Missouri Clean Water Commission
Meeting

January 9, 2020

Department of Natural Resources
Lewis and Clark State Office Building
1101 Riverside Drive
Jefferson City, MO

Tab A

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Call to Order

Issue:

The Missouri Clean Water Commission will be called to order.

Recommended Action:

None

List of Attachments:

None

Tab A1

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Selection of the Clean Water Commission Chairperson and Vice Chairperson

Issue:

Pursuant to Missouri Revised Statue 644.021 "At the first meeting of the commission and at yearly intervals thereafter, the member shall select from among themselves and chairman and vice chairman."

Recommended Action:

The Clean Water Commission should vote and select a Chairperson and Vice Chairperson for 2020.

Tab B

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Approval of Minutes

Issue:

The Missouri Clean Water Commission will review the minutes from the past Clean Water Commission meetings.

Recommended Action:

The Department recommends that the Missouri Clean Water Commission vote to approve past meeting minutes.

Tab B1

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES
WATER PROTECTION PROGRAM

MINUTES OF THE
MISSOURI CLEAN WATER COMMISSION MEETING
Elm Street Conference Center
1730 East Elm Street
Jefferson City, Missouri
October 9, 2019

Present at Lewis and Clark State Office Building
Ashley McCarty, Chair, Missouri Clean Water Commission
Patricia Thomas, Vice-Chair, Missouri Clean Water Commission
Stan Coday, Missouri Clean Water Commission
Tim Duggan, Legal Counsel, Missouri Clean Water Commission
John Reece, Missouri Clean Water Commission
Allen Rowland, Missouri Clean Water Commission
Krista Welschmeyer, Secretary, Missouri Clean Water Commission
Chris Wieberg, Director of Staff, Missouri Clean Water Commission

Michael Abbott, Missouri Department of Natural Resources, Jefferson City, Missouri
Van Beydler, Missouri Department of Natural Resources, Jefferson City, Missouri
Joe Boland, Environmental Improvement and Energy Resource Authority, Jefferson City, MO
Robert Brundage, Newman, Comley, and Ruth, Jefferson City, Missouri
Eric Crawford, Missouri Public Utility Alliance, Columbia, MO
Sharon Davenport, Missouri Department of Natural Resources, Jefferson City, Missouri
Jane Davis, Missouri Department of Natural Resources, Jefferson City, Missouri
Joan Doerhoff, Department of Natural Resources, Jefferson City, Missouri
Angela Falls, Missouri Department of Natural Resources, Jefferson City, Missouri
Chuck Gross, Duckett Creek, O'Fallon, MO
Darlene Helmig, Missouri Department of Natural Resources, Jefferson City, Missouri
Lacey Hirschvogel, Missouri Public Utility Alliance, Columbia, MO
John Hoke, Missouri Department of Natural Resources, Jefferson City, Missouri
Leslie Holloway, Missouri Farm Bureau, Jefferson City, MO
Jay Hoskins, Metropolitan Sewer District, St. Louis, Missouri
Donald Jones, Missouri Rural Water Association, Poplar Bluff, Missouri
Traci Lichtenberg, Missouri American Water, St. Louis, Missouri
Bill McBrayer, Citizen, Hickory County, MO
Cheryl Marcum, Citizen, Cedar County, Stockton, MO
Refaat Mefrakis, Missouri Department of Natural Resources, Jefferson City, Missouri
Randy Norden, Missouri Rural Water Association, Ashland, Missouri
Kevin Perry, REGFORM, Jefferson City, MO

Norb Plassmeyer, Citizen, Jefferson City, MO
Joel Reschly, Missouri Department of Natural Resources, Jefferson City, Missouri
Kristi Savage-Clarke, Missouri Department of Natural Resources, Jefferson City, Missouri

CALL TO ORDER

Chair McCarty called the meeting of the Missouri Clean Water Commission (CWC) to order on October 9, 2019, at 10:04 a.m., at the Elm Street Conference Center, 1730 East Elm Street, Jefferson City, MO.

Chair McCarty introduced the Commissioners, Staff Director, Legal Counsel, and the Commission Secretary.

Approval of Minutes

Approval of the July 22, 2019, Open Session Minutes
Agenda Item B-1

Commissioner Coday made a motion to approve the minutes as amended. Commissioner Reece seconded the motion. The motion passed with a roll call vote:

Commissioner Coday:	Yes
Commissioner Reece:	Yes
Commissioner Rowland:	Yes
Vice Chair Thomas:	Yes
Chair McCarty:	Yes

DNR Reports and Updates

Director's Update
Agenda Item C

Chris Wieberg, Director, Water Protection Program, reported the following to the Commission:

> Director Wieberg indicated that the agenda for today is amended from the one that was sent to the commission members. The item that was amended was the City of Joplin variance due to an unanticipated EPA comment that required further evaluation. The Water Protection Program anticipates that the item will be back on the agenda at the next Commission meeting. Director Wieberg then briefed the Commission on the issued permits report for 2019, pointing out that there has been an increase in the number of permit actions associated with the renewal of general permits. Director Wieberg also briefed the commission on a decision letter from USEPA Region 7 regarding the 2018 submittal of Water Quality Standards. Director Wieberg indicated that Angela Falls will be giving an update later in the meeting regarding this topic. Director Wieberg then briefed the commission on upcoming clean water fee rulemaking discussions that will start in 2020. The Program has already

started the process with the first meeting to be held in February of 2020. Director Wieberg then gave the commission an update regarding the Water Program's partnership with the Soil and Water Conservation Program on the development of the Nutrient Trading Clearinghouse. A grant application has been submitted to EPA for funding to help with implementation of the clearinghouse. Finally, Director Wieberg updated the commission on a rulemaking effort lead by USEPA on 401 Certifications and that this rule is currently out for public comment.

Commissioner Update

Commissioner Allen Rowland provide a brief update regarding his participation in a recent Upper Mississippi River Basin Association Meeting as a representative of the Missouri Clean Water Commission.

Public Hearing

10 CSR 20-6.020 – Public Participation, Hearings, and Notice
Agenda Item D

A court reporter swore in those wishing to testify.

Michael Abbott, Water Pollution Control Branch, Chief of Operating Permits, presented testimony on the proposed rule amendment 10 CSR 20-6.020 regarding public participation, hearings, and notice to governmental agencies.

Public Notice on the proposed amendment started September 3, 2019, and ends November 12, 2019. It was published in the Missouri Register on September 3, 2019.

10 CSR 20-6.020 is an administrative rule. The current rule adds 3 days to a 30-day period for appeals of conditions in issued permits when the service of notice is accomplished by mail, which is not in alignment with the statute which only allows 30 days.

Chair McCarty asked if anyone wished to testify on the amendment however no one came forward.

Commissioner Reece asked about the extension of the three days to clarify his understanding of the amendment.

Michael Abbott explained that the amendment is being proposed to remove the additional 3 days that the regulation currently allows stating the statute only allows for thirty days.

Chair McCarty closed the hearing.

Recommended for Adoption and Actions to be Voted On

2020 Clean Water State Revolving Fund Intended Use Plan (IUP) Approval
Agenda Item E1

Hannah Humphrey, Director of the Financial Assistance Center, presented the 2020 Clean Water State Revolving Fund IUP. The Draft Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan, Project Priority List, and Priority Point Criteria (IUP) was placed on public notice July 22, 2019. A public hearing was held on August 21, 2019, and the comment period subsequently closed on August 28, 2019. Comments were received from the public and responded to by the Department. Available funds have been allocated, and after all applications within a given group are satisfied, any remaining funds from a specific group have been distributed as necessary to fund other projects that are ready to proceed in other categories.

Eric Crawford, Missouri Public Utility Alliance (MPUA), provided comments to the Commission regarding the IUP. MPUA feels that it is important to get these additional subsidization opportunities out to communities. They have heard from members who are starting to come up against affordability thresholds. MPUA is looking forward to the stakeholder opportunities and to expand on their written comments. MPUA is advocating to expand the eligibilities so more communities would be eligible for these funding opportunities.

Commissioner Reece made a motion to approve the 2020 Clean Water State Revolving Intended Use Plan as presented. Commissioner Rowland seconded the motion. The motion passed with a roll call vote:

Commissioner Reece:	Yes
Commissioner Rowland:	Yes
Commissioner Coday:	Yes
Vice Chair Thomas:	Yes
Chair McCarty:	Yes

New Business

Update on EPA approval of the 2018 Water Quality Standards
Agenda Item F1

John Hoke, Missouri Department of Natural Resources, presented an update on the EPA approval of the 2018 Water Quality Standards (WQS). The Department submitted new and revised WQS to the U.S. Environmental Protection Agency (EPA) for approval. The EPA approved the numeric nutrient criteria for lakes section of the rule and other substantive revisions. EPA continues to review additional revisions of the rule pertaining to additional clarifying information.

Leslie Holloway, Missouri Farm Bureau, provided comments on part of the EPA approval letter regarding the segment length of impaired streams.

Update on the 2019/2020 Water Quality Standards Triennial Review

Agenda Item F2

Angela Falls, Missouri Department of Natural Resources, presented an update on the 2019/2020 Water Quality Standards Triennial Review.

