A LITTLE ROCK WATER RECLAMATION COMMISSION
RESOLUTION NO. 16-03

A RESOLUTION AUTHORIZING AMENDMENT NO. 1 TO THE 2010 SYSTEM EVALUATION CAPACITY ASSURANCE PLAN

WHEREAS, Little Rock Wastewater ("LRW") has the goal of mitigating all capacity related sanitary sewer overflows ("SSOs") in the Little Rock sanitary sewer system and the Little Rock Water Reclamation Commission ("LRWRC") desires to authorize the implementation of a program to achieve this goal by December 31, 2023; and

WHEREAS, Montgomery Watson Harza, Engineers ("MWH") prepared a System Evaluation Capacity Assurance Plan ("SECAP") to achieve this goal over a 15 year implementation schedule and which was implemented by the Little Rock Sanitary Sewer Committee by Resolution No. 02-04 dated September 18, 2002; and

WHEREAS, the RJN Group, Inc. prepared the 2010 SECAP Update which now includes a revised capital improvement plan, which encompassed the previously completed projects, designed to meet the terms of the Sierra Club Settlement Agreement and the Consent Administrative Order as they pertain to the Capacity Related Overflows;

WHEREAS, Hawkins Weir Engineers, Inc. completed a study of alternatives to treat wet weather flows and prepared Amendment No. 1 to the 2010 SECAP Update.

NOW, THEREFORE, BE IT RESOLVED by the Little Rock Water Reclamation Commission:

1. That Amendment No. 1 to the 2010 SECAP Update as prepared by Hawkins Weir Engineers, Inc. is hereby adopted and LRW, by its Chief Executive Officer ("C.E.O."), Greg Ramon, is further hereby authorized to proceed with the implementation of the Amended SECAP Update.

2. That LRW by its C.E.O. is further directed and authorized to take all other action necessary for the accomplishment of the implementation of the 2010 SECAP Update to meet the December 31, 2023 compliance deadline originally set forth therein, including, but not limited to execution of any and all documents on behalf of LRWRC in connection therewith, as well as performing such acts as may be necessary to comply with this Resolution and carry out the intent of the LRWRC to accomplish the implementation of the updated SECAP.

4. This resolution shall be in full force and effect from and after its adoption and approval.

PASSED AND ADOPTED this 20th day of April, 2016.

LITTLE ROCK WATER
RECLAMATION COMMISSION

By: ______________________________
Richard L. Mays, Jr., Chair

Attest: VICE CHAIR

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Ken Griffey, Secretary

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# 1.0 Executive Summary

This Executive Summary presents the results of the 2010 System Evaluation and Capacity Assurance Plan (SECAP) Update Amendment No. 1 developed for Little Rock Wastewater (LRW) by Hawkins-Weir Engineers, Inc. This Amendment is to the 2010 SECAP Update that was prepared for LRW by RJN Group, Inc.

## 1.1 Background

LRW entered into a consent administrative order (CAO) that requires the elimination of sanitary sewer overflows (SSOs) caused by a defined storm by 2023. The SECAP, which has served as the Utility's capital improvement plan since 2002, identifies the improvements required to achieve that objective. The SECAP was updated in 2010 to gauge the success of the completed projects and to evaluate the final steps required to achieve compliance with the CAO. The 2010 SECAP Update identified a number of required improvements including four (4) large equalization storage projects. A decision handed down in 2013 by the U.S. Court of Appeals for the Eighth Circuit[1] has spurred a potential shift in the way that regulatory agencies might allow peak flows to be managed at a WWTP. This regulatory shift has the potential to alter the recommended approach for two of the Utility's largest storage projects. The primary objective of this Amendment is to re-evaluate the approach for those two projects based on the anticipated regulatory changes.

## 1.2 Potential Impacts of a Shifting Regulatory Environment

SSOs are a common problem that occurs within collection systems. These overflows are a violation of a utility's NPDES permit. Completely eliminating the leaks in a sewage collection system is typically cost prohibitive. A shift in the regulatory environment may now allow blending which can be a cost effective way to process peak flows at a WWTP.

The wastewater that enters a WWTP during a rainfall event is typically very dilute. Even though this diluted influent is easier to treat, regulators have historically required it to receive full treatment. This requirement can be detrimental to a WWTP's biological processes. Blending diverts peak flow around biological treatment. This flow stream is recombined or "blended" with the effluent from the secondary treatment processes prior to disinfection.

The Iowa League of Cities (ILC) filed suit against the EPA in 2010 contending that the EPA's policies on wet weather treatment were too stringent. The group argued that the EPA's policies improperly limited municipalities' options in dealing with peak flows and often required that costlier and less desirable options be implemented. One of the ILC's major complaints was centered on the use of blending at WWTPs. The Court agreed with the ILC's position and ruled that the EPA did not have the authority to regulate the discharge from individual processes within the plant, but rather that the agency could only dictate the final effluent quality.

The recommendations of LRW's 2010 SECAP Update were made prior to the Court's 2012 ruling. The Update recommended a total of 76 million gallons of additional collection system

[1] United States Court of Appeals for the Eighth Circuit No. 11-3412

storage at an estimated cost of over $94 million. Collection system storage is expensive and it is often difficult to find an acceptable site. The biggest weakness of collection system storage, however, is that it has an inherently limited capacity. Once the basins are filled to capacity the collection system may be required to return to surcharged and overflowing conditions. The purpose of this Amendment is to explore any advantages to reducing or replacing the recommended storage volumes with peak flow treatment.

## 1.3 Collection System Hydraulics

A series of hydraulic scenarios were analyzed to find a way to reduce or eliminate equalization storage by increasing WWTP discharge capacity. Three (3) scenarios, including the original 2010 SECAP Update's recommended approach, were selected for further evaluation.

### 1.3.1 Scenario 1: 2010 SECAP Recommendation

This scenario includes the improvements recommended by the 2010 SECAP Update. The factors limiting the processing of peak flows in this scenario are the 94 MGD Adams Field WWTP influent capacity and the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP (Storage + Biological/UV) – 94 MGD (Until Storage is Full)
- Adams Field WWTP (Biological/UV) – 60 MGD (After Storage is Full)
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 81 MG (30 MG Existing + 51 MG New)
- Adams Field WWTP – 27 MG (13 MG Existing + 14 MG New)

**Required Capital Improvements:**

- 51 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 14 MG storage expansion at Adams Field WWTP
- Modifications to multiple Adams Field WWTP flow diversion structures

This scenario satisfies the requirements of LRW's CAO based on providing collection system storage only.

### 1.3.2 Scenario 3: Adams Field WWTP – Parallel Treatment

In this new scenario the Adams Field WWTP's discharge rate is raised to match its influent capacity, eliminating the need for equalization storage at the plant and extending the amount of time that the plant can process peak flows. This scenario also introduces a high-rate parallel treatment process to provide advanced treatment of the portion of the flow routed around biological treatment prior to blending it with the plant's normal effluent stream.

**Peak Flow Rates:**

- Adams Field WWTP– 94 MGD
    - Biological – 36 MGD
    - Parallel Treatment – 58 MGD
    - Peak Flow Disinfection – 58 MGD
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 61.2 MG (30 MG Existing + 31.2 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 31.2 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 58 MGD high rate treatment process at Adams Field WWTP
- 58 MGD peak flow disinfection system at Adams Field WWTP

This scenario would increase the WWTP's peak flow while allowing the plant to be operated efficiently.

### 1.3.3 Scenario 6: Eliminate New Storage at Adams Field & Scott Hamilton Drive

This scenario eliminates the need for any new storage at the Adams Field WWTP and the Scott Hamilton Drive Peak Flow Facility for mitigating SSOs at peak flows up to the design storm event. This option mirrors the concept outlined in Scenario 3 but with much higher peak flows. The only limiting factor included in this scenario is the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP– 122 MGD
    - Biological – 36 MGD
    - Parallel Treatment – 86 MGD
    - Peak Flow Disinfection – 86 MGD
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 30 MG (0 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 67 MGD booster pump station on the twin 60-inch interceptor sewers (Twin 60s)
- Approximately 8,100 feet of new 42-inch gravity interceptor upstream of the new booster pump station

- 28 MGD expansion of the Adams Field WWTP Influent Pump Station
- 86 MGD high rate treatment process at Adams Field WWTP
- 86 MGD peak flow disinfection system at Adams Field WWTP
- 122 MGD effluent pump station at Adams Field WWTP
- Multiple hydraulic improvements throughout the Adams Field WWTP
- Seal or raise 12 manholes in the vicinity of the William J. Clinton Presidential Library
- Add additional pump to the Arch Street Pump Station

Under this scenario a booster pump station would be needed in the Interstate Park area to overcome hydraulic restrictions in the Twin 60s. A new effluent pump station would also be required at the Adams Field WWTP. The primary advantage of this option is the elimination of expanded storage at the Scott Hamilton Drive Facility while mitigating SSOs for peak flows up to and including the design storm event.

## 1.4 Potential Capital Project Modifications

An analysis of the two (2) new potential options was conducted as a part of this Amendment. The purpose of the analysis was to develop costs that could be used to help evaluate if either option was preferable to the 2010 SECAP Update recommendations. Both of the two (2) new options evaluated would require an expansion of the Adams Field WWTP's disinfection system. A planning level evaluation of the following types of disinfection is included as a part of this Amendment. Peracetic acid was concluded to be the recommended option but a more detailed analysis will be performed as a part of a subsequent preliminary engineering report to confirm that finding.

## 1.5 Cost Analysis

The cost estimates for each of the three options evaluated are summarized in Table 1.1.

**Table 1.1**
**Summary of Estimated Capital Cost**

| Description | Estimated Capital Cost |
|---|---|
| Scenario 1: 2010 SECAP Recommendations | $44,189,000 |
| Scenario 3: Adams Field WWTP: Parallel Treatment | $43,626,000 |
| Scenario 6: Adams Field WWTP: Eliminate New Storage at Adams Field & Scott Hamilton Drive | $76,588,000 |

A 20-year present worth analysis was performed for each of the three scenarios using the capital and O&M costs outlined previously in this Amendment. Table 1.2 lists the results from that analysis.

**Table 1.2**
**Summary of Present Worth Cost Analysis**

| Description | Capital Cost | 20-YR O&M Cost | Present Worth |
|---|---|---|---|
| **Scenario 1: 2010 SECAP Recommendations** | **$44,189,000** | **$5,571,000** | **$49,760,000** |
| Mabelvale Pike 51 MG Storage Basin | $25,881,000 | $3,848,000 | $29,729,000 |
| Adams Field WWTP Equalization | $18,308,000 | $1,723,000 | $20,031,000 |
| **Scenario 3: Adams Field Parallel Treatment** | **$43,626,000** | **$7,120,000** | **$50,746,000** |
| Adams Field WWTP Improvements | $23,720,000 | $4,572,000 | $28,292,000 |
| Mabelvale Pike 31.2 MG Storage Basin | $19,906,000 | $2,548,000 | $22,454,000 |
| **Scenario 6: No New Storage at SH or AF** | **$76,588,000** | **$8,386,000** | **$84,974,000** |
| Adams Field WWTP Improvements | $57,605,000 | $6,854,000 | $64,459,000 |
| Collection System Improvements | $18,983,000 | $1,532,000 | $20,515,000 |

## 1.6 Recommendations

Based on the analysis of the available options performed for this Amendment and the objectives outlined in this Section, Hawkins-Weir Engineers recommends that Little Rock Wastewater amend their capital improvements schedule to include the changes identified under Scenario 3: Adams Field WWTP – Parallel Treatment.

## 1.7 NPDES Permit Modification

LRW applied for the necessary modifications to their NPDES permit on August 1, 2014 to allow the recommendations of this report to be implemented. The application process, which included several meetings and modifications, was finalized in November of that year. The permit application was forwarded to EPA Region 6 for review as is the standard practice. EPA Region 6 declined to review the application. The permit modification underwent the standard 30-day public comment period in October 2015. The modified permit, which is included as Appendix D, took effect on December 1, 2015. The permit is set to expire on July 31, 2017.

## 1.8 Public Participation

Keeping the people of Little Rock informed of its activities has always been a priority of LRW. Extra effort was made in that regard for each of the projects recommended by this SECAP Update. Prior to design of the Scott Hamilton Drive project, LRW met with several elected officials including the Little Rock Mayor, the Little Rock City Manager, and many of the City's Directors. They also met with several city departments including Public Works, Planning & Zoning, and the Parks Department. The Utility presented the project at three (3) community meetings where they gathered feedback from the public. After all of these meetings were complete, the Utility participated in the Conditional Use Permit process for the site. That process included posting signage at the site, conducting a public hearing, and presenting the project to the City's Planning Commission. A Conditional Use Permit was issued by the City for the Scott Hamilton Drive Project on December 5, 2014. Public participation on the Adam Field Parallel Treatment Project to date has included the public comment period required as a part of the NPDES permit modification process as well as discussions at the Utility's public commission meetings.

## 1.9 Compliance Schedule

Little Rock Wastewater is required per their amended CAO to have mitigated SSOs up to the design storm event by the end of 2023. The following project milestone dates are believed to be necessary to achieve compliance with that requirement:

- **Scott Hamilton Drive Peak Flow Facility**
  - Open Bids ........................................................ March 2017
  - Issue Notice to Proceed .................................................. May 2017
  - Complete Construction .................................................. May 2019
- **Adams Field WWTP Improvements**
  - Commence Final Design .................................................. June 2016
  - Complete Final Design .................................................... March 2017
  - Receive ADEQ Construction Permit ................................ May 2017
  - Open Bids ........................................................ May 2017
  - Issue Notice to Proceed .................................................. June 2017
  - Complete Construction .................................................. December 2018

## 2.0 Background

Little Rock Wastewater (LRW) provides wastewater collection and treatment services to the City of Little Rock which encompasses over 67,000 customers and 1,300 miles of collection system piping. LRW owns and operates three (3) wastewater treatment plants; Adams Field, Fourche Creek, and Little Maumelle. LRW entered into a Consent Administrative Order (CAO) with the Arkansas Department of Environmental Quality (ADEQ) in 2006, which required that the utility eliminate overflows for rainfall events of a certain magnitude by 2016. That deadline was subsequently extended to 2023. Before the CAO was entered into by all parties, the Utility had developed a capital improvements plan, entitled the System Evaluation & Capacity Assurance Plan or SECAP for short, in 2002. Between 2002 and 2010, LRW implemented many of the recommendations of their SECAP including the following major capital improvement projects:

- Adams Field Wastewater Treatment Plant (WWTP) Improvements
- Scott Hamilton Drive Peak Flow Storage Facility (30 MG)
- Little Maumelle Wastewater Treatment Plant
- Arch Street Pump Station & Force Main Improvements
- Fourche Creek WWTP Improvements (Schedules 1 & 2)

With the majority of these improvements completed, LRW retained RJN Group, Inc. to perform an update of their SECAP. The primary intent for this update was to quantify the progress achieved by the projects that were implemented and to refine the list of projects that were anticipated to be required to achieve compliance with the CAO. The resulting 2010 SECAP Update recommended the following major capital improvement projects in addition to a large amount of general improvements to the collection system:

- Scott Hamilton Drive (formally Mabelvale Pike) Peak Flow Storage Facility (51 MG)
- Cantrell Road Pump Station & Force Main Improvements
- Rock Creek Area Peak Flow Storage (7 MG)
- Adams Field WWTP Storage (14 MG)
- Cantrell Area Peak Flow Storage (4 MG)
- Deep 48 Gravity Interceptor
- Peak Flow Pump Station Improvements

At the time of this report, preliminary design has minimally begun on all of these seven (7) major capital improvement projects. Construction is complete on one (1) of the projects, the Cantrell Road Pump Station. However, a federal court ruling filed by the United States Court of Appeals for the Eighth Circuit (the Court) in March 2013[2] has provided justification for the re-evaluation of two of these projects (Scott Hamilton Drive & Adams Field WWTP). A copy of this ruling is included as Appendix A. This ruling is believed to have the potential to shift the way peak wastewater flows are regulated at a State and Federal level. These changes could result in cost savings for LRW and could also provide the Utility with a great deal more flexibility to operate their system in a manner that will minimize sanitary sewer overflows (SSOs) during the design storm as well as lower frequency rainfall events. Hawkins-Weir Engineers, Inc. (HW) was

[2] United States Court of Appeals for the Eighth Circuit No. 11-3412

retained by LRW for the purpose of re-evaluating those two (2) 2010 SECAP Update recommendations and documenting their findings in this 2010 SECAP Update Amendment No. 1.

