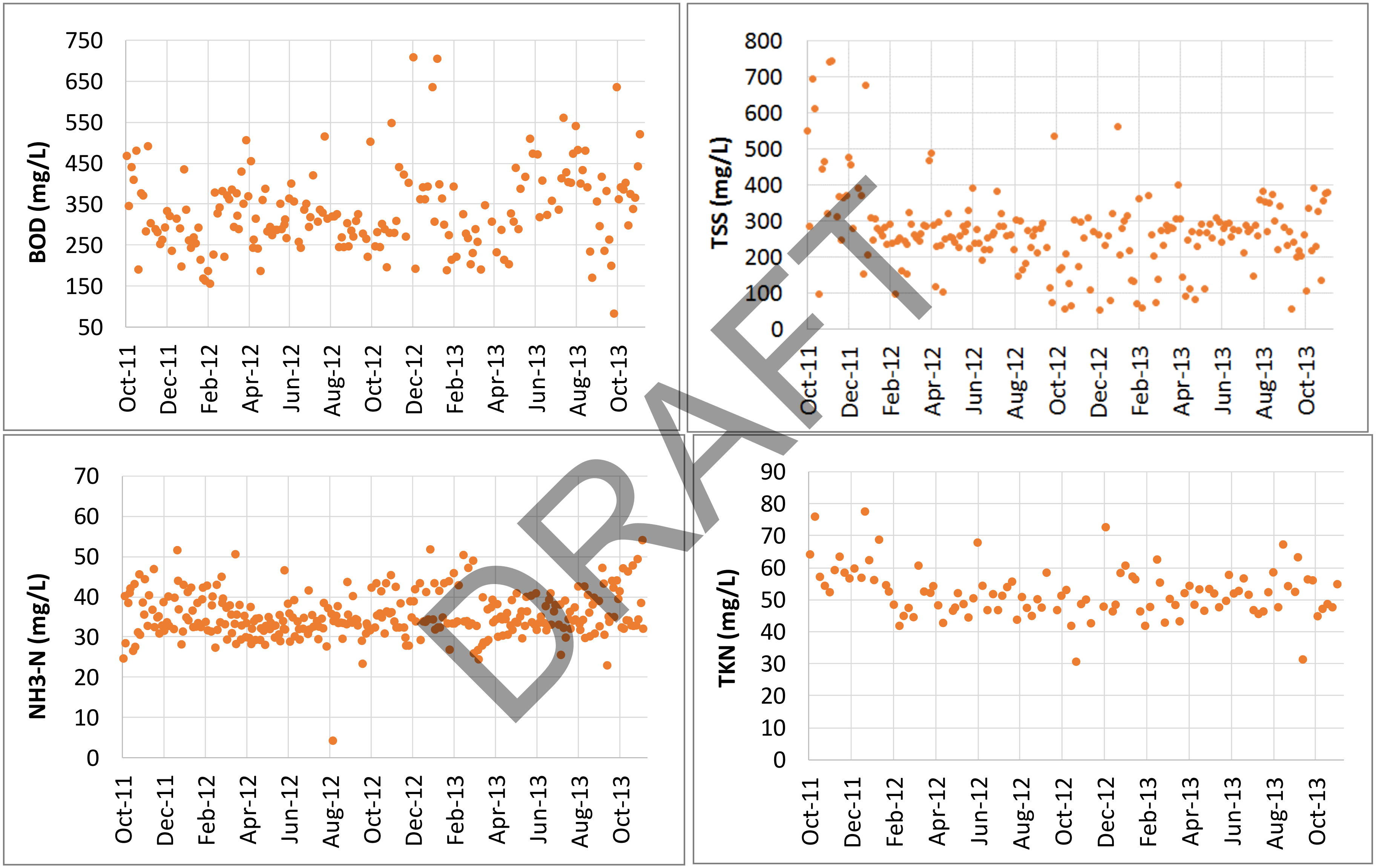


FIGURE 4-9

RP-5 Influent Wastewater Quality



3.5 Summary of Current Influent Wastewater Flows and Quality

In summary, each of the RWRPs exhibited fairly constant influent wastewater flows and constituent concentrations during the recent two year analysis period. A summary of the current influent wastewater flows is illustrated in Figure 4-10 for each plant and for the system as a whole. As depicted, the average influent flow for the entire system was about 56 mgd during the two year period, with most of the flows being treated at RP-1 and the least of the flows being treated at CCWRF. The average and maximum flows and peaking factors for each of the individual RWRPs are summarized in Table 4-1. Peaking factors were developed for maximum month, maximum week, and maximum day.