States are required by federal regulation to review their WQS at least once every 3 years and modify them as appropriate. The Department mapped out a rulemaking schedule, with the rule being finalized at the beginning of 2021. The Department first began this process by seeking input from the public through surveys, public meetings, and a Notice of Intent for the triennial review. The Department then held 4 WQS Workgroup meetings from July to September. The Department is proposing the following for this rule:

- Revisions to aluminum and acute cadmium criteria
- Addition of variances for 3 municipalities: Joplin, Salem, and Bolivar
- Reinstate site-specific dissolved oxygen criteria for Sni-a-bar Creek
- Revisions to chloride plus sulfate language
- Revisions to losing stream language
- Revisions to the Missouri Use Designation Dataset (MUDD)
- Other minor edits

The Regulatory Impact Report (RIR) is currently being drafted prior to approval by the Department Director. The draft RIR will be on public notice later this year. The proposed rule is planned to be published in April 2020. The public hearing for the rule will be held in the summer of next year with adoption planned late next year.

Update on the Regionalization Incentive Grant

Agenda Item F3

Hannah Humphrey, Missouri Department of Natural Resources, provided an update on the Regionalization Incentive Grant.

Appeals and Variance Requests

Open Comment Session

Jay Hoskins, Metropolitan Sewer District, St. Louis, Missouri, representing Missouri Water Environmental Association at this meeting the asked that the Department develop a good cost-of-service breakdown to be presented to stakeholders during the fee discussion process. The regulated community would like to see what it costs to run the program by specific sectors and the revenues that are brought in to support those programs.

Mr. Hoskins also commented on the importance of funding the State Revolving Fund and that they will continue to advocate for the funding of the SRF Program. Mr. Hoskins also announced that there was a meeting in Kansas City yesterday with EPA, Missouri Water Association, Kansas Water Association, Iowa Water Association, and the state natural resource agencies to discuss a variety of issues, including the possibility of a federal Peak Wet Weather Rule. Lastly, Mr. Hoskins commented on the issue of Significant Non-Compliance and how the issue will develop in the future and the pending federal PFAS legislation.

Kevin Perry, REGFORM, thanked Chris Wieberg and the Water Protection Program for all the presentations at the Water Seminar. He also thanked Chair McCarty for her attendance.

Tim Duggan, Legal Counsel, Missouri Clean Water Commission, provided an update to the Commission. Hickory Neighbors – Trenton Farms has been argued before the Supreme Court. The briefs are in for Renner Farm. This issue is an almost identical issue to Hickory Neighbors, except that it is focused only on the constitutional challenge. Renner Farm has not been set for oral arguments.

The Opponents of Copper County CAFOS vs. the PVC (Tipton East) case remains on hold until the Supreme Court decides the Hickory Neighbors case because one of the points on appeal in the Tipton East case is identical.

The Special Litigation Unit is representing the Clean Water Commission regarding challenges to Senate Bill 391.

Future Meeting Dates

<u>Missouri Clean Water Commission Meetings</u>
Agenda Item I

- January 9, 2020, Lewis and Clark State Office Building
- April 2, 2020, Lewis and Clark State Office Building
- July 8, 2020, Lewis and Clark State Office Building
- October 7, 2020, Lewis and Clark State Office Building

Closed Session

There was no closed session during this Clean Water Commission meeting.

Meeting Adjournment

Chair McCarty adjourned the open meeting at 11:59 a.m.

For more information contact:
Ms. Krista Welschmeyer, Commission Secretary, Missouri Clean Water Commission
Water Protection Program, P.O. Box 176, Jefferson City, MO 65102
Phone: 573-751-6721
Fax: 573-526-1146
E-mail: krista.welschmeyer@dnr.mo.gov

Respectfully Submitted,

Chris Wieberg
Director of Staff

Tab C

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Director's Update

Issue:

Routine update to the Commission

Recommended Action:

Information only.

Tab D

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Public Hearing

Issue:

This portion of the meeting allows for information to be presented to the Commission.

Recommended Action:

Information Only

List of Attachments:

None

Tab E

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Recommended for Adoption and Actions to Be Voted On

Issue:

This portion of the meeting allows for the Commission to review and vote on specific actions.

Recommended Action:

It is recommended that the Commission review and vote on the actions presented

List of Attachments:

None

Tab E1

Missouri Clean Water Commission Meeting
Department of Natural Resources
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Room
1101 Riverside Drive
Jefferson City, Missouri

January 9, 2020

Proposed Amendment of Order of Rulemaking
10 CSR 20-6.020, Public Participation, Hearings and Notice to Governmental Agencies

Issue: The Department has finalized its recommendation on the proposed 10 CSR 20-6.020, Public Participation, Hearings and Notice to Governmental Agencies, and is requesting the Commission adopt the Order of Rulemaking.

Background: 10 CSR 20-6.020 is an administrative rule and as such does not prescribe any environmental conditions or criteria. The existing rule establishes under 10 CSR 20-6.020(6)(C) three days shall be added to the prescribed thirty day period for appeals of conditions in issued permits when the service of notice is accomplished by mail. The addition of the three days does not correspond with the statutes that establish the required time period of thirty days. Section 621.250, RSMo, establishes only thirty days, as well as section 644.051.6 for the filing of an appeal with the Missouri Administrative Hearing Commission. The proposed rule amendment removes the allowance for three additional days, which then places the rule in line with applicable Missouri revised statutes.