## 3.0 Potential Impacts of the Shifting Regulatory Environment

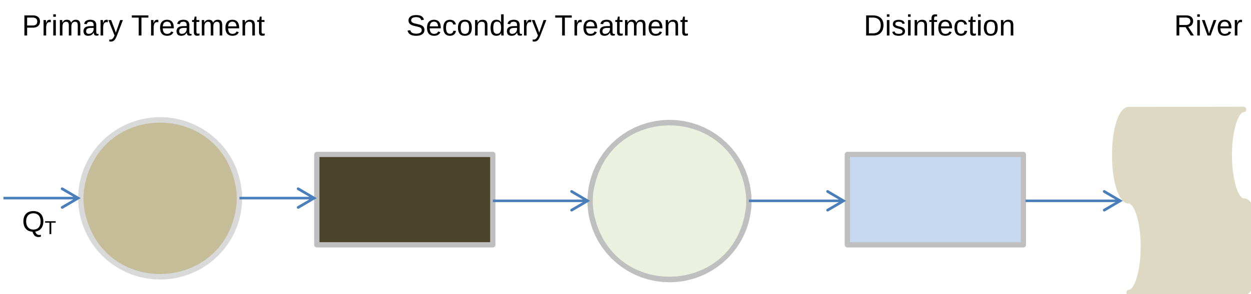
Sewer collection and treatment systems are as different and unique as the towns and cities that they serve. But there is one thing that nearly every sewage collection system has in common, they all leak. The reasons that sewage collection systems leak are most commonly attributed to their age, but other factors such as poor construction methods, material defects, and illegal connections also play a significant role. The primary concern with leaking collection systems is that they fill up with stormwater during rainfall events. This surcharging can overwhelm treatment facilities and cause sewage to overflow from low points in the collection system which could include manholes, homes, or businesses. These unintentional overflows are illegal as they constitute a violation of a system's NPDES Permit. Completely eliminating the leaks in a sewage collection system is typically cost prohibitive. Regulatory agencies often require that utilities build the necessary infrastructure to prevent overflows for rainfall magnitudes that are expected to occur on a relatively infrequent basis. These agencies have also historically limited the way a utility could process these peak flows at their WWTPs. In particular, regulators have typically not allowed utilities to blend effluents at their WWTPs. Blending is widely considered to be a lower cost method of processing peak wet weather flows without negatively impacting the environment. The recent U.S. 8th Circuit Court ruling particularly addresses blending at WWTPs and appears to pave the way for its use in the future.

### 3.1 Blending

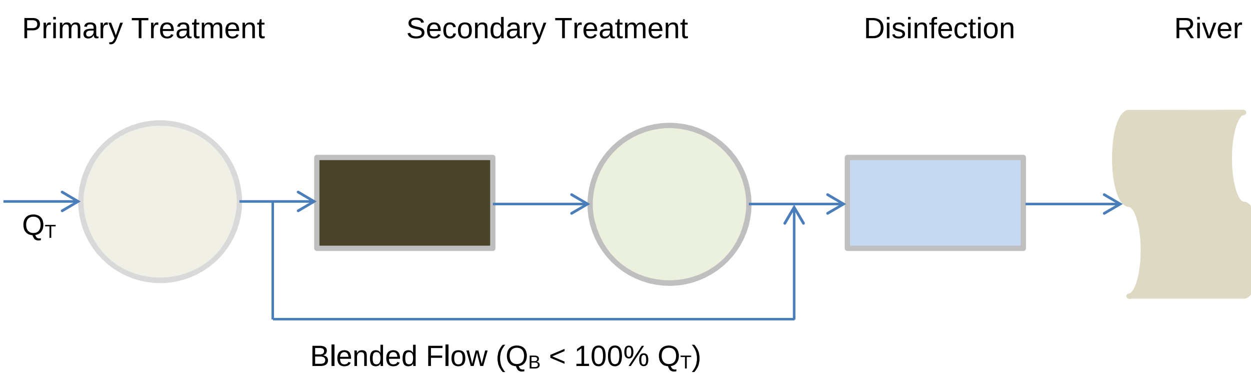
Wastewater treatment plants typically include primary and secondary treatment. The types and functions of the units that comprise primary and secondary treatment vary greatly from one plant to another. Primary treatment commonly includes screening, grit removal, and primary clarification. Secondary treatment is defined as those processes that are capable of achieving compliance with the effluent standards established by the 40 CFR 133 which is entitled "The Secondary Treatment Regulation". Those standards include a maximum 30-day and 7-day average five-day Biochemical Oxygen Demand ($BOD_5$) and Suspended Solids (SS) concentrations of 30 mg/l and 45 mg/l respectively (40 CFR §133.102(a-b)(1-2)). The law also requires that the average 30 day percent removal of both $BOD_5$ and SS not be less than 85% (40 CFR §133.102(a-b)(3)). Some regulatory agencies also commonly define secondary treatment as some form of biological treatment.

At many WWTPs, the primary treatment capacity exceeds secondary treatment capacity. Secondary treatment processes, particularly those that are biological, are more sensitive to variations in flow and pollutant loading. If peak flows resulting from wet weather events are not properly managed through the plant, they can overwhelm the biological process and render it inoperable. Blending, as illustrated by Figure 3.1, is used by some WWTPs to prevent this by routing a portion of the dilute peak influent flow through primary treatment and then around secondary treatment. The diverted flow is later recombined with the secondary effluent stream prior to disinfection and discharge. The combined discharge is required to meet all of the facilities effluent discharge limitations as defined by their NPDES permit. In recent history, the practice of blending has only been permitted by EPA & ADEQ on a case-by-case basis. The regulatory agencies have claimed that blending should not be universally applied because a portion of the flow stream does not receive "secondary treatment" which they have defined as biological treatment. They also have contended that the practice of blending is a violation of the bypass rule (40 CFR §122.41(m)(1)) which reads that "intentional diversion of waste streams from any portion of a treatment facility" is prohibited.

**Figure 3.1**
**Blending at a Wastewater Treatment Plant**




**Flow Path During Normal Flows**




**Flow Path During Peak Flows**

LRW's Adams Field WWTP is one of the few plants that has been historically allowed to "blend" during peak flow events by their NPDES Permit[3]. Part II, paragraph 6 of this permit allows bypassing of the secondary treatment operations when peak flows exceed 60 MGD to "protect the facility". When a bypass event occurs, the Utility is required to notify ADEQ within 24 hours, sample the blended effluent for compliance testing, and submit a written summary report describing the event to ADEQ within 5 days, among other requirements. The permit also implies in paragraph 6.E. that the continued practice of blending at the WWTP may not be allowed in the future.

## 3.2 Iowa League of Cities vs. EPA

The Iowa League of Cities (ILC) is a coalition of over 870 cities in Iowa that advocates for the group while also providing services such as insurance coverage and continuing education opportunities. The ILC is an organization that is similar to the Arkansas Municipal League. In

[3] NPDES Permit #AR0021806

2010 a subset of fourteen (14) of the ILC's members, including Des Moines, Davenport, Waterloo, and Ottumwa joined in a suit against the U.S. Environmental Protection Agency (EPA) to protest that agency's internal wet weather policy. They contended that policy regulated how a WWTP could manage wet weather flows more stringently than required by the Clean Water Act. It was also asserted that the necessary rule making procedures were not followed in the development of the Agency's wet weather policy. At the heart of the issue were the EPA's perceived prohibitions on blending and bacteria mixing zones. The group contended that the EPA's improper policies limited the municipalities' options in dealing with peak wet weather flow and often required that more costly and generally less desirable options, such as construction of peak flow detention basins, be implemented rather than utilizing peak flow treatment systems.

The ILC's suit was filed with the United States Court of Appeals for the 8th Circuit on May 8, 2012. The 8th Circuit consists of Arkansas, Iowa, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota. Of these states, Arkansas is the only state included within Region 6 of the EPA. The Court issued its decision on March 25, 2013 and ruled in favor of the ILC. The EPA did not file an appeal of the Court's ruling to the U.S. Supreme Court by the required deadline of October 18, 2013. The Court's ruling sought to vacate the EPA's apparent ban on blending and bacteria mixing zones. The ruling also asserted that the EPA's attempts to regulate blending or other treatment practices within a WWTP were beyond that Agency's authority. EPA has remained silent on this ruling since 2013 but there is some speculation that a future appeal or modification to the Clean Water Act may be forthcoming to limit its impact on Agency policy.

### 3.3 Potential Impacts of 8th Circuit Ruling on Utilities

The Court's historic ruling has, on its surface, the potential to fundamentally change the way that wastewater is treated across the United States. It essentially instructed that the EPA's responsibility was to set appropriate discharge limits, not to dictate how a permitee achieved the limits. The plaintiffs in the case, however, appear to be taking a more conservative approach to the application of the decision. The ILC was represented in its suit against the EPA by the environmental law firm of Hall & Associates (HA) of Washington D.C. This same firm has represented LRW in the past for permitting issues at the Adams Field WWTP. Following issuance of the final decision by the Court, HA composed a memo to the Iowa Department of Natural Resources (IDNR) dated August 20, 2013 that recommended a regulatory approach for peak flow processing and bacteria limitations as a result of the ruling. The memo did not ask the IDNR to turn a blind eye to the interworkings of the State's WWTPs in relation to blending as the Court's decision implied might be proper. Rather, the memo recommended that the IDNR revert back to EPA's 2003 draft Peak Flow Policy (2003 PFP) (68 Fed. Reg. 63,042 (Nov. 7, 2003), which reflected the Agency's historical approach to peak flow processing. HA's memo stated that it was appropriate to follow the guidance of the 2003 EPA policy because it followed "good engineering practices" and "provided an appropriate level of pollutant control". A copy of the Hall & Associates memo is included as Appendix B. A copy of the 2003 EPA policy is included as Appendix C.

The 2003 PFP did not seek to regulate the type of treatment process (biological or physical) used to achieve compliance with secondary treatment limits. It also recognized blending as an acceptable method for processing peak wet weather flows. The 2003 PFP allows for an alternate peak flow processing scheme to be included in a facility's NPDES permit. It requires the following considerations be made prior to the approval of any such process scheme:

- An engineering analysis must demonstrate that the expected final discharge is expected to comply with all applicable effluent limitations
- The NPDES permit application for the WWTP must provide notice of and specifically detail the treatment scheme that would be utilized during peak flow events
- The peak flow treatment scheme must minimally provide the equivalent of primary clarification prior to blending
- The peak flow treatment scheme must only be utilized when the influent flow exceeds the capacity of storage/equalization units, biological treatment, and/or any other advanced treatment units as outlined by the facility's NPDES Permit
- Final effluent monitoring should be adequate to confirm compliance with the WWTP's permit limits by the blended discharge
- The collection system must be properly operated and maintained consistent with 40 CFR § 122.41(e)

The memo summarizes the 2003 PFP to read that so long as a facility is operating as it was designed (not turning off treatment units simply because it can still meet permit limits), meeting applicable end-of-pipe permit limits, and providing the diverted flow with primary treatment, it is legal for a WWTP to route effluent flow around biological or other advanced treatment units and recombine the diverted flow with the effluent from the biological treatment units prior to discharge. This operation would only be allowed to occur in situations where the influent of a WWTP surpasses the amount of flow that the facility's biological treatment units can safely and effectively treat.

As of the writing of this Amendment, the IDNR has not yet published a response to the HA memo or defined what that state's approach to the permitting of peak flow treatment will be. The EPA has also not yet outlined any new approach to dealing with blending at WWTPs. The EPA has taken a position that the Court's ruling only applies to the 8$^{th}$ Circuit states. As discussed previously, Arkansas is in the 8$^{th}$ Circuit, but is the only 8$^{th}$ Circuit state that is within EPA's Region 6. As such, LRW may not directly benefit from any policy changes potentially applied in other EPA Regions as a result of the Court's ruling. Rather, LRW may be required to lead the charge in Region 6 if they are to benefit from any of the regulatory changes allowed by the Court's decision.

## 3.4 Potential Impacts of 8$^{th}$ Circuit Ruling on LRW

LRW's 2010 SECAP Update's recommendations were made prior to the Court's 2012 ruling. It recommended a total of 76 million gallons of additional collection system storage at an estimated cost of over $94 million. In addition to its high costs, collection system storage is often not considered to be a desirable solution due to the environmental justice issues related to locating an acceptable site for a wastewater storage facility. But the biggest weakness of collection system storage is that no matter how large of a volume is constructed; peak flows in excess of the design storm could potentially fill it to capacity before the collection system surcharge receded. When an equalization basin is filled to capacity, the inflow to the basin must be turned off. If the diversion to the equalization basin is turned off during a peak flow event, the SSOs that the basin was designed to prevent will most likely reoccur in the system. One distinct advantage of peak flow treatment, such as blending, over storage is that it can be operated continuously throughout the high flow event with no maximum volume limitations. This would allow LRW to prevent SSOs more effectively for lower frequency storms or back-to-back storm events.

### 3.4.1 2010 SECAP Update

LRW's 2010 SECAP Update's recommendations for two (2) of the four (4) new peak flow storage facilities may not have been made if the Court's ruling on blending had been in effect at the time of the Update's preparation. Those projects are the Mabelvale Pike Facility (subsequently entitled the Scott Hamilton Drive Peak Flow Facility) and the Adams Field WWTP Basin. The Rock Creek and Cantrell Road storage projects cannot be reduced or eliminated by increasing the capacity of the WWTPs due to hydraulic restrictions that prevent the peak flow from being conveyed to the plants without creating SSOs.

Based on permitting concerns at that time, the Update did not even take into account the current blending practices at the Adams Field WWTP because it was believed that EPA/ADEQ might require the Utility to abandon that peak flow scheme at some point in the then near future. The subsequent filing of the 8$^{th}$ Court's decision has given the Utility appropriate pause. At the point in time that the full nature of the ruling was made known to LRW, one of the storage projects was in preliminary design and a contract was about to be awarded for the preliminary design of the second project. At that time LRW elected to re-evaluate both projects through the preparation of this Amendment. The primary purpose of this Amendment is to explore any advantages to reducing or replacing the recommended storage volume with peak flow treatment at one or more of the Utility's treatment plants.

### 3.4.2 Scott Hamilton Drive Peak Flow Project

The original Scott Hamilton Drive Peak Flow Project recommendation included an additional 51 million gallons of storage near the Utility's existing Scott Hamilton Drive Peak Flow Facility. A design team lead by Hawkins-Weir Engineers was selected to perform the design of that facility in 2012. The preliminary engineering report prepared as a part of that effort recommended that the new storage basin be located along a common levee with the existing storage basin located near Scott Hamilton Drive. The estimated capital cost of the new 51 MG concrete lined earthen basin and appurtenances in 2016 dollars is approximately $26.1 million. The Utility had begun the process of obtaining a Conditional Use Permit (CUP) from the City of Little Rock in 2014 when it was determined necessary to re-evaluate the project. Feedback obtained during the CUP process from City Directors and other interested parties gave reason to believe that gaining approval of the CUP would be extremely difficult. Much concern was expressed over the proximity of the proposed facility to the neighboring city park and nearby residences. One of the goals of this Amendment is to determine if the required volume of the Scott Hamilton Drive Project can be reduced or eliminated by increasing the flow to one or more of the Utility's treatment plants.