The average concentrations for key constituents including BOD, TSS, NH3-N, and TKN for each of the RWRPs are summarized in Table 4-2. For comparison, the concentrations established previously for the 2002 WFMP are also presented in Table 4-2. A comparison of the two analyses demonstrates a substantial increase in wastewater strength since the 2002 WFMP.

For analysis of the current wastewater loads, loads were calculated based on the reported influent flow and constituent concentration for each reporting day. Therefore, the average and maximum loads and peaking factors presented in Table 4-3 represent load characteristics as calculated from flow and concentration data. These load peaking factors formed the basis of the influent wastewater load projections discussed in the next section.

FIGURE 4-10
IEUA Current Influent Wastewater Flows

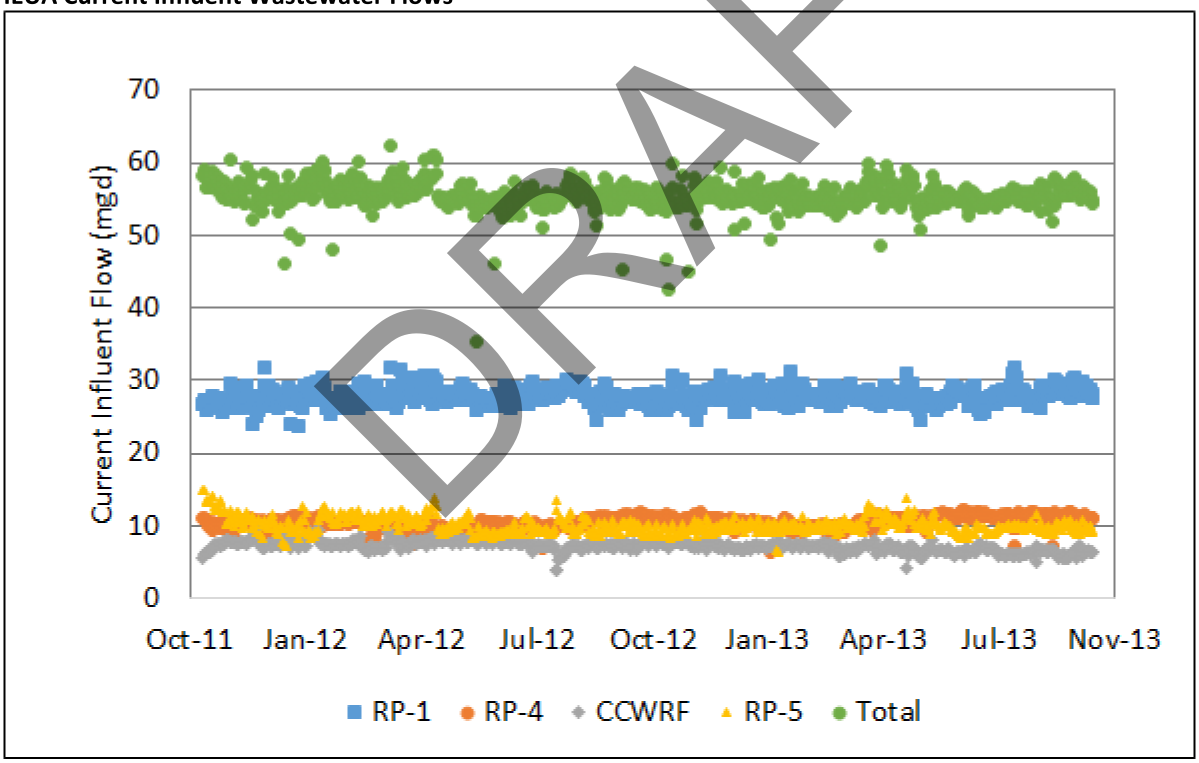


TABLE 4-1
Summary of Current Influent Wastewater Flows[1]