This rule was available for public comment from September 3, 2019 until November 12, 2019, and published in the *Missouri Register* on September 3, 2019. A public hearing for the proposed rule was held October 9, 2019. No comments were received on this rule amendment.

Recommended Action: The Department recommends the Commission adopt the Order of Rulemaking for 10 CSR 20-6.020, Public Participation, Hearings, and Notice to Governmental Agencies.

Suggested Motion Language: The Department suggests the Commission motion to adopt the Order of Rulemaking for 10 CSR 20-6.020, Public Participation, Hearings; and Notice to Governmental Agencies, as proposed.

List of Attachments:
10 CSR 20-6.020 Public Participation, Hearings, and Notice to Governmental Agencies

Title 10 – DEPARTMENT OF NATURAL RESOURCES
Division 20 – Clean Water Commission
Chapter 6.020 – Public Participation, Hearings and Notice to Governmental Agencies

ORDER OF RULEMAKING

By the authority vested in the Clean Water Commission of the State of Missouri under Section 644.026 and Section 536.023(3), RSMo, the Commission amends a rule as follows:

10 CSR 20-6.020 is amended

A notice of proposed rulemaking containing the text of the proposed amendment was published in the *Missouri Register* on September 3, 2019 (44 MoReg 2290). This proposed amendment will become effective thirty (30) days after publication in the *Code of State Regulations*.

SUMMARY OF COMMENTS: A public hearing on this proposed amendment was held October 9, 2019, and the public comment period ended November 12, 2019. At the public hearing, Department staff explained the proposed amendment. No comments were made at the public hearing. The Department did not receive any comments during the public comment period.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 6—Permits

PROPOSED AMENDMENT

10 CSR 20-6.020 Public Participation, Hearings, and Notice to Governmental Agencies. The department is amending this rule by deleting section (6)(C).

PURPOSE: This amendment deletes language related to time limits for appeals of conditions in issued permits. The current rule language is not consistent with chapters 640.250.2 and 644.051.6 RSMo.

(1) Public Participation.

(A) The department shall review applications for general permits, operating permits or the renewal of operating permits and other relevant facts to determine whether or not the permits should be issued. When all required and requested information has been received, the department shall prepare the following documents:

1. A draft operating permit containing the following elements:
   A. Terms and conditions of the permit;
   B. Effluent limitations, standards and other limitations;
   C. Applicable compliance schedules; and
   D. Monitoring requirements; and
2. If the draft operating permit is for a major discharger as defined by the Environmental Protection Agency (EPA) or a general permit or if it incorporates any variances or modifications, or if the regional administrator or director finds it is the subject of widespread public interest, the department will prepare a fact sheet. The fact sheet shall include:
   A. A brief explanation of the express statutory or regulatory provisions on which permit requirements are based;
   B. Any calculations or other necessary explanation of the derivation of specific effluent limitations and conditions, including a citation to the applicable guideline, development documents or standard provisions and reasons why they are applicable or an explanation of how the alternate effluent limitations were developed;
   C. Where appropriate, a sketch or detailed description of the location of the discharge described in the application;
   D. A quantitative description of the discharge described in the application and of the activities that lead to the discharge;
   E. Reasons requested variances or modifications do or do not appear justified; and
   F. Name and telephone number of a person who can provide additional information.

(B) A public notice of permit pending will be prepared by the department. There shall be a period of not less than thirty (30) days following the date of the public notice when interested persons may submit their written views on the proposed permit. The department will issue or deny the permit within sixty (60) days after all requirements of the Federal Clean Water Act, the Missouri Clean Water Law and those regulations concerning the issuance of permits have been satisfied.

(C) Public Notice for General Permits.

1. Public notice of newly created, or the reissuance of an existing statewide general permit shall be prepared by the department in accordance with subsections (1)(B) and (D) of this rule.

2. Public notification of the issuance of any general permit to an applicant will not be required, except for the following general permits:

A. Airports;

B. Chemical manufacturing;

C. Fabricated structured metal;

D. Foundries;

E. Limestone and rock quarries;

F. Lubricant manufacturing;

G. Petroleum storage greater than fifty thousand (50,000) gallons; and

H. Wood treaters.

3. For issuance of the first general permit for any newly constructed water contaminant source, point source, or wastewater treatment facility, public notification shall occur in accordance with subsections (1)(B) and (C) of this rule.

4. As new general permits are created, the need for an individual facility public notification process shall be determined and identified in the general permit.