### 3.4.3 Adams Field WWTP Project

The Adams Field WWTP currently utilizes a 13 MG concrete lined equalization basin. The 2010 SECAP Update recommended the addition of a new 14 MG equalization basin on that site. LRW received Statements of Qualifications (SOQs) for the design of that storage project but did not enter into a contract with the selected engineering firm based on the questions raised by the 8th Circuit Court ruling. The Utility subsequently in 2015 issued a new SOQ for the planning and design of improvements to the Adams Field WWTP that would include both peak flow and nutrient removal improvements. A team led by a joint partnership of Black & Veatch and Hawkins-Weir Engineers was selected at that time.

The reason that equalization storage has been recommended from the the Adams Field WWTP by the SECAP is that the plant's influent capacity (94 MGD) exceeded its effluent treatment capacity (72 MGD). The plant's limiting factor is its UV disinfection process. The plant's UV system was designed for 72 MGD, but it has proven to be less than reliable at achieving sufficient disinfection at the design flow rate. The plant's biological treatment process is also a bottleneck. The treatment process may be able to hydraulically pass up to 60 MGD, but it was designed to treat only a peak flow rate of 36 MGD. Sustained flows higher than 36 MGD would likely impair the plant's ability to effectively treat subsequent influent flows by washing out or otherwise negatively affecting the biological solids. Another goal of this Amendment is to evaluate the possibility that increasing the hydraulic capacity of the Adams Field WWTP by utilizing blending could reduce or eliminate the need for additional equalization storage at that plant.

# 4.0 Collection System Hydraulics

Sanitary Sewer Overflows (SSOs) occur when a collection system becomes clogged or when it does not have the hydraulic capacity to convey the volume of sewage being collected to the treatment plants. Capacity related overflows typically only occur during wet weather events as a result of storm water infiltrating the collection system piping. LRW has conducted multiple evaluations of their collection system to ascertain the causes of SSOs within the City. This section will focus on the conveyance of peak flows from the central portion of the collection system near the existing Scott Hamilton Drive Peak Flow Facility to the Adams Field WWTP and/or the Fourche Creek WWTP.

## 4.1 Hydraulic Analysis

LRW's 2010 SECAP Update, including the hydraulic modeling, was performed by RJN Group Inc. HW retained RJN Group Inc. to perform the hydraulic modeling required for this Amendment as well. This section will describe the modeling performed to determine the potential new opportunities available to LRW as a result of the recent Court ruling.

### 4.1.1 Goals

The goals of the hydraulic analysis performed for this 2010 SECAP Update Amendment No. 1 are as follows:

- Determine the maximum practical influent flow that might be achieved at the Adams Field WWTP and/or Fourche Creek WWTP by employing blending at one or both of the plants
- Determine the reduction in collection system storage that is practically achievable by increasing the throughput of the Adams Field WWTP and/or the Fourche Creek WWTP with the goal of mitigating overflows up to the design storm event identified in the 2010 SECAP Update
- Make a preliminary identification of any major collection system improvements required to convey any increased wet weather flows to the Adams Field WWTP and/or the Fourche Creek WWTP
- Perform a preliminary evaluation of improvements required to the Arch Street Pump Station and Force Main to increase the influent flow to the Fourche Creek WWTP
- Determine the most practical hydraulic solution to eliminate the need for any additional storage to both the Scott Hamilton Drive and Adams Field equalization storage facilities

### 4.1.2 Assumptions & Limitations

The following assumptions and limitations were utilized as a part of this hydraulic analysis:

- The hydraulic model developed by RJN as a part of the 2010 SECAP Update will be utilized for all model runs. No flow measurement was performed and the model was not re-calibrated prior to its use for this Amendment
- Only the Scott Hamilton Drive and Adams Field Storage Projects were evaluated as a part of this modeling effort. Increased flow to the treatment plants may have impacts on other recommended collections system projects
- Other scenario specific limitations are outlined in the next section

#### 4.1.3 Scenarios

A total of eight (8) new flow scenarios were explored as a part of this effort. Each of the model runs are summarized briefly below. The scenarios that exhibited the greatest potential for success were explored in more detail and a preliminary engineer's cost estimate was prepared for each. Those detailed evaluations are discussed in the next section of this Amendment.

##### 4.1.3.1 Scenario 1: 2010 SECAP Recommendation

This scenario is intended to serve as a summary recap of the applicable recommendations from the 2010 SECAP Update. Although it was not re-evaluated as a part of this Amendment, it is included here as the baseline. A flowchart illustrating the components of this scenario is included as Exhibit 4.1. The limiting factors in this scenario are the 94 MGD Adams Field WWTP influent capacity and the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP (Storage + Biological/UV) – 94 MGD (Until Storage is Full)
- Adams Field WWTP (Biological/UV) – 60 MGD (After Storage is Full)
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 81 MG (30 MG Existing + 51 MG New)
- Adams Field WWTP – 27 MG (13 MG Existing + 14 MG New)

**Required Capital Improvements:**

- 51 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 14 MG storage expansion at Adams Field WWTP
- Modifications to multiple Adams Field WWTP flow diversion structures

This scenario satisfies the requirements of LRW's CAO based on providing collection system storage only. This list of 2010 SECAP Update recommendations will serve as the baseline for the evaluation of each of the other alternatives.

##### 4.1.3.2 Scenario 2: Adams Field WWTP – Blending

This scenario more closely represents the plant's current peak flow mode of operation than Scenario 1. The 2010 SECAP Update omitted the plant's permitted ability to blend up to 12 MGD in its recommended approach due to regulatory uncertainties over that practice. A flowchart illustrating the components of this scenario is included as Exhibit 4.2. The limiting factors in this scenario are the 94 MGD Adams Field WWTP influent capacity, the 72 MGD Adams Field WWTP UV disinfection capacity, and the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP (Storage + Biological/UV + Blending/UV) – 94 MGD (Until Storage is Full)
- Adams Field WWTP (Biological/UV) – 60 MGD (After Storage is Full)
- Adams Field WWTP (Blending/UV) – 12 MGD (After Storage is Full)
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 61.2 MG (30 MG Existing + 31.2 MG New)
- Adams Field WWTP – 22.6 MG (13 MG Existing + 9.6 MG New)

**Required Capital Improvements:**

- 31.2 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 9.6 MG storage expansion at Adams Field WWTP
- Modifications to multiple Adams Field WWTP flow diversion structures

Like Scenario 1, this option addresses LRW's CAO requirements. One significant concern regarding this scenario is the plant's ability to consistently achieve compliance with $BOD_5$ and SS secondary treatment requirements when the blended flow only receives screening and primary clarification as treatment. Another legitimate concern is whether the plant's UV system can consistently maintain compliance with the plant's disinfection requirements at the 72 MGD peak flow rate.

#### 4.1.3.3 Scenario 3: Adams Field WWTP – Parallel Treatment

The most distinguishing feature of this new scenario is that the Adams Field WWTP's discharge rate is raised to match its influent capacity, eliminating the requirement for equalization storage at the plant and extending the amount of time that the plant can process peak flows. Another key feature is the introduction of an enhanced high-rate treatment process to provide advanced treatment of the portion of the flow routed around biological treatment prior to recombining it with the plant's normal effluent stream. This treatment is believed to address the concern over compliance with secondary treatment requirements mentioned in Scenario 2. This option also removes Adams Field WWTP's UV disinfection process as a limiting factor as well as concerns of inadequate disinfection during high flows by incorporating a new peak flow disinfection system. A flowchart illustrating the components of this scenario is included as Exhibit 4.3. The limiting factors in this scenario are the 94 MGD Adams Field WWTP influent capacity and the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP– 94 MGD
    - Biological – 36 MGD
    - Parallel Treatment – 58 MGD

    - Peak Flow Disinfection – 58 MGD
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 61.2 MG (30 MG Existing + 31.2 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 31.2 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 58 MGD high rate treatment process at Adams Field WWTP
- 58 MGD peak flow disinfection system at Adams Field WWTP

The flow scheme outlined in this scenario would greatly increase the WWTP's ability to manage peak flows. This option would provide the tools that the operators need to move the peak flow through the plant efficiently and effectively. The utility would not be faced with the daunting responsibility of choosing between SSOs or a plant bypass at the point in time that their storage facility becomes full. The length of the disruption to the plant's normal operation would also be reduced since the WWTP would not have to treat a large volume of stored water after the peak flow event in the collection system had subsided. This scenario would include a new peak flow disinfection system. The type of disinfection process recommended for this approach is discussed later in this amendment.

#### 4.1.3.4 Scenario 4: Eliminate Storage at Adams WWTP

This option is a slight refinement of Scenario 3. Rather than assuming that Adams Field WWTP's influent would match its existing maximum 94 MGD capacity, the actual influent capacity required to mitigate SSOs during the design storm was calculated. A flowchart illustrating the components of this scenario is included as Exhibit 4.4. The limiting factor in this scenario is the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP– 90 MGD
    - Biological – 36 MGD
    - Parallel Treatment – 54 MGD
    - Peak Flow Disinfection – 54 MGD
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 62.6 MG (30 MG Existing + 32.6 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 32.6 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 54 MGD high rate treatment process at Adams Field WWTP
- 54 MGD peak flow disinfection system at Adams Field WWTP

While this scenario doesn't fully utilize the existing infrastructure at the Adams Field WWTP, it would offer a somewhat reduced construction cost over Scenario 3 while providing the same basic benefits. This scenario would not be able to process as large of a rainfall event as Scenario 3, but it would satisfy the Utility's CAO requirements.

#### 4.1.3.5 Scenario 5: Eliminate Storage at Adams and Limit Flow to Fourche Creek

This option is another refinement of Scenario 3. The goal of this scenario modification is to eliminate the storage at Adams Field WWTP while limiting the peak flow of the Fourche Creek WWTP. The Fourche Creek WWTP receives the majority of the City's industrial loading. Consequently, it is very heavily loaded. Limiting the influent flow to the Fourche Creek WWTP will reduce process upsets caused by drastic spikes in flow and better enable the facility to consistently comply with its NPDES Permit Requirements. A flowchart illustrating the components of this scenario is included as Exhibit 4.5. The limiting factors in this scenario are the 94 MGD Adams Field WWTP influent capacity and an imposed limitation of 36 MGD at the Arch Street Pump Station.

**Peak Flow Rates:**

- Adams Field WWTP– 94 MGD
  - Biological – 36 MGD
  - Parallel Treatment – 58 MGD
  - Peak Flow Disinfection – 58 MGD
- Fourche Creek WWTP – 38 to 43 MGD (2 to 7 MGD from Port Area)
- Arch Street Pump Station – 36 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 65 MG (30 MG Existing + 35 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 35 MG storage expansion at Scott Hamilton Drive Peak Flow Facility
- 58 MGD high rate treatment process at Adams Field WWTP
- 58 MGD peak flow disinfection system at Adams Field WWTP

Reducing the peak influent flow of the Fourche Creek WWTP facility to 36 MGD would have a minimal impact on the storage requirements at the Scott Hamilton Drive Facility. No other aspects of Scenario 3 would change as a result of this modification.

#### 4.1.3.6 Scenario 6: Eliminate New Storage at Adams Field & Scott Hamilton Drive

The goal of this scenario was to eliminate the need for any new storage at the Adams Field WWTP and the Scott Hamilton Drive Peak Flow Facility for peak flows up to the design storm event. Due to collection system limitations, it was determined that the most practical way to accomplish this difficult goal would be to maximize flow to Adams Field WWTP. This option mirrors the concept outlined in Scenario 3 but with much higher peak flows. A flowchart illustrating the components of this scenario is included as Exhibit 4.6. The only limiting factor included in this scenario is the 45 MGD Arch Street Pump Station & Force Main capacity.

**Peak Flow Rates:**

- Adams Field WWTP– 122 MGD
    - Biological – 36 MGD
    - Parallel Treatment – 86 MGD
    - Peak Flow Disinfection – 86 MGD
- Fourche Creek WWTP – 52 MGD
- Arch Street Pump Station – 45 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 30 MG (0 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 67 MGD booster pump station on the twin 60s interceptors
- Approximately 8,100 feet of new 42-inch gravity interceptor upstream of the new booster pump station
- 28 MGD expansion of the Adams Field WWTP Influent Pump Station
- 86 MGD high rate treatment process at Adams Field WWTP
- 86 MGD peak flow disinfection system at Adams Field WWTP
- 122 MGD effluent pump station at Adams Field WWTP
- Multiple hydraulic improvements throughout the Adams Field WWTP
- Seal or raise 12 manholes in the William J. Clinton Presidential Library area
- Add additional pump to the Arch Street Pump Station

Under this scenario a booster pump station would be needed in the Interstate Park area to overcome hydraulic restrictions in the twin 60s. The flow would be required to be re-lifted at the front of the treatment plant by an expanded influent pump station. Following treatment, a new effluent pump station would be required to discharge up to 122 MGD to the Arkansas River assuming a 25-year flood stage. The increased parallel flow assumed in this option would make it more difficult for the plant to comply with the monthly percent removal requirements outlined by the Secondary Treatment Rule. The primary advantage of this option is the elimination of expanded storage at the Scott Hamilton Drive Facility while mitigating SSOs for up to the design storm event.

#### 4.1.3.7 Scenario 7: Eliminate New Storage While Limiting Fourche Creek WWTP Peak Flow

Scenario 7 combines Scenarios 5 & 6 by eliminating all new storage by increasing the flow to the Adams Field WWTP while limiting the peak flow to the Fourche Creek WWTP. A flowchart illustrating the components of this scenario is included as Exhibit 4.7.

**Peak Flow Rates:**

- Adams Field WWTP– 130 MGD
  - Biological – 36 MGD
  - Parallel Treatment – 94 MGD
  - Peak Flow Disinfection – 94 MGD
- Fourche Creek WWTP – 38 to 43 MGD (36 MGD from Arch, 2 to 7 MGD from Port Area)
- Arch Street Pump Station – 48 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 30 MG (0 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 67 MGD booster pump station on the twin 60s interceptors
- Modifications to Arch Street Force Main to allow diversion of 12 MGD from the Arch Street Pump Station to the Adams Field WWTP
- Upsize grit diversion from Scott Hamilton Facility to the Arch Street Pump Station
- Add 1 additional pump to the Arch Street Pump Station
- 8,060 feet of new 42-inch gravity interceptor upstream of the new booster pump station
- 36 MGD expansion of the Adams Field WWTP Influent Pump Station
- 94 MGD high rate treatment process at Adams Field WWTP
- 94 MGD peak flow disinfection system at Adams Field WWTP
- 130 MGD effluent pump station at Adams Field WWTP
- Multiple hydraulic improvements throughout the Adams Field WWTP
- Seal or raise 12 manholes in the William J. Clinton Presidential Library area.

To eliminate storage while limiting the flow from the Arch Street Pump Station to the Fourche Creek WWTP to 36 MGD would require all of the capital improvements identified in Scenario 6. It would also require the diversion of up to 12 MGD from Arch Street to the Adams Field WWTP and collection system modifications to divert flow to the Scott Hamilton Peak Flow Facility. This scenario would be the most expensive of any of the options considered.

#### 4.1.3.8 Scenario 8: Fourche Creek WWTP – Maximize Influent

The purpose of this scenario was to explore any advantage of maximizing the influent flow to the Fourche Creek WWTP. The capacity of the Adams Field WWTP was assumed to be limited to the existing capacity of the influent pump station, 94 MGD. Fixing this assumption, the goal is to push as much flow as practically possible to the Fourche Creek WWTP in an effort to eliminate the need for any new storage at Scott Hamilton Drive. This scenario stopped short of such drastic modifications as laying an additional force main between the Arch Street Pump Station and the Fourche Creek WWTP or recommending major upgrades to the recently improved Arch Street Pump Station. A flowchart illustrating the components of this scenario is included as Exhibit 4.8.