	RP-4		RP-1		CCWRF		RP-5	
	Peaking Factor	Influent Flow (mgd)	Peaking Factor	Influent Flow (mgd)	Peaking Factor	Influent Flow (mgd)	Peaking Factor	Influent Flow (mgd)
Annual Average	-	10.5	-	28	-	7.2	-	10.0
Max Month	1.10	11.6	1.04	29	1.13	8.1	1.27	12.8
Max Week	1.14	11.9	1.08	30	1.25	8.9	1.43	14.3
Max Day	1.15	12.1	1.14	32	1.34	9.6	1.47	14.8

Notes:
[1] Analysis based on plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.

TABLE 4-2
Summary of Influent Wastewater Concentrations[1,2]

	Average Influent Water Quality (mg/L)							
	RP-4		**RP-1**		**CCWRF**		**RP-5**	
	Current	**2002**	**Current**	**2002**	**Current**	**2002**	**Current**	**2002**
BOD	**352**	245	**434**	243	**455**	240	**321**	240
TSS	**318**	256	**472**	301	**367**	300	**267**	300
NH3-N	**41**	28	**32**	23	**34**	23	**35**	23
TKN	**59**	43	**55**	42	**53**	42	**52**	42

Notes:
[1] Current concentrations based on plant influent data provided by IEUA for the period between Oct 15, 2011 and Oct 15, 2013.
[2] 2002 wastewater characteristics as presented in the 2002 WFMP Volume II memoranda. RP-4 concentrations based on plant influent data between Aug 1999 and Jul 2001. RP-1 concentrations based on plant influent data between Jul 1999 and May 2001. CCWRF and RP-5 concentrations established under the assumption that raw wastewater received at most of IEUA's wastewater treatment plants shared the same characteristics.

TABLE 4-3
Summary of Current Influent Wastewater Loads[1,2]

	RP-4		RP-1		CCWRF		RP-5	
	Peaking Factor	Load (lb/day)	Peaking Factor	Load (lb/day)	Peaking Factor	Load (lb/day)	Peaking Factor	Load (lb/day)
BOD								
Annual Average	-	30,543	-	101,197	-	26,839	-	27,771
Max Month	1.85	56,393	1.53	155,195	1.58	42,479	1.79	49,636
Max Week	2.09	63,735	1.74	175,768	1.88	50,430	2.48	69,009
Max Day	2.12	64,696	1.90	191,964	1.99	53,289	2.31	64,209
TSS								
Annual Average	-	27,630	-	109,880	-	21,683	-	23,181
Max Month	1.59	43,963	1.38	151,459	1.88	40,837	2.47	57,295
Max Week	1.98	54,717	1.71	187,551	2.45	53,219	3.22	74,660
Max Day	1.98	54,717	1.71	187,551	2.45	53,219	3.48	80,742
NH3-N								
Annual Average	-	3,550	-	7,544	-	1,993	-	3,005
Max Month	1.24	4,393	1.20	9,045	1.21	2,413	1.35	4,043
Max Week	1.32	4,692	1.33	10,023	1.42	2,823	1.65	4,953
Max Day	1.57	5,566	1.63	12,276	1.64	3,262	1.70	5,112
TKN								
Annual Average	-	5,015	-	12,975	-	3,105	-	4,602
Max Month	1.46	7,322	1.24	16,027	1.28	3,963	1.60	7,349
Max Week	1.59	7,963	1.53	19,912	1.40	4,338	1.92	8,854
Max Day	1.59	7,963	1.53	19,912	1.40	4,338	1.92	8,854

Notes:
[1] Analysis based on plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013. Loads calculated from flow and concentration data.
[2] Maximum weekly and daily load values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.