(D) The public notice of permit pending will contain at least the following:

1. Name, address, telephone number of the department, and any other places at which interested persons may obtain further information, request copies of the draft permit and the fact sheet, and inspect and copy related forms and documents;

2. Name and address of the applicant and address of the discharger if different from the applicant;

3. Brief description of the applicant’s activities or operations which result in the discharge or potential discharge described in the application;

4. Name of watercourse to which the applicant will discharge, a description of the location of the discharge and designation of the discharge as new or existing;

5. A statement of the tentative determination to issue a permit;

6. A brief description of the procedures for making final determination, including the thirty (30)-day comment period and any other means by which interested persons may influence or comment upon the making of the determinations; and

7. The name and address of the office processing the application.

(E) Notice will be circulated within the geographical areas of the proposed discharge; the circulation may include any or all of the following:

1. Posting in the post office and public places of the municipality nearest the proposed discharge; and

2. Posting near the entrance to the applicant's premises.

(F) The notice shall be mailed by the department to persons who have notified the department of their interest or who have requested the notice.

(G) The department, upon request, shall add the name of any person or group to a mailing list to receive copies of notices for all applications within the state.

(H) All relevant and material comments received pursuant to the public notice shall be given consideration by the department before making a final decision. When significant water quality concerns are raised during the comment period the department may hold a public meeting to discuss the applications. The department does not have jurisdiction to address questions of zoning, location, property values or other nonwater quality related items.

(2) Notice to Other Governmental Agencies. Notices to governmental agencies shall conform to the stipulations outlined in federal regulation 40 CFR 124.59 "Conditions requested by the Corps of Engineers and other government agencies," January 4, 1989, as published by the Office of the Federal Register, National Archives and Records Administration, Washington, DC 20408 which is incorporated by reference and does not include later amendments or additions.

(3) Public Access to Information.

(A) Any information or records submitted or obtained pursuant to Chapter 644, RSMo, may be subject to public disclosure pursuant to Chapter 610, RSMo. Information other than effluent data, support documents or reports contained in any issued permit or document in the water protection program may be made confidential upon a showing that methods or processes entitled to protection as trade secrets would be revealed if the information were made public. The department shall make the final determination of confidentiality.

(B) The department shall provide for public inspection and copying of information relating to these documents.

(4) Public Participation Process.

(A) Department of Natural Resources (DNR) Hearing.

1. An opportunity shall be provided for the applicant, any affected state, any affected interstate agency, the regional administrator or any interested agency, person or group of persons to request or petition for a public hearing with respect to the application. Any request for a public hearing shall be filed with the department within the comment period and shall indicate the interest of the party filing the request and the reasons why a hearing is warranted. The department shall hold a public hearing if there is significant technical merit and concern related to the responsibilities of the Missouri Clean Water Law. Instances of doubt shall be resolved in favor of holding the hearing. Any public hearing shall be held in the geographical area of the proposed discharge or other appropriate area. An appeal filed upon the issuance of a construction permit will be considered as an appeal of the construction permit and the first operating permit.

2. At least thirty (30) days before any hearing, notice of hearing shall be published in at least one (1) newspaper of general circulation in the geographical area of the discharge and mailed to any person or group on request and to all persons, groups and agencies who received a copy of notice or fact sheet for the proposed permit. In any case, notice shall be at least as broad as was the notice of permit pending. The notice shall contain at least the following:

A. Name, address and telephone number of the department;

B. Name and address of each applicant whose application will be considered at the hearing and name and address of the discharger if different from the applicant;

C. A brief statement of the applicant's activities for which the permit is sought;

D. Name of the watercourse to which permittee will discharge and a short description of the location of each discharge;

E. A brief reference to the public notice issued for each application, including identification number and date of issuance;

F. Information regarding the time and location for the hearing;

G. The purpose of the hearing;

H. A concise statement of the department's understanding of the issues raised by the persons requesting the hearing;

I. Address and telephone number of premises at which interested persons may obtain further information, request a copy of each draft permit or each fact sheet or statement of basis, inspect and copy forms and related documents; and

J. A brief description of the nature of the hearing, including the rules and procedures to be followed.

(B) Clean Water Commission hearings for regulation development, fact finding and other nonjudicatory matters will be held in conformance with Chapter 644, RSMo.

(C) Clean Water Commission hearings on permit issues, abatement orders and other judicatory type matters will be held in conformance with Chapters 536 and 644, RSMo.

(5) Time Limits for Appeals for Abatement Orders, Permit Denials and Variances.

(A) The thirty (30)-day time limit provided for the filing of appeals to the commission as established by section 644.056.3, RSMo for appeals of abatement orders; section 644.051.6, RSMo for appeals from denials of permits; section 644.061.5, RSMo for appeals from the recommendation to grant or deny variances; and 10 CSR 20-6.060(5) for appeals from the denial of water quality certifications shall be computed from the day of service of the notice of the order or issuance or denial of the variance or denial of the permit or water quality certification, as the case may be.

(B) Service of the notice may be accomplished by either hand delivery or certified mail, return receipt requested.