**Peak Flow Rates:**

- Adams Field WWTP– 94 MGD
  - Biological – 36 MGD
  - Parallel Treatment – 58 MGD
  - Peak Flow Disinfection – 58 MGD
- Fourche Creek WWTP – 65 MGD
  - Biological – 16 MGD
  - Parallel Treatment – 49 MGD
  - Peak Flow Disinfection – 49 MGD
- Arch Street Pump Station – 58 MGD

**Maximum Required Storage Volumes (Design Storm):**

- Scott Hamilton Drive Peak Flow Facility – 39 MG (9 MG New)
- Adams Field WWTP – 0 MG

**Required Capital Improvements:**

- 14,080 feet 30-inch diameter force main from Scott Hamilton to the Arch Street Pump Station
- Add 1 additional pump to the Arch Street Pump Station
- Booster pump station on 42" and 30" Arch Street Force Mains near Lindsay Road.
- 58 MGD high rate treatment process at Adams Field WWTP
- 49 MGD high rate treatment process at Fourche Creek WWTP
- 58 MGD peak flow disinfection system at Adams Field WWTP
- 49 MGD peak flow disinfection system at Fourche Creek WWTP
- 65 MGD effluent pump station at Fourche Creek WWTP
- Multiple hydraulic improvements throughout the Adams Field and Fourche Creek WWTP

This scenario was not considered viable since it would require more capital improvements than Scenario 6 without providing the benefit of completely eliminating the need for additional storage at the Scott Hamilton Drive Peak Flow Facility. Both the hydraulic and organic loading restrictions associated with Fourche Creek WWTP eliminate that plant as the best alternative for the management of additional peak flows. If LRW elects to move forward with a project that eliminates new collection system storage at Scott Hamilton and Adams Field, then Scenario 6 or some derivation thereof would be the recommended option.

#### 4.1.3.9 Results

Following consultation with the Utility, three scenarios were selected for additional evaluation and consideration. Those scenarios selected and discussed in subsequent sections are as follows:

- Scenario 1 – 2010 SECAP Update Recommendation
- Scenario 3 – Adams Field WWTP: Parallel Treatment
- Scenario 6 – Adams Field WWTP: Eliminate New Storage at Adams Field & Scott Hamilton Drive

## 5.0 Potential Capital Project Modifications

This section provides a more detailed evaluation of the new scenarios recommended by the collection system hydraulic analysis. Both Scenarios 3 and 6 are centered on incorporating blending at the Adams Field WWTP with the use of a wet weather parallel treatment process. Both the collection system and the Adams Field WWTP were evaluated to determine the potential modifications that would be required to convey and treat wastewater flows resulting from Scenarios 3 & 6. A cost evaluation is included in the next section to compare the potential costs of the required improvements of these scenarios to the costs provided in the 2010 SECAP Update for Scenario 1.

### 5.1 Assumptions

The following assumptions and criteria were used for all scenarios in the evaluation of incorporating wet weather parallel treatment at the Adams Field WWTP:

1) An Evoqua Water Technologies CoMag® high rate clarification system would be used for the parallel treatment process at the Adams Field WWTP. This process was previously evaluated by LRW through the Mabelvale Pike Peak Flow Attenuation Basin Preliminary Engineering Report (Mabelvale Pike PER) and it was concluded to be a cost effective process option for treating diluted wastewater. If the parallel treatment option is pursued by LRW at the Adams Field WWTP, it is recommended that additional treatment processes be evaluated for this application.

2) Adams Field WWTP conventional treatment units are fully utilized at the plant's current permitted flow of 36 MGD. This assumption was made to quantify a design peak flow rate to the parallel treatment process for each scenario.

3) Influent Total Biochemical Oxygen Demand ($BOD_5$): 80 to 120 mg/L. The influent $BOD_5$ concentration is assumed to be diluted due to the wet weather flow conditions.

4) Influent Settleable $BOD_5$: 60 to 90 mg/L. This concentration range represents the amount of total $BOD_5$ that is settleable and therefore is capable of removal by screening, clarification and/or filtration. The conceptual proposal for this system indicates a settable $BOD_5$ removal of 90%.

5) Influent Total Suspended Solids (TSS): 80 to 120 mg/L. The influent TSS concentration is assumed to be diluted due to the wet weather flow conditions. The conceptual proposal for this system indicates a TSS removal of 90%.

6) Arkansas River 25-year flood elevation at David D. Terry Lock and Dam (Pool 6) Navigation Mile 115.4: 245.5-feet mean sea level. This elevation was interpolated from Arkansas River water surface profiles provided by the U.S. Army Corp of Engineers through a FOIA request.

## 5.2 Peak Flow Disinfection System

The existing UV disinfection system at the Adams Field WWTP does not have the capacity to disinfect the additional flows proposed by Scenarios 3 & 6. As a result, additional disinfection capacity would be required if the discharge capacity of the WWTP were to be increased. This section provides an outline of the available disinfection technologies that could be used to disinfect the effluent from the peak flow process as well as a cost and technical comparison of the various options.

### 5.2.1 Available Technologies

Various process technologies are available for use in treating wastewater effluent that would provide a level of disinfection that meets EPA standards. For this evaluation, chlorine gas, sodium hypochlorite, chlorine dioxide, ozone, peracetic acid, and UV were investigated.

#### 5.2.1.1 Chlorine Gas

Chlorine gas ($Cl_2$) has historically been one of the most widely used disinfectants by the water and wastewater industry. Chlorine is available in quantities that range from 150-pound cylinders to 55-ton rail cars. Chlorine is moderately soluble in water and both heavier than air and denser than water. When dissolved into water chlorine forms a mix of hypochlorus acid (HOCl) and hypochlorite ($OCl^-$) in a ratio that varies depending on pH. Chlorine disinfection works by inhibiting enzymatic activity, changing the permeability of the cellular wall, and disrupting the cellular structure of the bacteria. Due to the effectiveness of chlorine in destroying cellular material, it is also very hazardous to the system operators and others in the adjacent area in the event of a spill or leak. The hazardous nature of the chemical requires that additional protective measures be instituted at facilities that use chlorine gas. These measures include evacuation plans, spill/leak response plans and drills, special ventilation systems, chlorine destruct systems, and gas detection systems. The use of chlorine as a disinfectant also creates a number of disinfection by-products some of which are known to be toxic and/or carcinogens. The use of a de-chlorination system to remove any residual chlorine prior to discharge into the environment is typically also required. Chlorine gas is very frequently the lowest cost alternative for wastewater disinfection.

#### 5.2.1.2 Sodium Hypochlorite

Sodium hypochlorite (NaOCl) is a chlorine containing compound that is becoming a common replacement to chlorine gas in applications where the user wants to keep using chlorine but does not want to deal with the hazards and regulations of storing and using the disinfectant in its gaseous form. The most common form of sodium hypochlorite is household bleach which typically contains approximately 6% sodium hypochlorite by volume. Sodium hypochlorite is available from bulk chemical suppliers in higher concentration solutions as well as being able to be produced onsite from a brine solution. Sodium hypochlorite is unstable in solution form and tends to degrade over time with the degradation rate changing in relation to the concentration. Due to the unstable nature of the solution long term, storage of 12 percent or higher concentrations is difficult and therefore the more stable 6 percent solutions would be better suited for an intermittently operating unit. Sodium hypochlorite, when used as a disinfectant in wastewater, has the same mechanism as chlorine to destroy or inactivate bacteriological cells in effluent. Since sodium hypochlorite is chlorine based it has the same disinfectant by-product issues as well as the de-chlorination requirements as chlorine gas. While often a cost effective disinfectant, sodium hypochlorite typically has a higher operating cost than chlorine gas.

#### 5.2.1.3 Chlorine Dioxide

Chlorine Dioxide ($ClO_2$) is another chlorine containing compound that can be used in place of chlorine gas. Chlorine dioxide is very unstable and must be generated onsite from a mixture of chlorine gas and sodium chlorite. Chlorine dioxide when dissolved into water has approximately 2.5 times as much oxidizing power as chlorine due to the specific nature of the chlorine dioxide reaction in water. This increased oxidizing power reduces the chemical demand in the disinfection process. Chlorine dioxide is particularly effective at inactivating certain proteins that are a critical part of viruses, making chlorine dioxide substantially more effective against viruses than an equivalent amount of chlorine. Since the production of chlorine dioxide requires chlorine gas, all of the storage and operational concerns that come with chlorine gas also come with chlorine dioxide. In addition, chlorine dioxide forms disinfection by-products (though primarily different compounds than chlorine and sodium hypochlorite) and requires de-chlorination prior to discharge. Chlorine dioxide is more commonly used in drinking water disinfection and has a substantially higher operating cost than sodium hypochlorite.

#### 5.2.1.4 Ozone

Ozone ($O_3$) is another powerful oxidizer that while traditionally used in the water industry is seeing greater application in the wastewater industry. Ozone is generated by passing oxygen through a high voltage corona discharge. The oxygen can either be supplied in an air mix or in pure form from compressed or liquid oxygen. In larger installations, pure oxygen is typically used to increase efficiency of the production process. While ozone is a very powerful oxidizer, since it is generated on demand there are no significant storage or operational constraints like there are with chlorine gas. Ozone does require that a destruct system be installed in the process train that captures any off-gassed ozone and coverts it back to oxygen. The waste oxygen can then be reused to feed the process. Ozone works by destroying the cell wall of any bacteriological matter exposed to the gas or the free radicals that form as its by-products. The use of ozone does not produce any regulated disinfection by-products.

#### 5.2.1.5 Peracetic Acid

Peracetic acid ($C_2H_4O_3$) is a common industrial disinfectant that is starting to be used in the wastewater industry as a more environmentally friendly alternative to the various forms of chlorine. Peracetic acid for industrial purposes is manufactured by reacting acetic acid with hydrogen peroxide. The production of peracetic acid produces a solution that contains a mix of water, peracetic acid, acetic acid, and hydrogen peroxide. The excess acetic acid and hydrogen peroxide improve the stability of the finished product, which increases the product’s shelf life. Peracetic acid works by breaking down the cell walls of the bacteria that causes the cell to rupture and die. Peracetic acid as an oxidizer is approximately twice as efficient as chlorine. The biggest advantage of peracetic acid is the relative safety of the product and lack of disinfection by-products. While peracetic acid is a relatively strong acid and requires care in handling and storage, it causes no major threat to human health in the event of a leak or spill. The biggest requirement to use peracetic acid is that it should be stored and transported in stainless steel because it slowly degrades plastics. The greatest advantage of peracetic acid is the lack of harmful or regulated disinfection by-products. The use of peracetic acid, unlike chlorine based products, does not require the use of additional chemicals to neutralize any residual disinfectant in the effluent stream.

#### 5.2.1.6 UV

Ultraviolet (UV) light (260 nm) is a rapidly growing disinfection technology. The process requires no chemicals and does not produce any by-products or waste. UV works by disrupting the replication of DNA in a bacterial cell thus preventing the cell from reproducing. The process uses UV lamps immersed into the flow stream to expose the bacterial population to sufficient UV radiation to achieve inactivation. The process can require a significant amount of electrical power and is impacted by flow conditions, changes in flow rate, effluent quality, and algae growth on the lamps. UV systems can also require significant amounts of maintenance. UV disinfection is currently employed at the Adams Field WWTP for disinfection of their primary flow stream.

### 5.2.2 Disinfection Technology Evaluation

All of the technologies for disinfection discussed in this section would be effective when properly designed and operated. As a result, the decision of which disinfectant would be best suited for the Adam's Field WWTP peak flow disinfection system is dependent on site specific restrictions and cost considerations. Due to the WWTP's proximity to the Bill and Hillary Clinton Airport, the use of chlorine gas is not recommended due to safety concerns. This limitation eliminates chlorine gas and chlorine dioxide from consideration in the final equipment selection for this evaluation. Since chlorine in the form of sodium hypochlorite is delivered in a solution or generated onsite from saline solutions, it was determined to be the only chlorine based solution that should be considered. To meet the permit requirements of using a chlorine-based disinfectant, a de-chlorination system and a contact basin with 15 to 20 minutes of contact time would be required. Due to the oxygen demand exerted by the de-chlorination chemicals, a post aeration system would also be needed on the effluent side of the chlorine contact chamber. Both bulk sodium hypochlorite and the feed chemicals for the generation of sodium hypochlorite onsite are readily available at a relatively low cost, however, the significant capital cost for the occasionally used generation equipment, as described in the next section, should be considered in the equipment selection for this application.

Ozone systems require an onsite generation system that uses oxygen to create the ozone needed. The generation of ozone has significant electrical requirements and, at the scale required for this process, a pure oxygen feed would be required. This system provides an advantage for intermittent use under the operation scheme of the proposed scenarios in that the system would only require generation during operation of the parallel process. In addition, since the ozone would be generated on demand and oxygen does not degrade during storage there would be no loss of chemical due to degradation. The primary disadvantage of using an ozone system for this process would be the high cost-per-hour of operation due to the high capital cost and the limited number of operational hours. Like sodium hypochlorite generation systems, the feed material is relatively low cost but the capital cost is very high. A cost comparison is included in the following section.

Peracetic acid is the simplest of the proposed disinfection systems. The use of peracetic acid requires a contact basin with a residence time of approximately 10 minutes combined with a single chemical feed system to feed peracetic acid at a rate paced by flow. Similar to sodium hypochlorite, peracetic acid creates an oxygen demand and a post aeration system would be required. Unlike sodium hypochlorite and ozone, since peracetic acid degrades to acetic acid and hydrogen peroxide in the environment and does not create regulated disinfection by-products, there would not be a need for its neutralization or removal process step. Also unlike the other disinfection systems evaluated for this process, peracetic acid could be fed to other parts of the plant as a component of the normal flow disinfection process. The system could be used to pre-treat UV system influent and could be fed into secondary clarifiers to reduce algae growth. The simplicity of the feed system, as described in the following section, results in a low system capital cost. However, peracetic acid costs approximately 10 times more than sodium hypochlorite resulting in increased operational costs. This increase in feed chemical costs, while offset somewhat by lower feed demands, raises the long term operations and maintenance costs of the peracetic acid disinfection system.

UV systems are typically easy to operate when clean and functioning, but cleaning and maintenance demands can place a significant burden on operations staff. The formation of mineral buildup and the growth of algae on the lamps can degrade system efficiency. The growth of algae would be especially significant on a system that only operates a limited number of times in a given year. The algae growth would require that the system be operated and the lamps cleaned during periods when there was no flow in the system. This would significantly increase the operation and maintenance costs of the system. There is also a significant capital cost associated with the equipment that, similar to ozone and sodium hypochlorite generation, make the cost-per-hour of operation very high. Because of these operational and cost issues, UV systems were not included in the capital cost analysis for this evaluation.

### 5.2.3 Disinfection System Cost Analysis

The selection of potential disinfection technologies was limited to three (3) primary technologies along with an alternative for onsite generation of sodium hypochlorite. A capital cost estimate and projected operations and maintenance cost was developed for each of the selected alternatives. These costs are based on construction in the year 2016 and an expected design life of 20 years. The capital cost for each option includes all of the structures, equipment, and infrastructure needed to install the specific process option. The operations and maintenance costs include equipment replacement, chemical costs, and electrical costs. Table 5.1 provides an estimate of probable cost for each process units based on the Scenario 3 peak design flow of 58 MGD at the Adams Field WWTP.

**Table 5.1**
**58 MGD Parallel Disinfection Planning Level Cost Estimate**

| Process Option | Capital Cost | 20 YR O&M Cost | Present Worth |
|---|---|---|---|
| Sodium Hypochlorite - Stored | $6,814,000.00 | $3,221,000.00 | $10,034,000.00 |
| Sodium Hypochlorite - Generated | $11,314,000.00 | $3,988,000.00 | $15,301,000.00 |
| Ozone | $12,284,000.00 | $6,355,000.00 | $18,639,000.00 |
| Peracetic Acid | $3,743,000.00 | $2,986,000.00 | $6,729,000.00 |

Table 5.1 reveals that Peracetic Acid has both the lowest capital and 20-year present worth cost for any of the systems evaluated at 58 MGD. In Table 5.2 the estimates of probable cost are based on the 86 MGD peak design flow required for Scenario 6.