4.0 Wastewater Flow and Loading Forecast

The Consultant Team developed flow and loading projections for each of the RWRPs based on the results of the flow diversion analysis presented in TM 3 as well as the influent wastewater analysis presented in the previous section. The results of the flow and loading forecast discussed in this section will form the basis of establishing the capacity and expansion needs for each of the four RWRPs as part of this WFMP effort.

Flow projections were developed by the IRP Consultant and are based on the average influent wastewater flows measured during the flow monitoring period in November 2013 and projected through the year 2060 using population, employment, and land use information. The year 2060 represents buildout or ultimate flows. A detailed discussion of the flow monitoring equipment, methodology, and data analysis is presented in the *IEUA IRP Temporary Flow Monitoring Report* (ADS, 2014). A discussion of the development of flow projections is presented in the *IEUA IRP Wastewater Flow Projections Technical Memorandum* (RMC 2013). These flow projections formed the basis of the flow diversion alternatives analysis presented in TM 3 *Regional Trunk Sewer Analysis* of the WFMP. Accordingly, several flow diversion alternatives were evaluated as part of this WFMP effort, each offering different means to divert flows to either RP-1 or RP-5 to optimize groundwater recharge and serve IEUA customers in each sewershed. As established in TM 3, IEUA's preferred flow diversion alternative is Alternative 2, whereby flows from the existing Whispering Lakes and Haven pump stations will be conveyed to RP-1, while maintaining flexibility in the system to convey flows south to RP-5 if needed.

Under Flow Diversion Alternative 2, the CCWRF influent wastewater flows are projected to increase between 2020 and 2060 by about 15 percent, with more significant flow increases expected at RP-1, RP-4 and RP-5. The increase in flows to RP-4 by approximately 60 percent is largely attributable to the gradual incorporation of septic flows into the system beginning in 2020. RP-1 flows are projected to increase by 20 percent, and RP-5 flows are projected to more than double by year 2060 as a result of population growth in Chino and other areas served by RP-5. The forecasted influent wastewater flows for Alternative 2 are summarized in Table 4-4 for each of the four RWRPs and for the overall system.

TABLE 4-4
Average Influent Wastewater Flow Projections for Preferred Flow Diversion Alternative 2[1]

Year	RP-1[2] (mgd)	RP-4[3] (mgd)	CCWRF (mgd)	RP-5 (mgd)	Total (mgd)
2020	30.4	11.7	6.9	10.2	**59.2**
2030	32.2	14.0	7.1	15.9	**69.2**
2035[4]	33.1	14.7	7.3	18.4	**73.5**
2040	34.0	15.4	7.4	20.9	**77.7**
2050	36.1	16.8	7.7	24.8	**85.4**
2060[4]	36.3	18.4	7.9	25.3	**87.9**

Notes:
[1] Analysis performed by IRP Consultant during November 2013 flow monitoring period. Values adjusted by IEUA to reflect normal bypass and diversion operations between plants.
[2] Assumes Whispering Lakes Pump Station and Montclair Pipeline infrastructure improvements discussed in TM 3 are complete and operational by 2020, with both pump stations online and conveying flow to RP-1.
[3] Includes septic flows tributary to RP-4, introduced in 2020 at 1 mgd and increasing by 0.5 mgd every 10 years through 2060.
[4] WFMP planning effort based on 2035 planning year. For site footprint planning considerations, the ultimate flows (i.e., 2060 flow values) constitute the basis of systems sizing and site space requirements.

At the request of IEUA, the Consultant Team evaluated as a subset of Alternative 2 the impact on RP-5 flow projections under the assumption that both the Whispering Lakes and Haven pump stations are offline. Under this scenario, the flows from each of these tributary areas would be conveyed to RP-5 rather than to RP-1. In order to provide greater system reliability and redundancy, RP-5 facilities planning will assume both pump stations are offline. These projected flows will form the basis for establishing RP-5 facilities planning and expansion needs in subsequent TMs, which will likely result in the need for RP-5 capacity enhancements to occur sooner. The RP-5 flow projections for the two scenarios (pump stations online and pump stations offline) are presented in Table 4-5.