1. Service by hand delivery.

A. Service by hand delivery is accomplished when a copy of the notice is tendered to—

(I) The applicant or permittee or other affected person or with some person of his/her family over the age of fifteen (15) years and residing in his/her dwelling, house or usual place of abode;

(II) An officer of a corporate applicant or permittee or other affected person;

(III) A partner of a partnership applicant or permittee or other affected person;

(IV) A managing or general agent of the applicant or permittee or other affected person;

(V) A registered agent or any other agent of the applicant or permittee or other affected person authorized by appointment or required by law to receive the notice; and

(VI) Any person in charge of the water contaminant or point source of the applicant or permittee or other affected person.

B. The person who effects service by hand delivery shall state the time, place and manner of service in a signed file memorandum or other writing.

C. The accomplishment of service of notice by hand delivery is not altered by the refusal of the person to be served to receive the notice when this fact is shown on the return.

2. Service by certified mail.

A. Service by certified mail is accomplished by mailing a copy of the notice by certified or registered mail, return receipt requested, to any of the persons listed in parts (5)(B)1.A.(I)–(VI) of this rule.

B. Service by mail is complete on the delivery date shown on the return receipt; or on the date of refusal as shown on the envelope of the returned notice.

(C) The appeals previously referenced in subsection (5)(A) of this rule may be made by the applicant, permittee, person named in the order or any other person with an interest which is or may be adversely affected. The appeal shall be filed with the Administrative Hearing Commission, 131 W. High St., PO Box 1557, Jefferson City, MO 65101 and shall be received by the Administrative Hearing Commission prior to expiration of the thirty (30)-day appeal period as computed in subsection (5)(A). The appeal shall be a contested case and shall be conducted under section 644.066, RSMo.

(6) Time Limits for Appeals of Conditions in Issued Permits.

(A) The thirty (30)-day limit provided for the filing of appeals to the commission established by sections 640.010.1 and 644.051.6, RSMo for appeals of conditions in issued permits shall be computed from the day of service of notice.

(B) Service of the notice shall be accomplished by mailing the issued permits, first-class postage prepaid, to the persons listed in parts (5)(B)1.A.(I)–(VI) of this rule.

[(C) Three (3) days shall be added to the prescribed thirty (30)-day period for appeals of conditions in issued permits when the service of notice is accomplished by mail.]

*[(D)]***(C)** The appeals referenced previously in subsection (6)(A) of this rule may be made by the applicant, permittee, or any other person with an interest which is or may be adversely affected. The appeal shall be filed with the Administrative Hearing Commission, 131 W. High St., PO Box 1557, Jefferson City, MO 65101 and shall be received by the Administrative Hearing Commission prior to expiration of the thirty (30)-day appeal period as computed in subsection (5)(A). The appeal shall be a contested case and shall be conducted under section 644.066, RSMo.

(7) Appeals made under sections (5) and (6) of this rule shall conform to the requirements of the Administrative Hearing Commission regulation 1 CSR 15-3.350, effective March 30, 2017.

AUTHORITY: section 644.026, RSMo 2016. Original rule filed June 19, 1974, effective June 29, 1974. Rescinded: Filed Oct. 16, 1979, effective July 11, 1980. Readopted: Filed Feb. 4, 1980, effective July 11, 1980. Amended: Filed May 10, 1984, effective Oct. 15, 1984. Amended: Filed Feb. 1, 1988, effective June 13, 1988. Amended: Filed March 1, 1996, effective Nov. 30, 1996. Amended: Filed July 9, 1998, effective March 30, 1999. Amended: Filed June 13, 2018, effective Feb. 28, 2019.*

**Original authority: 644.026, RSMo 1972, amended 1973, 1987, 1993, 1995, 2000, 2012, 2014.*

PUBLIC COST: The proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS:

Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, Attn: Michael Abbott, P.O. Box 176, Jefferson City, MO 65102. Comments may also be sent with name and address through e-mail to michael.abbott@dnr.mo.gov or online https://dnr.mo.gov/proposed-rules/welcome.action#OPEN.

To be considered, comments must be received no later than November 12, 2019. The public hearing is scheduled at a meeting of the Clean Water Commission, to be held at 10 a.m. on October 9, 2019, at the Lewis and Clark State Office Building, LaCharrette/Nightingale Conference Rooms, 1101 Riverside Drive, Jefferson City, MO 65101.