**Table 5.2**
**86 MGD Parallel Disinfection Planning Level Cost Estimate**

| Process Option | Capital Cost | 20 YR O&M Cost | Present Worth |
|---|---|---|---|
| Sodium Hypochlorite - Stored | $6,974,000.00 | $3,775,000.00 | $10,748,000.00 |
| Sodium Hypochlorite - Generated | $12,273,000.00 | $4,521,000.00 | $16,794,000.00 |
| Ozone | $18,127,000.00 | $7,976,000.00 | $26,103,000.00 |
| Peracetic Acid | $4,585,000.00 | $3,551,000.00 | $8,136,000.00 |

Table 5.2 indicates that, as with the 58 MGD design flow, the peracetic acid process has the lowest capital and 20-year present worth costs.

#### 5.2.4 Recommended Disinfection Technology

With the lowest present worth cost, the smallest footprint, and the lowest equipment and operational requirements, peracetic acid is the preliminarily recommended process for both Scenario 3 (58 MGD) and Scenario 6 (86 MGD). A peracetic acid disinfection system is included in the cost analysis for both of the scenarios in Section 6. A more detailed evaluation of peracetic acid is being conducted by LRW. As a part of that evaluation, LRW is performing pilot testing to determine proper dosage ranges and validate the relatively new disinfection process for the design application.

## 5.3 Scenario 1: 2010 SECAP Recommendations

Scenario 1 compiles the applicable recommendations from the 2010 SECAP Update. That capital improvement plan recommended the addition of 51 MG of equalization storage near Mabelvale Pike Road and 14 MG of additional storage at the Adams Field WWTP. The preliminary engineering report has been submitted for the storage in the Mabelvale Pike Area. That storage project has been re-named the Scott Hamilton Drive Peak Flow Facility Improvements because it was concluded that the best alternative would be to expand the Utility's existing storage basin located off of Scott Hamilton Drive. The capital cost to construct that facility has been estimated to be significantly less than the cost listed in the 2010 SECAP Update. The newer estimate of capital cost, which has been updated to 2016 dollars, is included in Table 5.3.

No preliminary engineering work has been performed on the Adams Field storage project that was recommended in the 2010 SECAP Update. The estimated capital cost including engineering and contingencies for the facility in the 2010 report was $12.62 million. For the purposes of this Amendment that estimate was inflated to 2016 dollars. The cost for a post aeration facility was also included in that estimate since the process, which was included in both of the other scenarios considered, would provide benefits during normal and peak flow. The updated cost estimate for the Adams Field Storage Facility is included in Table 5.3 below.

**Table 5.3**
**Scenario 1: Planning Level Cost Estimate**

| Item No. | Description | Cost |
|---|---|---|
| 1 | 51 MG Scott Hamilton Drive Peak Flow Facility | $21,571,000 |
| 2 | 14 MG Adams Field Storage Facility | $14,244,000 |
| | **Subtotal Including 20% Contingency** | **$35,815,000** |
| | TOTAL ESTIMATED CONSTRUCTION COST | $35,815,000 |
| | INFLATION (3.5%, Varies) | $3,639,000 |
| | PROJECTED CONSTRUCTION COST ESTIMATE PLUS INFLATION | $39,454,000 |
| | ENGINEERING SERVICES (12%) | $4,735,000 |
| | **CONST. COST ESTIMATE PLUS INFLATION AND ENGINEERING** | **$44,189,000** |

## 5.4 Scenario 3: Adams Field WWTP – Parallel Treatment

Scenario 3 considers incorporating blending at the Adams Field WWTP using a parallel alternative treatment process that could ultimately allow the plant to continuously treat peak wet weather flows up to 94 MGD. The overall impact on system equalization storage is discussed and a preliminary estimate of capital costs are provided below for the potential modifications that would be required for this scenario.

### 5.4.1 Adams Field WWTP

This Section introduces the capital improvements and associated costs at the Adams Field WWTP that would be required to institute the recommendations described as Scenario 3. This is a planning level evaluation and it is assumed that additional improvement requirements may be revealed in a more detailed preliminary engineering evaluation.

#### 5.4.1.1 Storage Volume Required

Hydraulic modeling results indicate that increasing the peak capacity of the Adams Field WWTP to 94 MGD would eliminate the need for equalization storage volume at the Adams Field WWTP site. Under this scenario the plant's influent capacity would be the same as its peak discharge rate. It is anticipated, however, that the plant's existing 13-MG equalization basin could still be utilized in various modes.

#### 5.4.1.2 Peak Flow Process Description

Constructing a diversion box over the existing twin 48" primary influent lines from the Main Pump Station could allow influent flow to be split between the conventional treatment train and the peak flow treatment process. During wet weather conditions, primary influent flows in excess of 36 MGD could be diverted to the parallel treatment process immediately following screening. Effluent from this process would be disinfected and combined with effluent from the conventional treatment train where it would be aerated to meet dissolved oxygen permit limits. A pH adjustment system, using a chemical such as caustic soda, would be installed to raise the pH of the final effluent if required. The combined effluent would be discharged through the plant's existing 72" outfall to the Arkansas River. A preliminary process flow diagram for the Adams Field WWTP 94 MGD Scenario 3 option is shown in Exhibit 5.1 and a conceptual site layout is shown in Exhibit 5.2.

LRW has observed lower than expected UV transmittance (UVT) values from the existing UV disinfection system at the Adams Field WWTP. These low values are suspected to be a result of operational issues with the secondary clarifiers. During dry weather conditions, flows up to 36 MGD could be routed through the existing conventional treatment process. A splitter box could be constructed on the effluent line from the secondary clarifiers that would allow flow to be diverted to the parallel treatment process for tertiary polishing. The tertiary polishing option could provide LRW a means of increasing the quality of the influent to the UV system, thereby increasing the UVT and the overall effectiveness of the system. This potential plant improvement was not included in the cost evaluation since it is not required for the Utility to achieve compliance with its CAO.

#### 5.4.1.3 Modifications Required

The following capital improvements would potentially be required for Scenario 3:

- 58 MGD High Rate Clarification Process Units
- Electrical/Chemical Building
- Peak Flow Disinfection System
- Post Aeration System
- pH Adjustment System
- Yard Piping & Small Structures

According to the 2010 SECAP Update, the influent pump station at the Adams Field WWTP currently has a firm capacity of 94 MGD, requiring no additional improvements for Scenario 3. A preliminary hydraulic evaluation indicated that the existing pumps could produce the head required for the Scenario 3 parallel process. Based on a preliminary hydraulic evaluation of the existing disinfection system, effluent from the parallel treatment process would need to be combined with effluent from the conventional train downstream of the old chlorine contact chamber. This would be required so that the maximum submergence of the existing UV disinfection system is not exceeded.

#### 5.4.1.4 Planning Level Estimate of Probable Cost

The planning level estimate of capital costs for Scenario 3 is included as Table 5.4.

**Table 5.4**
**Scenario 3 Planning Level Cost Estimate**

| Description | Cost |
|---|---|
| CoMag™ Process Units | $7,352,000 |
| Electrical/Chemical Building | $3,209,000 |
| Peak Flow Disinfection System | $3,743,000 |
| Yard Piping & Small Structures | $4,057,000 |
| **Subtotal (Including 20% Contingency)** | **$18,361,000** |
| | |
| Bonds | $368,000 |
| Mobilization | $185,000 |
| General Conditions and Supervision | $735,000 |
| Trench Safety | $93,000 |
| Erosion Control | $27,000 |
| | |
| **Total Construction Cost in 2016** | **$19,769,000** |
| **Inflation (3.5% annual, 2-year term)** | **$1,409,000** |
| **Total (Including 20% Contingency and Inflation)** | **$21,178,000** |
| **Engineering Services (12%)** | **$2,542,000** |
| **Total Estimated Capital Cost** | **$23,720,000** |

### 5.4.2 Scott Hamilton Drive Peak Flow Facility

This Section introduces the capital improvement modifications and associated costs at the Scott Hamilton Drive Peak Flow Facility that would be required to institute the recommendations described as Scenario 3.

#### 5.4.2.1 Storage Volume Required

Hydraulic modeling results indicate that increasing the peak capacity of the Adams Field WWTP to 94 MGD would reduce the required additional storage volume at the Scott Hamilton Drive Peak Flow Facility from 51 MG to 31.2 MG. Based on the preliminary site layout provided in the Mabelvale Pike Peak Flow Attenuation Facility PER, the 51 MG option would provide a buffer zone of approximately 340 feet between the proposed storage basin and the Benny Craig Park property line. The preliminary layout of a 31.2 MG storage option, as discussed below, could increase this buffer zone to approximately 610 feet.

#### 5.4.2.2 Preliminary Site Plan

For this planning level analysis it was assumed that the 31.2 MG Scott Hamilton Drive storage option would be consistent with the recommendations for the 51 MG storage option provided in the Mabelvale Pike PER. The 31.2 MG storage option would include a concrete lined storage basin using calcium nitrate addition for odor control without the addition of a mixing system. A conceptual site layout for the 31.2 MG storage option is shown in Exhibit 5.3.

#### 5.4.2.3 Planning Level Estimate of Probable Cost

The planning level estimate of capital costs for the 31.2 MG concrete lined storage basin utilizing calcium nitrate for odor control is identified in Table 5.5.

**Table 5.5**
**31.2 MG Storage Option: Planning Level Cost Estimate**

| Description | Cost |
|---|---|
| Concrete Lined Equalization Basin | $12,530,000 |
| Site Civil Improvements | $2,149,000 |
| Dewatering Pump Station | $327,000 |
| Equalization Basin Drain Control Valve Vault | $307,000 |
| Calcium Nitrate Feed System and Storage | $64,000 |
| **Subtotal (Including 20% Contingency)** | **$15,377,000** |
| | |
| Bonds | $309,000 |
| Mobilization | $155,000 |
| General Conditions and Supervision | $616,000 |
| Trench Safety | $27,000 |
| Erosion Control | $107,000 |
| | |
| **Total Construction Cost in 2016** | **$16,591,000** |
| **Inflation (3.5% annual, 2-year term)** | **$1,182,000** |
| **Total (Including 20% Contingency and Inflation)** | **$17,773,000** |
| **Engineering Services (12%)** | **$2,133,000** |
| **Total Estimated Capital Cost** | **$19,906,000** |

This option provides an estimated $6.2 million reduction in unloaded capital costs as compared to the similar 51 MG storage option presented in the Mabelvale Pike Peak PER. This option does not include the previously proposed sub-basin interconnection downstream of the Arch Street Pump Station.

### 5.4.3 Collection System Improvements

The hydraulic analysis determined that no additional collection system improvements would be required to convey 94 MGD to the Adams Field WWTP.

### 5.4.4 Combined Estimate of Probable Costs

The planning level estimate of capital costs for the combined improvements of Scenario 3 are identified in Table 5.6 below.

**Table 5.6**
**Scenario 3: Combined Planning Level Cost Estimate**

| Description | Cost |
|---|---|
| Scott Hamilton 31.2 MG Storage Option | $15,377,000 |
| Adams Field WWTP Improvements | $18,361,000 |
| **Subtotal (Including 20% Contingency)** | **$33,738,000** |
| | |
| Bonds | $677,000 |
| Mobilization | $340,000 |
| General Conditions and Supervision | $1,351,000 |
| Trench Safety | $120,000 |
| Erosion Control | $134,000 |
| | |
| **Total Construction Cost in 2016** | **$36,360,000** |
| **Inflation (3.5% annual, 2-year term)** | **$2,591,000** |
| **Total (Including 20% Contingency and Inflation)** | **$38,951,000** |
| **Engineering Services (12%)** | **$4,675,000** |
| **Total Estimated Capital Cost** | **$43,626,000** |

## 5.5 Scenario 6: Eliminate New Storage at Scott Hamilton Drive & Adams Field WWTP

The goal of Scenario 6 is to increase treatment capacity at the Adams Field WWTP to the point that no additional collection system or equalization storage would be needed at the Scott Hamilton Drive or Adams Field WWTP Facilities. The following section identifies the major improvements that would be required to accomplish that goal and provides planning level cost estimates for the improvements.

### 5.5.1 Adams Field WWTP

This Section introduces the capital improvements and associated costs at the Adams Field WWTP that would be required to institute the recommendations described as Scenario 6. This is a planning level evaluation and it is assumed that additional improvement requirements may be revealed later in a more detailed preliminary engineering evaluation.

### 5.5.2 Storage Volume Required

Hydraulic modeling indicated that this scenario would completely eliminate the need for additional equalization storage volume recommended in the 2010 SECAP Update at the Adams Field WWTP site. It is anticipated that the existing 13 MG equalization basin would still be used in various modes at the treatment facility.

### 5.5.3 Peak Flow Process Description

Similar to Scenario 3, during a wet weather event, once the conventional treatment train has reached full utilization, influent flow following screening could be diverted to the parallel process for treatment. The effluent from this process could then be disinfected, recombined with the conventional effluent stream, aerated to meet dissolved oxygen permit limits, and discharged to the Arkansas River. A pH adjustment system, using a chemical such as caustic soda, would also be constructed to neutralize the final effluent as necessary. Based on a preliminary hydraulic analysis of the existing 72" outfall, an effluent pump station or an additional outfall line would be required to keep the WWTP fully operational during a 25-year flood stage on the river.

As part of the preliminary hydraulic analysis for this scenario, an evaluation was performed to determine the feasibility of using the original 60" outfall pipe in conjunction with the 72" outfall to increase WWTP discharge capacity. The original 60" outfall is currently used solely to convey stormwater for the entire WWTP site to the river. During a field investigation of the existing 60" outfall, it was discovered that a manhole on this line near the airport runway had previously been altered to provide an inlet for stormwater runoff from the adjoining property east of the WWTP site. The results of this analysis indicated that the original 60" outfall and the existing 72" outfall would not have the combined capacity available to handle the peak flow of Scenario 6 when the river was at its 25-year flood stage.

### 5.5.4 Modifications Required

The following capital improvements would potentially be required at the Adams Field WWTP for Scenario 6:

- 28 MGD Influent Pump Station Expansion
- 86 MGD High Rate Clarification Process Units
- Electrical/Chemical Building
- 86 MGD Peak Flow Disinfection System
- 122 MGD Post Aeration System
- pH Adjustment System
- 122 MGD Effluent Pump Station
- WWTP Hydraulic Modifications
- Yard Piping & Small Structures

The plant's influent pump station, currently with a firm capacity of 94 MGD, would need to be expanded to convey the Scenario 6 flow rate of 122 MGD. Similar to Scenario 3, a preliminary hydraulic evaluation at 122 MGD indicates that effluent from the parallel treatment process would need to be combined with effluent from the conventional train downstream of the old chlorine contact chamber to insure that the existing UV disinfection system does not exceed maximum submergence. A preliminary process flow diagram for the Adams Field WWTP 122 MGD Scenario 6 option is shown in Exhibit 5.4 and a conceptual site layout is shown in Exhibit 5.5.

### 5.5.5 Planning Level Estimate of Probable Cost

The planning level estimated capital costs for Scenario 6 are identified in Table 5.7 below.