TABLE 4-5
RP-5 Average Influent Wastewater Flow Projections for Preferred Flow Diversion Alternative 2

Year	RP-5 w/ Pump Stations Online (mgd)	RP-5 w/ Pump Stations Offline[1] (mgd)
2020	10.2	11.9
2030	15.9	17.7
2035[2]	18.4	20.2
2040	20.9	22.8
2050	24.8	26.7
2060[2]	25.3	27.2

Notes:
[1] Flow projections established for this scenario assumed both Whispering Lakes and Haven Pump Stations are offline.
[2] WFMP planning effort based on 2035 planning year. For site footprint planning considerations, the ultimate flows (i.e., 2060 flow values) constitute the basis of systems sizing and site space requirements.

The wastewater loading projections were developed for the four key wastewater parameters identified previously, for each of the four RWRPs for the 2035 planning year as well as the 2060 ultimate buildout year. These projections are based on the flow peaking factors presented in Table 4-1, the average influent wastewater constituent concentrations presented in Table 4-2, the load peaking factors presented in Table 4-3, and average influent wastewater flow projections established in Tables 4-4 and 4-5. The forecasted influent wastewater flow and loading values are summarized in Tables 4-6 through 4-10 for each of the four RWRPs and forms the basis of the master planning effort for each of these RWRPs in subsequent TMs. The results are presented below from upstream-most plant to downstream-most plant.

TABLE 4-6
RP-4 Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2

	Flows		Loads[1]							
			BOD		TSS		NH3-N		TKN	
	PF	mgd	PF	lb/day	PF	lb/day	PF	lb/day	PF	lb/day
Current (Based on 2011-2013 Data)										
Annual Average	-	10.5	-	30,543	-	27,630	-	3,550	-	5,015
Max Month	1.10	11.6	1.85	56,393	1.59	43,963	1.24	4,393	1.46	7,322
Max Week	1.14	11.9	2.09	63,735	1.98	54,717	1.32	4,692	1.59	7,963
Max Day	1.15	12.1	2.12	64,696	1.98	54,717	1.57	5,566	1.59	7,963
Projections (Planning Year: 2035)[2]										
Annual Average	-	14.7	-	43,207	-	38,948	-	5,010	-	7,186
Max Month	1.10	16.2	1.85	79,775	1.59	61,971	1.24	6,200	1.46	10,492
Max Week	1.14	16.7	2.09	90,161	1.98	77,132	1.32	6,621	1.59	11,410
Max Day	1.15	17.0	2.12	91,521	1.98	77,132	1.57	7,856	1.59	11,410
Projections (Planning Year: 2060)[3]										
Annual Average	-	18.4	-	54,082	-	48,752	-	6,271	-	8,994
Max Month	1.10	20.3	1.85	99,854	1.59	77,570	1.24	7,761	1.46	13,132
Max Week	1.14	20.9	2.09	112,855	1.98	96,546	1.32	8,288	1.59	14,282
Max Day	1.15	21.2	2.12	114,556	1.98	96,546	1.57	9,833	1.59	14,282

Notes:
[1] Maximum weekly and daily loading values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.
[2] Analysis based on average influent wastewater flow projections presented in Table 4-4 and the average concentrations and loading peaking factors established from plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.
[3] Site planning considerations will be based on the projections established for the 2060 ultimate planning year.

TABLE 4-7
RP-1 Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2

	Flows		Loads[1]							
			BOD		TSS		NH3-N		TKN	
	PF	mgd	PF	lb/day	PF	lb/day	PF	lb/day	PF	lb/day
Current (Based on 2011-2013 Data)										
Annual Average	-	27.8	-	101,197	-	109,880	-	7,544	-	12,975
Max Month	1.04	29.0	1.53	155,195	1.38	151,459	1.20	9,045	1.24	16,027
Max Week	1.08	30.0	1.74	175,768	1.71	187,551	1.33	10,023	1.53	19,912
Max Day	1.14	31.8	1.90	191,964	1.71	187,551	1.63	12,276	1.53	19,912
Projections (Planning Year: 2035)[2]										
Annual Average	-	33.1	-	119,771	-	130,296	-	8,937	-	15,249
Max Month	1.04	34.4	1.53	183,680	1.38	179,602	1.20	10,716	1.24	18,835
Max Week	1.08	35.7	1.74	208,029	1.71	222,400	1.33	11,875	1.53	23,401
Max Day	1.14	37.7	1.90	227,197	1.71	222,400	1.63	14,544	1.53	23,401
Projections (Planning Year: 2060)[3]										
Annual Average	-	36.3	-	131,350	-	142,893	-	9,801	-	16,723
Max Month	1.04	37.8	1.53	201,438	1.38	196,965	1.20	11,752	1.24	20,656
Max Week	1.08	39.1	1.74	228,141	1.71	243,900	1.33	13,023	1.53	25,663
Max Day	1.14	41.4	1.90	249,162	1.71	243,900	1.63	15,951	1.53	25,663