Tab E2

Missouri Clean Water Commission Meeting
Department of Natural Resources
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri

January 9, 2020

Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan and Project Priority List Revisions

Issue: Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan and Project Priority List Revisions

Background: Financial Assistance Center staff is recommending that the project lists for the Fiscal Year (FY) 2020 Clean Water State Revolving Fund Intended Use Plan (IUP) and Project Priority List be amended as follows:

- The Boone County Regional Sewer District – Highfield Acres project, currently on the FY 2020 Planning List for $414,294, will be moved to the Fundable List since the district meets the readiness to proceed criteria.
- The requested amount of funds for the Miller project, currently on the FY 2020 Fundable List, will be decreased from $3,268,839 to $2,858,525, as other funding secured by the city has been deducted from the total eligible project costs. The loan amount will decrease from $1,634,420 to $1,429,263, and the additional subsidization amount will decrease from $1,634,419 to $1,429,262.
- The loan amount of $28,830,000 for the City of Rolla project, currently on the FY 2020 Fundable List, will be reduced to $27,750,000, the amount the city may borrow as authorized by its bonding capacity.
- The loan amount of $27,509,650 for the City of Perryville project, currently on the FY 2020 Fundable List, will be reduced to $26,000,000 the amount the city may borrow as authorized by its bonding capacity.
- The Department had listed the City of Lathrop project on the FY 2020 Fundable List for $5,745,200 for a treatment plant upgrade and collection system rehabilitation. This amount reflected the city's initial project cost estimate. Since its initial application, the city solicited bids for construction of the project, and bids returned were higher than anticipated, exceeding the city's bond capacity. The city has chosen to split the project into two separate projects, treatment plant and collection system. The city will proceed now with the collection system project (number C295821-01) with a loan in the amount of $3,045,000. Meanwhile, it will modify the wastewater treatment facility project (number C295821-02) with for a total project cost of $3,255,000 and a loan amount of $2,755,000 based on their bonding authority and the availability of other funds.
- Three projects on the Sources and Uses of Funds table listed in the Loan and Grant Commitments Section on page 9 have closed on their loans, and the funded dates have been added. They are the following:
    - The Drexel project was funded on September 23, 2019.

- The Carthage project was funded on September 27, 2019.
- The MSD Deer Creek Sanitary Relief project was funded on September 24, 2019.

Recommended Action: The Department recommends the Missouri Clean Water Commission approve changes to the Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan and Project Priority List as follows:

- Move the Boone County Regional Sewer District – Highfield Acres project in the amount of $414,294 to the FY 2020 Fundable List.
- Decrease the loan and requested amounts for the City of Miller project from $3,268,839 to $2,858,525. Decrease the loan amount from $1,634,420 to $1,429,263, and decrease the additional subsidization amount from $1,634,419 to $1,429,262.
- Decrease the loan amount for the City of Rolla project from $28,830,000 to $27,750,000.
- Decrease the loan amount for the City of Perryville project from $27,509,650 to $26,000,000.
- Decrease the loan and requested amounts for the City of Lathrop project, number C295821-01, from $5,745,200 to $3,045,000. Add another Lathrop project, number C295821-02, with a requested amount of $3,255,000 and loan amount of $2,755,000.
- Add the loan closing dates for the Cities of Drexel and Carthage projects, and MSD Sanitary Relief project to the Sources and Uses of Funds Loan and Grant Commitments table as described above.

Suggested Motion Language: I move to approve the proposed changes to the Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan and Priority List as proposed.

List of Attachments:

- Revised Fiscal Year 2020 Clean Water State Revolving Fund Intended Use Plan and Project Priority List.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Fiscal Year 2020

(Oct. 1, 2019 – Sept. 30, 2020)

Clean Water State Revolving Fund Intended Use Plan And Priority List

Adopted October 9, 2019

Proposed Amendment January 9, 2020

List of Fiscal Year 2020 Applicants

	APPLICANT	PRIORITY POINTS	SERVICE AREA POP.	Financial Assistance Request
	Boone County Commission (Bolli Road Coll System)	110	37	$ 319,900
	Boone County Commission (Phenora North Coll System)	90	102	$ 372,099
	Boone County RSD (Highfield Acres)	90	200	$ 414,294
	Deer Run Reorganized Common Sewer District	105	385	$ 1,808,100
	East Lynne	95	303	$ 1,315,310
	Gravois Arm Sewer District - Phase 5	130	300	$ 3,275,950
C	Greenfield	95	1,500	$ 1,454,350
	Huntsville	95	1,525	$ 4,626,125
	Jackson	125	14,869	$ 8,620,000
	Jasper	80	931	$ 750,000
	Jefferson County Public Sewer District	95	170	$ 3,751,075
C	Kansas City	135	631,000	$ 80,000,000
C	Labadie Creek Watershed Sewer District of Franklin County	110	963	$ 2,127,756
C	Lancaster	95	940	$ 2,227,325
	Lathrop **(Collection System)**	125	2,086	~~$ 5,745,200~~ **$ 3,045,000**
	Lathrop (Treatment Plant)	**125**	**2,086**	**$ 3,255,000**
	Lockwood	80	1,114	$ 2,139,310
	Meadville	110	512	$ 1,226,730
	Miller	90	725	~~$ 3,268,839~~ $ 2,858,525
	Missouri Agriculture & Small Business Development	N/A	N/A	$ 500,000
C	Moberly (Regional Lift Station)	70	13,974	$ 3,000,000
C	Moberly (Sewer Installation)	70	13,974	$ 1,629,666
C	MSD - Deer Creek Tunnel Pump Station	140	140,000	$ 22,000,000
	MSD - Lower Meramec River System Improvements	185	32,000	$ 218,000,000
	MSD Public I/I Reduction Program - Phase 5	155	1,300,000	$ 41,200,000
C	MSD Public I/I Reduction Program - Phase 6	175	1,300,000	$ 41,200,000
C	Northeast Public Sewer District Jefferson County	140	30,166	$ 5,000,000
	Peculiar	75	4,608	$ 8,691,880
C	Perryville	90	8,458	$ 27,509,650
	Rocky Mount Sewer District	115	450	$ 2,937,000
C	Rolla	85	20,000	$ 28,830,000
	Skidmore	110	276	$ 1,178,457
	Troy	120	10,500	$ 18,579,000
C	Urbana	80	417	$ 1,250,652
	Weston	125	1,641	$ 3,533,430
C	Windsor	100	3,087	$ 5,000,000
Total Projects				~~$ 553,482,098~~ **$ 553,626,584**