**Table 5.7**
**Scenario 6 Planning Level Cost Estimate**

| Description | Cost |
|---|---|
| Influent Pump Station Expansion | $14,631,000 |
| CoMag™ Process Units | $8,570,000 |
| Electrical/Chemical Building | $3,815,000 |
| Peak Flow Disinfection System | $3,822,000 |
| Effluent Pump Station | $8,135,000 |
| Yard Piping & Small Structures | $5,637,000 |
| **Subtotal (Including 20% Contingency)** | **$44,610,000** |
| | |
| Bonds | $893,000 |
| Mobilization | $447,000 |
| General Conditions and Supervision | $1,785,000 |
| Trench Safety | $224,000 |
| Erosion Control | $54,000 |
| | |
| **Total Construction Cost in 2016** | **$48,013,000** |
| **Inflation (3.5% annual, 2-year term)** | **$3,420,000** |
| **Total (Including 20% Contingency and Inflation)** | **$51,433,000** |
| **Engineering Services (12%)** | **$6,172,000** |
| **Total Estimated Capital Cost** | **$57,605,000** |

### 5.5.6 Scott Hamilton Peak Flow Facility

Hydraulic modeling results indicated that this scenario would completely eliminate the need for the additional equalization storage volume recommended in the 2010 SECAP Update at the Scott Hamilton Drive (Mabelvale Pike) Peak Flow Facility.

### 5.5.7 Collection System Improvements

Hydraulic modeling revealed that multiple improvements and operational modifications to the collection system would be required to convey a continuous flow rate of 122 MGD to the Adams Field WWTP. The following capital improvements would potentially be required to the collection system for Scenario 6:

- 67 MGD Booster Pump Station on Twin 60s
- Approximately 8,100 feet 42-inch Gravity Sewer Line Upstream of the Booster Pump Station
- Install 5th Pump at Arch Street Pump Station
- Raise or seal 12 manholes in the William J. Clinton Presidential Library area

To increase flows to the WWTP above 94 MGD, additional hydraulic head would be required in the Twin 60s. To achieve the additional head required to deliver 122 MGD, an inline booster pump station could be added on the 48-inch and 60-inch gravity lines upstream of Interstate Park. This pump station could be configured such that it would only operate during wet weather conditions and could be bypassed during dry weather. The hydraulic analysis also concluded that the capacity of the collection system upstream of the proposed booster pump station was insufficient to supply the needed volume to the pumps. To achieve the required capacity to the new pump station, approximately 8,100 feet of 42-inch gravity line would be needed upstream. With the addition of the booster pump station, twelve (12) manholes would need to be raised by 3 feet or sealed to prevent overflows during pumping operation. In addition to these improvements, an additional pump would be required at the Arch Street Pump Station to increase the station's redundant peak flow pumping capacity.

The following operational modifications would potentially be required to the collection system for Scenario 6:

- Close Interstate Park Gate during peak flow
- Raise diversion weirs at Peak Flow Pump Station
- Modify Fourche diversion valve

In the hydraulic analysis, it was assumed that the Interstate Park Gate would remain closed during peak flow. The diversion weirs at the Peak Flow Pump Station would need to be raised to increase flow to the booster pump station and reduce flow to the Scott Hamilton Drive Peak Flow Facility. Modifications would be required to the Fourche diversion valve to modulate flow between the Arch Street Pump Station and the Scott Hamilton Drive Peak Flow Facility.

### 5.5.8 Planning Level Estimate of Probable Cost

The planning level estimated capital costs for the improvements to the collection system required to convey 122 MGD to the Adams Field WWTP are identified in Table 5.8.

**Table 5.8**
**Scenario 6 Estimate: Collection System Improvements**

| Description | Cost |
|---|---|
| 42" Gravity Sewer and Manholes | $5,157,000 |
| Site Civil Improvements | $471,000 |
| Gravity Sewer Flow Diversion Structures | $816,000 |
| In-Line Booster Pump Station | $7,681,000 |
| Electrical Building | $554,000 |
| Arch Street Pump Station Improvements | $64,000 |
| **Subtotal (Including 20% Contingency)** | **$14,743,000** |
| | |
| Bonds | $296,000 |
| Mobilization | $149,000 |
| General Conditions and Supervision | $590,000 |
| Trench Safety | $22,000 |
| Erosion Control | $22,000 |
| | |
| **Total Construction Cost in 2016** | **$15,822,000** |
| **Inflation (3.5% annual, 2- year term)** | **$1,127,000** |
| **Total (Including 20% Contingency and Inflation)** | **$16,949,000** |
| **Engineering Services (12%)** | **$2,034,000** |
| **Total Estimated Capital Cost** | **$18,983,000** |

### 5.5.9 Combined Scenario 6 Planning Level Estimate

The estimated capital costs for the combined improvements of Scenario 6 are identified in Table 5.9.

**Table 5.9**
**Scenario 6: Combined Planning Level Cost Estimate**

| Description | Cost |
|---|---|
| Adams Field WWTP Improvements | $44,610,000 |
| Collection System Improvements | $14,743,000 |
| | |
| **Subtotal (Including 20% Contingency)** | **$59,353,000** |
| | |
| Bonds | $1,189,000 |
| Mobilization | $596,000 |
| General Conditions and Supervision | $2,375,000 |
| Trench Safety | $246,000 |
| Erosion Control | $76,000 |
| | |
| **Total Construction Cost in 2016** | **$63,835,000** |
| **Inflation (3.5% annual, 2- year term)** | **$4,547,000** |
| **Total (Including 20% Contingency and Inflation)** | **$68,382,000** |
| **Engineering Services (12%)** | **$8,206,000** |
| **Total Estimated Capital Cost** | **$76,588,000** |

## 6.0 Cost Analysis

The planning level estimates of capital cost for each of the three (3) options evaluated are summarized in Table 6.1. The difference between the estimated capital costs of Scenario 3 and the 2010 SECAP Recommendations are within the margin of error for the estimating process. From this analysis it can be concluded that the capital costs of those two (2) options are essentially the same. The estimated capital cost for Scenario 6 is significantly higher than the other two (2) options considered.

**Table 6.0**
**Summary of Estimated Capital Cost**

| Description | Estimated Capital Cost |
|---|---|
| Scenario 1: 2010 SECAP Recommendations | $44,189,000 |
| Scenario 3: Adams Field WWTP: Parallel Treatment | $43,626,000 |
| Scenario 6: Adams Field WWTP: Eliminate New Storage at Adams Field & Scott Hamilton Drive | $76,588,000 |

The operation and maintenance costs (O&M) were also estimated for each of the scenarios. A combination of the estimated capital and O&M costs were used to perform a present worth analysis for each of the options. The methodology used to perform this analysis is detailed in the next three (3) sections. This report does not address any water conservation, waste minimization, reuse, or recycling elements because they are not applicable to this type of project. Energy efficiency is addressed in the O&M cost analysis through a review of annual electrical costs applicable to each scenario.

### 6.1 Scenario 1: SECAP 2010 Recommendations

The O&M items included in this analysis for Scenario 1 are listed in Table 6.2.

**Table 6.1**
**Summary of Scenario 1 Annual O&M Costs**

| Item No. | Description | Annual O&M |
|---|---|---|
| 1 | Odor Control Chemical Costs | $81,700 |
| 2 | Electrical Costs | $4,400 |
| 3 | Cleanup Costs | $53,800 |
| 4 | Maintenance Costs | $52,500 |
| 5 | Gas Line Repair | $6,700 |
| 6 | Treatment Cost | $199,700 |
| | **TOTAL ANNUAL O&M** | **$398,800** |

The odor control chemical costs are based on the use of calcium nitrate ($Ca(NO_3)_2$) at the Scott Hamilton Facility only. The analysis assumed a hydrogen sulfide concentration of 2 ppm and a $Ca(NO_3)_2$ dosage of 63 ppm. Approximately 8,000 gallons would be required per design storm event. Assuming a chemical cost of $1.65 per gallon, the total chemical cost per design storm would be $13,200. Six (6) design storms were assumed per year for a total annual cost of $79,200.

Cleanup costs were based on LRW's historical records with costs adjusted to 2016 dollars. According to LRW maintenance personnel, the cost to clean the existing 30 MG facility at Scott Hamilton Drive is $2,000 per event using the dry cleanup method. This cost was extrapolated to determine the approximate cost to clean all of the proposed storage facilities at Adams Field and Scott Hamilton Drive. The cleanup costs were based on twelve (12) events per year, six (6) of which that are full design storm events. The cost to clean the existing 30 MG storage at the Scott Hamilton Drive Facility was excluded since it would remain to be a requirement for each of the options evaluated.

The proposed 51 MG storage facility at Scott Hamilton Drive will be partially constructed on top of a natural gas transmission main owned by Centerpoint Energy. A joint use agreement between LRW and the Gas Utility requires that LRW participate in any effort to repair a gas leak underneath the constructed levy. The gas line repair cost assumes that one (1) gas line repair would be required every 10 years. LRW's cost associated with the gas leak would not include fixing the gas line, but rather the repair of the common levy after the gas line repair was complete. The present worth cost analysis for this option also includes a one-time expense of $500,000 for any city road repairs following construction of the new basin.

All of the wastewater that is stored as a part of this scenario will have to be treated as soon as the collection system surcharging has subsided. The cost for LRW to treat wastewater has been calculated to be approximately $425 per million gallons. The total cost of treatment was based on a volume of 78 million gallons (51 MG at SH & 27 MG at AF) per design storm and six (6) design storm events annually.

## 6.2 Scenario 3: Adams Field WWTP – Parallel Treatment

The O&M items included in this analysis for Scenario 3 are listed in Table 6.3.

**Table 6.2**
**Summary of Scenario 3 Annual O&M Costs**

| Item No. | Description | Annual O&M |
|---|---|---|
| 1 | HRC Chemical Costs | $44,900 |
| 2 | Electrical Costs | $19,700 |
| 3 | Maintenance Costs | $62,700 |
| 4 | Disinfection Costs | $163,900 |
| 5 | Odor Control Chemical Costs | $31,200 |
| 6 | Gas Line Repair | $6,900 |
| 7 | Treatment Costs | $74,400 |
| 8 | Cleanup Costs | $13,000 |
| | **TOTAL ANNUAL O&M** | **$416,700** |

The HRC chemical costs were based on feeding 2 ppm of 8.3% alum (coagulant), 0.5 ppm of polymer, 2 ppm of 50% caustic (pH adjustment) and 4 lbs. of magnetite per million gallons treated. It was assumed that six (6) design storm events would occur each year with a total volume of 128.7 MG treated per event. It should be noted that pH may not always be needed as a result of high rate clarification. It may also be required, however, following the use of peracetic acid for disinfection. The disinfection costs assume the use of peracetic acid at $10.55 per gallon.

The odor control chemical costs were based on the same assumptions outlined in Section 6.2. Odor control costs were included for the new 31.2 MG basin at Scott Hamilton Drive only. The gas line repair costs used the same assumptions outlined in Section 6.2. The treatment costs were based on the treatment of 187 MG per year (31.2 MG x 6 design storm events). Cleanup costs were based on cleaning the 31.2 MG basin 6 times per year.

## 6.3 Scenario 6: Eliminate New Storage at Adams Field & Scott Hamilton Drive

The O&M items included in this analysis for Scenario 6 are listed in Table 6.3.

**Table 6.3**
**Summary of Scenario 6 Annual O&M Costs**

| Item No. | Description | Annual O&M |
|---|---|---|
| 1 | HRC Chemical Costs | $53,800 |
| 2 | Electrical Costs | $72,100 |
| 3 | Maintenance Costs | $232,900 |
| 4 | Disinfection Costs | $236,400 |
| | **TOTAL ANNUAL O&M** | **$595,200** |

The HRC chemical costs were based on feeding 2 ppm of 8.3% alum (coagulant), 0.5 ppm of polymer, 2 ppm of 50% caustic (pH adjustment) and 4 lbs. of magnetite per million gallons treated. It was assumed that six (6) design storm events would occur each year with a total volume of 154.3 MG treated per event. It should be noted that pH may not always be needed as a result of high rate clarification. It may also be required, however, following the use of peracetic acid for disinfection. The disinfection costs assume the use of peracetic acid at $10.55 per gallon.

The electrical and maintenance system costs for this scenario include both the treatment plant improvements and the recommended collection system improvements such as the new inline booster pump station. Neither odor control or gas line repair costs were included in these costs since no new storage is proposed for the Scott Hamilton Drive Facility. Treatment costs are also not included since no new storage is recommended under this scenario.

## 6.4 Present Worth Cost Analysis

A 20-year present worth analysis was performed for each of the three scenarios using the capital and O&M costs outlined previously in this Amendment. An annual interest rate of 3.6% was used in the calculation of the present worth values. Table 6.4 lists the results from that analysis.

**Table 6.4**
**Summary of Present Worth Cost Analysis**

| Description | Capital Cost | 20-YR O&M Cost | Present Worth |
|---|---|---|---|
| **Scenario 1: 2010 SECAP Recommendations** | **$44,189,000** | **$5,571,000** | **$49,760,000** |
| Mabelvale Pike 51 MG Storage Basin | $25,881,000 | $3,848,000 | $29,729,000 |
| Adams Field WWTP Equalization | $18,308,000 | $1,723,000 | $20,031,000 |
| **Scenario 3: Adams Field Parallel Treatment** | **$43,626,000** | **$7,120,000** | **$50,746,000** |
| Adams Field WWTP Improvements | $23,720,000 | $4,572,000 | $28,292,000 |
| Mabelvale Pike 31.2 MG Storage Basin | $19,906,000 | $2,548,000 | $22,454,000 |
| **Scenario 6: No New Storage at SH or AF** | **$76,588,000** | **$8,386,000** | **$84,974,000** |
| Adams Field WWTP Improvements | $57,605,000 | $6,854,000 | $64,459,000 |
| Collection System Improvements | $18,983,000 | $1,532,000 | $20,515,000 |

## 7.0 Recommendations

The purpose of this SECAP Amendment was to re-evaluate the 2010 SECAP Update's recommendations for the Scott Hamilton Drive and Adams Field storage projects. This re-evaluation comes in light of the potential shift in the regulatory position on blending prompted by the ILC's petition to the U.S. Court of Appeals for the Eight Circuit. This Amendment does not question the validity of the original storage project recommendations. Those recommendations were evaluated as the best available options for LRW in the regulatory environment that existed at the time the Update was written. Similar to the 2010 SECAP Update, this Amendment will filter the newly proposed options through the Utility's core objectives to determine a recommended approach for achieving compliance with their CAO. These objectives are presented in Table 7.1, which also lists sub-objectives to further distinguish each objective.

The identified objectives were defined to serve as a measure of how well each alternative could meet the Utility's overall objectives. The relative importance of each objective is essential to consider in alternative ranking and selection. The following percentages were used for a weighted ranking of the evaluated alternatives:

- Eliminate & Mitigate SSOs as Required by the CAO – 25%
- Protect Health & Welfare of Little Rock's Citizens – 15%
- Protect the Environment – 15%
- Manage Costs – 25%
- Maximize Public Acceptance – 10%
- Provide Improvements with the Flexibility to Adapt to Potential Regulatory & Other Conditions – 10%

Scores of 0 to 5 were used in rating the alternatives for each objective. The ranking scores are the product of the rating for each alternative under each criterion and the weight assigned to each criterion.