Notes:
[1] Maximum weekly and daily loading values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.
[2] Analysis based on average influent wastewater flow projections presented in Table 4-4 and the average concentrations and loading peaking factors established from plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.
[3] Site planning considerations will be based on the projections established for the 2060 ultimate planning year.

TABLE 4-8
CCWRF Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2

	Flows		Loads[1]							
			BOD		TSS		NH3-N		TKN	
	PF	mgd	PF	lb/day	PF	lb/day	PF	lb/day	PF	lb/day
Current (Based on 2011-2013 Data)										
Annual Average	-	7.2	-	26,839	-	21,683	-	1,993	-	3,105
Max Month	1.13	8.1	1.58	42,479	1.88	40,837	1.21	2,413	1.28	3,963
Max Week	1.25	8.9	1.88	50,430	2.45	53,219	1.42	2,823	1.40	4,338
Max Day	1.34	9.6	1.99	53,289	2.45	53,219	1.64	3,262	1.40	4,338
Projections (Planning Year: 2035)[2]										
Annual Average	-	7.3	-	27,708	-	22,353	-	2,048	-	3,257
Max Month	1.13	8.2	1.58	43,854	1.88	42,099	1.21	2,480	1.28	4,156
Max Week	1.25	9.1	1.88	52,063	2.45	54,863	1.42	2,901	1.40	4,550
Max Day	1.34	9.8	1.99	55,014	2.45	54,863	1.64	3,352	1.40	4,550
Projections (Planning Year: 2060)[3]										
Annual Average	-	7.9	-	29,985	-	24,190	-	2,217	-	3,524
Max Month	1.13	8.9	1.58	47,459	1.88	45,559	1.21	2,684	1.28	4,498
Max Week	1.25	9.8	1.88	56,342	2.45	59,373	1.42	3,139	1.40	4,924
Max Day	1.34	10.6	1.99	59,535	2.45	59,373	1.64	3,628	1.40	4,924

Notes:
[1] Maximum weekly and daily loading values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.
[2] Analysis based on average influent wastewater flow projections presented in Table 4-4 and the average concentrations and loading peaking factors established from plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.
[3] Site planning considerations will be based on the projections established for the 2060 ultimate planning year.

TABLE 4-9

RP-5 Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2 w/ Haven & WL PS Online

	Flows		Loads[1]							
			BOD		TSS		NH3-N		TKN	
	PF	mgd	PF	lb/day	PF	lb/day	PF	lb/day	PF	lb/day
Current (Based on 2011-2013 Data)										
Annual Average	-	10.0	-	27,771	-	23,181	-	3,005	-	4,602
Max Month	1.27	12.8	1.79	49,636	2.47	57,295	1.35	4,043	1.60	7,349
Max Week	1.43	14.3	2.48	69,009	3.22	74,660	1.65	4,953	1.92	8,854
Max Day	1.47	14.8	2.31	64,209	3.48	80,742	1.70	5,112	1.92	8,854
Projections (Planning Year: 2035)[2]										
Annual Average	-	18.4	-	49,290	-	40,964	-	5,422	-	8,036
Max Month	1.27	23.4	1.79	88,099	2.47	101,247	1.35	7,294	1.60	12,835
Max Week	1.43	26.3	2.48	122,483	3.22	131,932	1.65	8,937	1.92	15,463
Max Day	1.47	27.1	2.31	113,964	3.48	142,680	1.70	9,223	1.92	15,463
Projections (Planning Year: 2060)[3]										
Annual Average	-	25.3	-	67,774	-	56,326	-	7,456	-	11,050
Max Month	1.27	32.2	1.79	121,137	2.47	139,214	1.35	10,029	1.60	17,648
Max Week	1.43	36.1	2.48	168,415	3.22	181,406	1.65	12,288	1.92	21,261
Max Day	1.47	37.3	2.31	156,700	3.48	196,185	1.70	12,682	1.92	21,261