**Table 7.1**
**Overall Objectives for the 2010 SECAP Update Amendment**

| Designation | Objective | Sub-Objective |
|---|---|---|
| A | Eliminate & Mitigate SSOs as Required by the CAO | Eliminate SSOs resulting from the qualifying storm event defined by the Consent Administrative Order |
| | | Mitigate SSOs resulting from lower frequency storms |
| | | Provide redundancy |
| B | Protect Health & Welfare of Little Rock's Citizens | Comply with NPDES Permits |
| | | Provide improvements that will protect health & welfare beyond NPDES compliance |
| | | Minimize potential contact between the general public & untreated sewage from SSOs |
| C | Protect the Environment | Comply with NPDES Permits |
| | | Provide environmental benefits beyond NPDES compliance |
| | | Minimize wetland disturbance & clearing of trees |
| D | Manage Costs | Minimize capital costs |
| | | Minimize O&M costs |
| | | Minimize life-cycle costs |
| E | Maximize Public Acceptance | Inform and involve the public regarding LRW capital improvements |
| | | Minimize environmental justice concerns |
| | | Promote positive impacts and mitigate potential negative impacts to the community |
| F | Provide Improvements with the Flexibility to Adapt to Potential Regulatory & Other Conditions | Provide operational flexibility |
| | | Provide solutions that are adaptable to current conditions |
| | | Provide flexibility for future improvements required for anticipated regulatory changes |

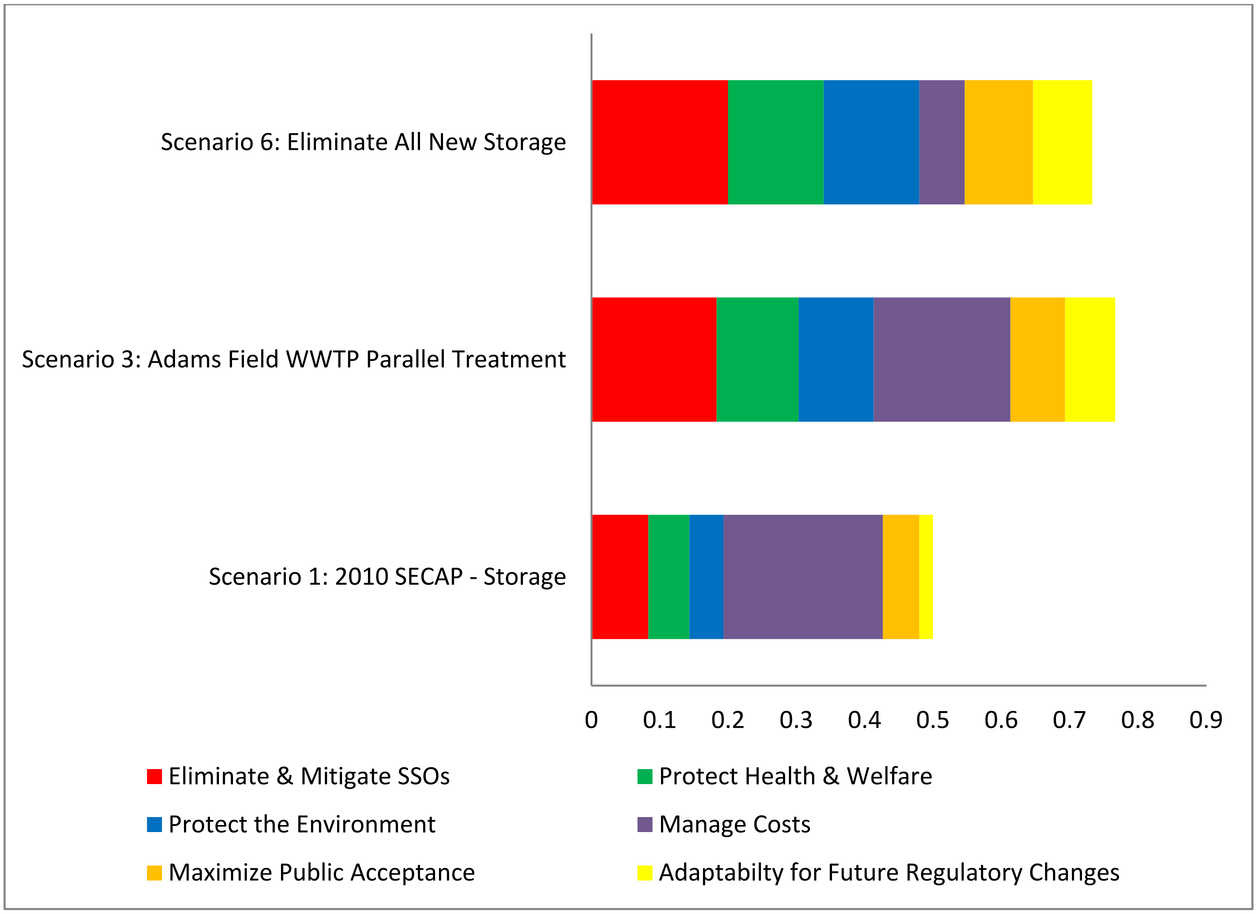
**Table 7.2**

**Alternative Ranking Scores for Each Sub-Objective**

| Objective | Sub-Objective | Scenarios | | |
|---|---|---|---|---|
| | | 1 | 3 | 6 |
| Eliminate & Mitigate SSOs as Required by the CAO | Eliminate SSOs resulting from the qualifying storm event defined by the Consent Administrative Order | 5 | 5 | 5 |
| | Mitigate SSOs resulting from lower frequency storms | 0 | 3 | 4 |
| | Provide redundancy | 0 | 3 | 3 |
| Protect Health & Welfare of Little Rock's Citizens | Comply with NPDES Permits | 4 | 5 | 5 |
| | Provide improvements that will protect health & welfare beyond NPDES compliance | 0 | 3 | 4 |
| | Minimize potential contact between the general public & untreated sewage from SSOs | 2 | 4 | 5 |
| Protect the Environment | Comply with NPDES Permits | 4 | 5 | 5 |
| | Provide environmental benefits beyond NPDES compliance | 0 | 3 | 4 |
| | Minimize wetland disturbance & clearing of trees | 1 | 3 | 5 |
| Manage Costs | Minimize capital costs | 4 | 4 | 1 |
| | Minimize O&M costs | 5 | 4 | 2 |
| | Minimize life-cycle costs | 5 | 4 | 1 |
| Maximize Public Acceptance | Inform and involve the public regarding LRW capital improvements | 5 | 5 | 5 |
| | Minimize environmental justice concerns | 1 | 3 | 5 |
| | Promote positive impacts and mitigate potential negative impacts to the community | 2 | 5 | 4 |
| Provide Improvements with the Flexibility to Adapt to Potential Regulatory & Other Conditions | Provide operational flexibility | 1 | 3 | 4 |
| | Provide solutions that are adaptable to current conditions | 1 | 4 | 4 |
| | Provide flexibility for future improvements required for anticipated regulatory changes | 1 | 4 | 5 |

Figure 7.1 shows the ranking in a stack bar where the color represents the contribution of each criterion to the final ranking score. In Figure 7.1 the length of the bar for a given color indicates how well the improvement does in terms of the criterion or objective represented by that color.

**Figure 7.1**
**Ranking of Project Alternatives**




Based on the analysis of the available options evaluated for this Amendment and the objectives outlined in this Section, Hawkins-Weir Engineers recommends that Little Rock Wastewater amend their capital improvements schedule to include the changes identified under Scenario 3: Adams Field WWTP – Parallel Treatment.

## 8.0 Regulatory Challenges

The Court's ruling on the ILC's petition has the potential to be a watershed moment in the area of the treatment of wastewater peak wet weather flows all across the nation. At this point in time, however, the full ramifications of the ruling have yet to be revealed. The EPA has stated that the ruling only applies to the states within the Court's jurisdiction. They have also stated that the Court's ruling did not vacate the bypass rule (40 CFR §122.41(m)(1)). The EPA is planning to conduct further study into the area of blending.

Despite many requests by multiple parties, no indication has been given by EPA as to how future permit applications that include blending will be handled by that agency. As mentioned previously, the law firm that represented ILC in this case, Hall & Associates, has recommended to the IDNR that the EPA 2003 PFP should be used as a basis for future permits written in that state. It should be noted that the 2003 PFP only made it as far as the public comment period in the rulemaking process and therefore never became law. As of the time of the writing of this report, the IDNR has not published a draft or final policy for incorporating peak flow processing into NPDES Permits for that State. For the purposes of this report, we will assume that the 2003 PFP will be the framework of the EPA's final position. We caution, however, that any number of other outcomes is possible. Based on the stated assumptions, this section will briefly discuss the following regulatory challenges that LRW might face in the pursuit of blending at their Adams Field WWTP:

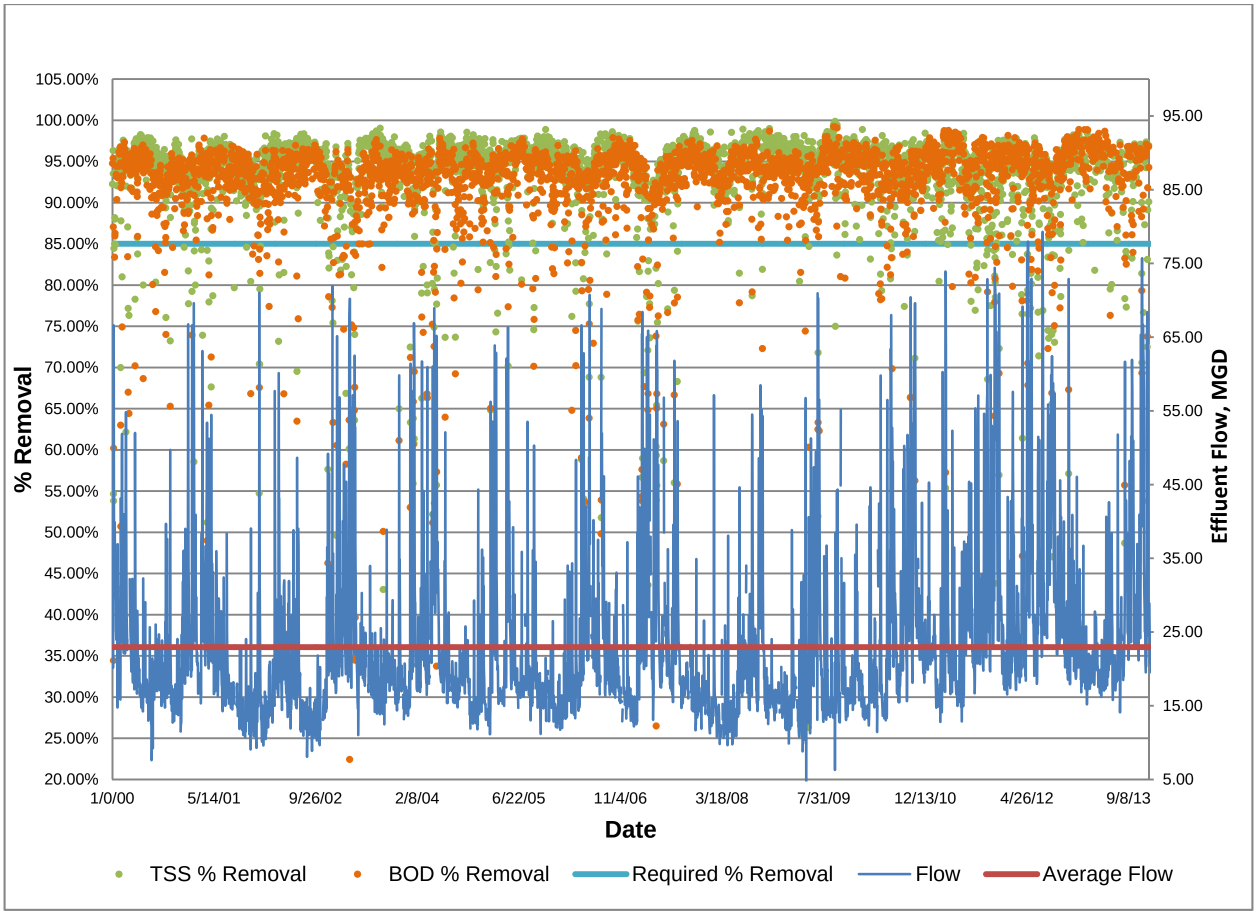
- Compliance with Requirement for 85% Removal of $BOD_5$ and SS
- Compliance with Mass Loading Requirements

### 8.1 Percent Removal Requirements

The Secondary Treatment Regulation requires that the minimum 30-day percent removal for $BOD_5$ and SS be 85% (40 CFR §133.102(a.4.iii) & (b.3)). Assuming a typical municipal average influent $BOD_5$ or SS of 200 mg/l, 85% removal would produce an effluent concentration of 30 mg/l of each constituent. This is equal to the plant's current effluent permit limits for each constituent and is reasonably achieved. The potential difficulty in complying with this requirement exists primarily during peak flows when the plant's influent flow is diluted by stormwater. The plant's influent $BOD_5$ and SS during wet weather could be 50 mg/l or lower. To achieve 85% removal under those circumstances would require the plant to produce an effluent of 7.5 or lower. The processes employed by the Adam's Field WWTP are not designed for and are not capable of achieving consistent compliance with that low of an effluent limit.

Figure 8.1 below compares the percent removal achieved at Adams Field over the past 13 years with the plant's influent flow.

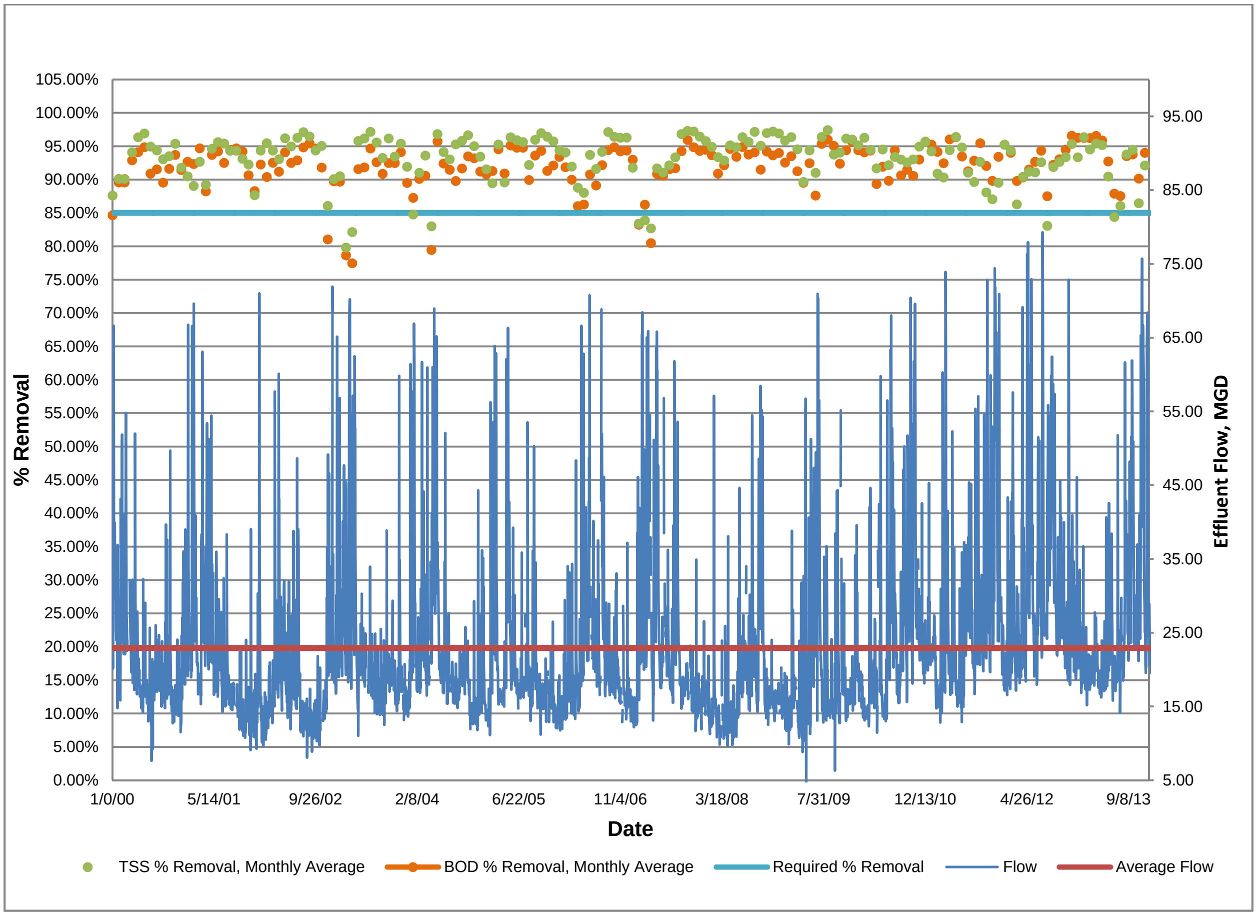
**Figure 8.1**
**Daily TSS & BOD % Removal Compared to Total Plant Flow**




This Figure illustrates the plant's inability to achieve compliance with the 85% removal rule on a daily basis, particularly during high flows. Fortunately, the Secondary Treatment Rule requires compliance based on a 30-day average.

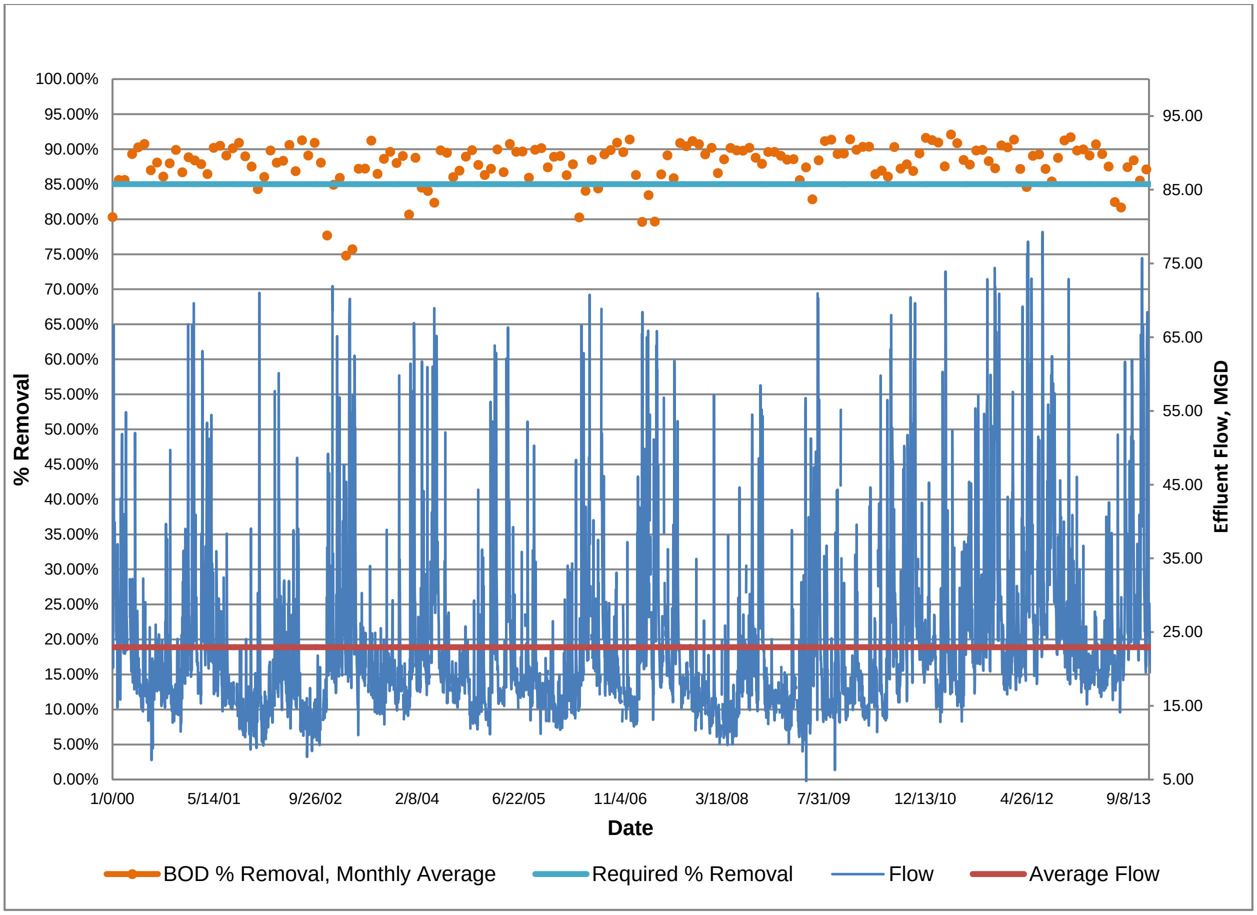
Figure 8.2 illustrates that the plant has had much greater success in achieving compliance over a 30-day period.

**Figure 8.2**
**Average Monthly TSS & BOD % Removal Compared to Total Plant Flow**




The implementation of the recommended blending option should not be expected to inhibit the plant's ability to comply with the 85% removal rule for SS because the high rate process typically includes a manufacturer's guarantee of 90% removal of that constituent during the design flow conditions. The high rate process included in the recommendation is not designed to remove soluble $BOD_5$. It guarantees 90% removal of particulate $BOD_5$ but that only equates to about 50% removal of the total $BOD_5$. Figure 8.3 conservatively assumes that two (2) peak flow events occurred each month over the last 13 years each resulting in a daily $BOD_5$ removal of 50%.

**Figure 8.3**
**Estimated BOD % Removal with 2 Design Storms per Month**




From this figure, it can be seen that the number of potential violations over that time period for $BOD_5$ percent-removal more than doubled with the inclusion of the superimposed storm events. While this is an oversimplified representation of the issue, a detailed engineering analysis should be performed to ensure that the treatment processes selected as a part of the recommended option are capable of achieving consistent compliance with the percent-removal for $BOD_5$. It should also be noted that should EPA or ADEQ require compliance on a more frequent basis than a 30-day average, as was suggested by a senior representative of ADEQ during a recent project related meeting, the WWTP could not be reasonably expected to achieve consistent compliance.

## 8.2 Mass Loading Requirements

The peak allowable flow rate at WWTPs in Arkansas is typically regulated indirectly by a limitation of the total mass of a particular pollutant that can be discharged into the receiving stream over a period of time. To determine this limit ADEQ commonly multiplies the plants discharge concentration limitation (mg/l) times the facility's design flow for a month. Under these conditions, WWTPs are allowed to discharge at periodic rates that are above their design flow without violating their permit so long as their average flow for the month is not exceeded. WWTPs can also achieve compliance with this requirement by achieving a lower average effluent concentration than required by their permit.

Concern was raised about Adam's Field WWTP's ability to comply with its mass loading requirements if allowed to discharge at a rate of up to 94 MGD during peak flow events. The following two (2) figures illustrate the historical TSS and $BOD_5$ mass loading discharged by the plant over the past 13 years. On the same exhibits HW has superimposed what the mass loading rates would have been over the same period if up to six (6) design storm events had occurred each month (94 MGD, 24 hours, 30 mg/l $BOD_5$ & TSS). It is highly unlikely that this number of storm events would occur within a 30-day period. It is also expected that the effluent concentration of $BOD_5$ & TSS during a storm event would be less than 30 mg/l. The figures demonstrate that the WWTPs mass loading requirements should not be exceeded as a result of the recommended improvements.

**Figure 8.4**
**Adams Field Historical BOD Loading with Superimposed Storm Events**

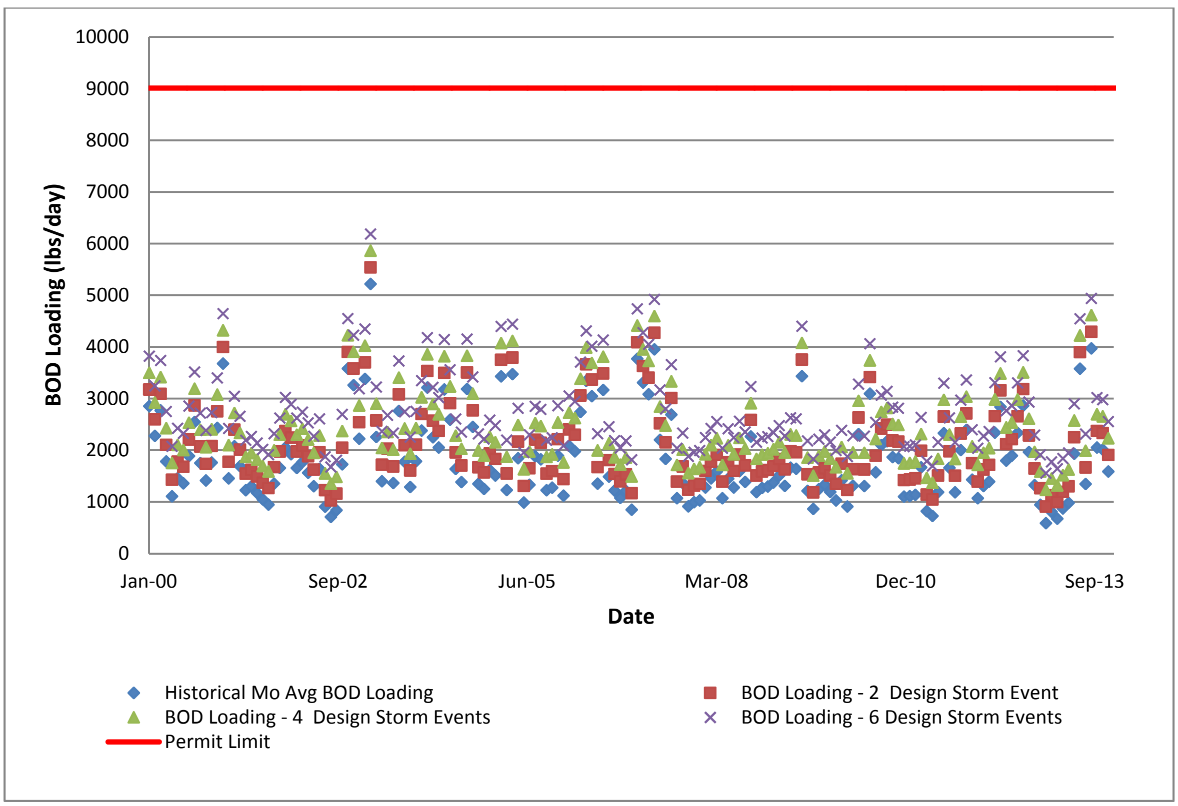
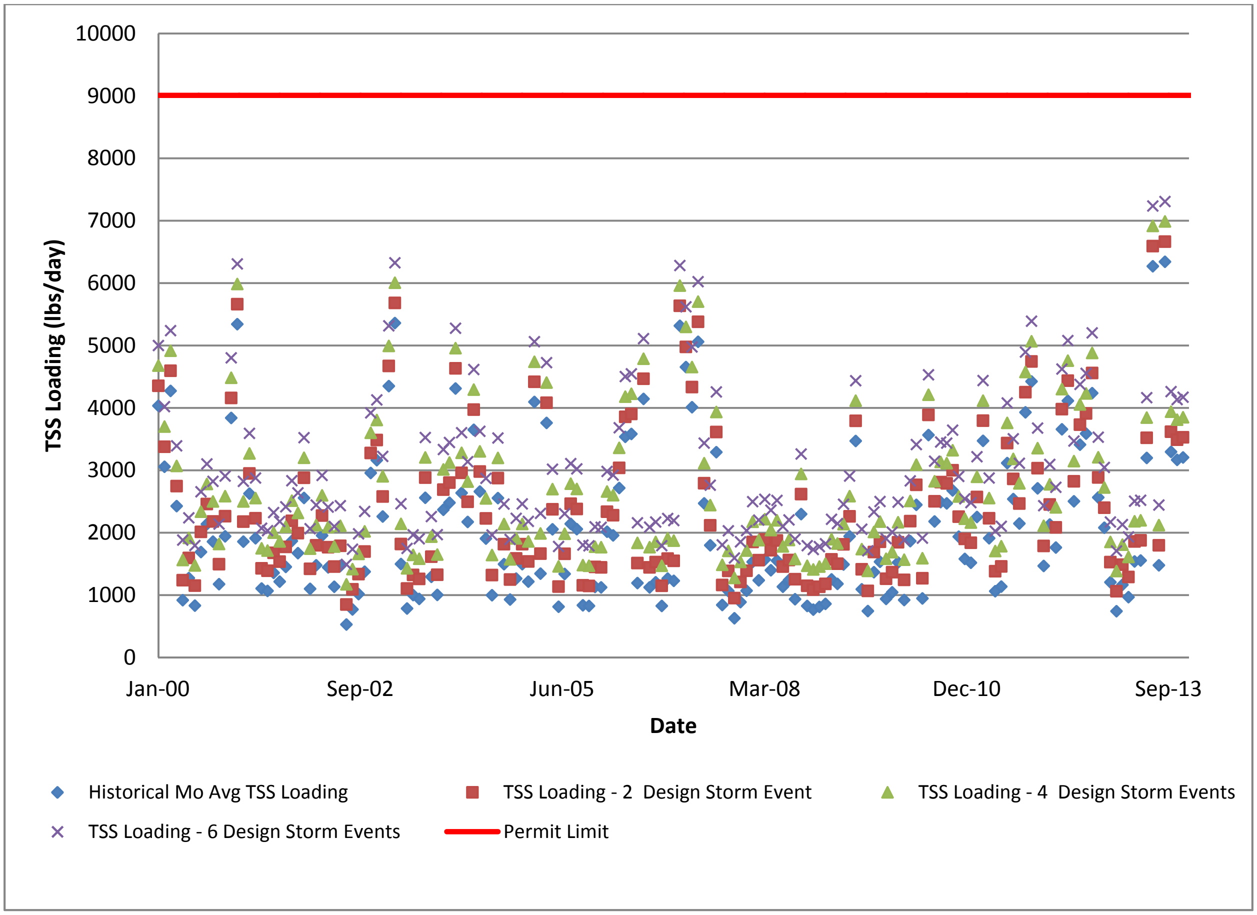


**Figure 8.5**
**Adams Field Historical TSS Loading with Superimposed Storm Events**



## 8.3 NPDES Permit Modification

LRW applied for the necessary modifications to their NPDES permit on August 1, 2014 to allow the recommendations of this report to be implemented. The application process, which included several meetings and modifications, was finalized in November of that year. The permit application was forwarded to EPA Region 6 for review as is the standard practice. EPA Region 6 declined to review the application. The permit modification underwent the standard 30-day public comment period in October 2015. The modified permit, which is included as Appendix D, took effect on December 1, 2015. The permit is set to expire on July 31, 2017.

# 9.0 Public Participation

Keeping the people of Little Rock informed of its activities has always been a priority of LRW. Extra effort was made in that regard for each of the projects recommended by this SECAP Update. Prior to design of the Scott Hamilton Drive project, LRW met with several elected officials including the Little Rock Mayor, the Little Rock City Manager, and many of the City's Directors. They also met with several city departments including Public Works, Planning & Zoning, and the Parks Department. The Utility presented the project at three (3) community meetings where they gathered feedback from the public. After all of these meetings were complete, the Utility participated in the Conditional Use Permit process for the site. That process included posting signage at the site, conducting a public hearing, and presenting the project to the City's Planning Commission. A Conditional Use Permit was issued by the City for the Scott Hamilton Drive Project on December 5, 2014. Public participation on the Adam Field Parallel Treatment Project to date has included the public comment period required as a part of the NPDES permit modification process as well as discussions at the Utility's public commission meetings.

# 10.0 Compliance Schedule

Little Rock Wastewater is required per their amended CAO to have mitigated SSOs up to the design storm event by the end of 2023. The following project milestone dates are believed to be necessary to achieve compliance with that requirement:

- **Scott Hamilton Drive Peak Flow Facility**
  - Open Bids.......................................................................... March 2017
  - Issue Notice to Proceed .................................................. May 2017
  - Complete Construction .................................................. May 2019
- **Adams Field WWTP Improvements**
  - Commence Final Design.................................................. June 2016
  - Complete Final Design .................................................... March 2017
  - Receive ADEQ Construction Permit ................................ May 2017
  - Open Bids.......................................................................... May 2017
  - Issue Notice to Proceed .................................................. June 2017
  - Complete Construction .................................................. December 2018