Notes:

[1] Maximum weekly and daily loading values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.

[2] Analysis based on average influent wastewater flow projections presented in Table 4-5 and the average concentrations and loading peaking factors established from plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.

[3] Site planning considerations will be based on the projections established for the 2060 ultimate planning year.

TABLE 4-10
RP-5 Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2 w/ Haven & WL PS Offline

	Flows		Loads[1]							
			BOD		TSS		NH3-N		TKN	
	PF	mgd	PF	lb/day	PF	lb/day	PF	lb/day	PF	lb/day
Current (Based on 2011-2013 Data)										
Annual Average	-	10.0	-	27,771	-	23,181	-	3,005	-	4,602
Max Month	1.27	12.8	1.79	49,636	2.47	57,295	1.35	4,043	1.60	7,349
Max Week	1.43	14.3	2.48	69,009	3.22	74,660	1.65	4,953	1.92	8,854
Max Day	1.47	14.8	2.31	64,209	3.48	80,742	1.70	5,112	1.92	8,854
Projections (Planning Year: 2035)[2]										
Annual Average	-	20.2	-	54,112	-	44,972	-	5,953	-	8,823
Max Month	1.27	25.7	1.79	96,718	2.47	111,151	1.35	8,007	1.60	14,090
Max Week	1.43	28.8	2.48	134,465	3.22	144,838	1.65	9,811	1.92	16,975
Max Day	1.47	29.8	2.31	125,113	3.48	156,638	1.70	10,125	1.92	16,975
Projections (Planning Year: 2060)[3]										
Annual Average	-	27.2	-	72,864	-	60,556	-	8,016	-	11,880
Max Month	1.27	34.7	1.79	130,234	2.47	149,669	1.35	10,782	1.60	18,973
Max Week	1.43	38.8	2.48	181,062	3.22	195,030	1.65	13,211	1.92	22,858
Max Day	1.47	40.1	2.31	168,468	3.48	210,918	1.70	13,634	1.92	22,858

Notes:
[1] Maximum weekly and daily loading values are based on limited data with sampling frequencies ranging between 1 and 3 times per week.
[2] Analysis based on average influent wastewater flow projections presented in Table 4-5 and the average concentrations and loading peaking factors established from plant influent data provided by IEUA for the period between October 15, 2011 and October 15, 2013.
[3] Site planning considerations will be based on the projections established for the 2060 ultimate planning year.

6.0 Conclusions

As discussed in TM 3, the WFMP planning effort will be based on IEUA's preferred Flow Diversion Alternative 2, optimizing groundwater recharge by diverting flows from Whispering Lakes and Haven pump stations to RP-1. The corresponding influent wastewater flow and loading projections under this alternative for the planning year 2035 are presented in this TM and will form the basis of the master planning effort for each of the RWRPs in subsequent TMs. Projections are also presented for the 2060 ultimate buildout year, which will be used for site planning considerations. In order to provide greater system reliability and redundancy, RP-5 facilities planning will assume both the Whispering Lakes and Haven pump stations are offline. These projected flows will form the basis for establishing RP-5 facilities planning and expansion needs conducted as part of this WFMP effort.

7.0 References

ADS Environmental Services (ADS). January 2014. *IEUA IRP Temporary Flow Monitoring Report.* Prepared for RMC Water and Environment and IEUA for the Flow Monitoring Period between October 25, 2013 and November 7, 2013.

RMC Water and Environment (RMC). December 2013. *Technical Memorandum: IEUA IRP Wastewater Flow Projections.* Prepared for IEUA.