C = Carried over from the last Intended Use Plan

Clean Water State Revolving Fund
Estimated Sources and Uses of Funds
FFY 2020 Intended Use Plan

Estimated Sources as of December 31, 2018				
Anticipated Capitalization Grants for Clean Water State Revolving Fund	$	88,611,267		
Cash Balance *	$	303,760,136		
Anticipated Loan Repayments and Investment Earnings Net of Bond Payments (1/1/19 - 9/30/21)	$	298,316,227		
Total Estimated Sources			**$**	**690,687,630**
Estimated Uses				
Undisbursed Amounts Committed to Existing Projects	$	118,488,309		
Anticipated Program Administrative Expenses from Capitalization Grants	$	3,610,947		
A2010 Match Bond Debt Service Payments due through 9/30/21	$	2,211,537		
Anticipated Direct Loans Closing between 1/1/19 and 9/30/19	$	52,478,000		
Anticipated Grants Awarded between 1/1/19 and 9/30/19	$	3,106,000		
Anticipated Additional Subsidization Available for FFY 2020 CWSRF IUP Projects	$	18,649,526		
Anticipated Loan Funds Available for FFY 2020 CWSRF IUP Projects	$	492,143,311		
Total Estimated Uses			**$**	**690,687,630**

* On October 18, 2018, the Environmental Improvement and Energy Resources Authority issued bond series 2018A in tax exempt revenue bonds, of which $21,590,000 was for the Clean Water program. The bond proceeds will be disbursed as state match to Clean Water capitalization grants. The proceeds will support approximately three years of state match requirements to the FFY2018, 2019 and 2020 capitalization grants. The bond proceeds were deposited into the Water & Wastewater Loan Revolving Fund for disbursement.

Loan and Grant Commitments 1/1/19 through 9/30/19		**Loan**		**Grant**		**Total**
Belle - Funded 1/17/19	$	284,000	$	284,000	$	568,000
MPUA - Funded 1/18/19	$	-	$	300,000	$	300,000
Moscow Mills - Funded 5/16/19	$	860,000	$	860,000	$	1,720,000
Drexel - Funded 9/23/19	$	1,662,000	$	1,662,000	$	3,324,000
Carthage - Funded 9/27/19	$	4,501,000	$	-	$	4,501,000
BCRSD Oberlin Valley/Lee Heights - Funded 5/30/19	$	1,219,000	$	-	$	1,219,000
Poplar Bluff - Funded 7/25/19	$	20,000,000	$	-	$	20,000,000
MSD Deer Creek Sanitary Relief - Funded 9/24/19	$	23,952,000			$	23,952,000
Total Commitments 1/1/19 through 9/30/19	**$**	**52,478,000**	**$**	**3,106,000**	**$**	**55,584,000**

Allocation of Available Loan Funds

It is important to note:

- **The fundable project lists may change significantly between the draft Intended Use Plan placed on public notice and the final version approved by the Clean Water Commission.**
- **The inclusion of a project on the fundable list is not a guarantee of funding. Other factors, such as timely progress, compliance with program requirements and funding availability, may impact project funding.**
- **Projects carried over from the 2019 Intended Use Plan retain the points they received under the criteria in effect at the time they initially applied. Carry-over projects in the fiscal year 2020 Intended Use Plan are not eligible to compete in the fiscal year 2021 Intended Use Plan unless reapplication was made by January 15, 2020.**

Allocation of Available Funds (Loan and Additional Subsidization)

Funding Category	Percent of Fundable List Allocation	Loan	Additional Subsidization	Total
Small and Non-Metropolitan Areas and Districts (1)	40%	$ 185,667,609	$ 18,649,526	$ 204,317,135
Large Metropolitan Areas and Districts (2)	30%	$ 153,237,850	$ -	$ 153,237,850
Combined Sewer Overflow (CSO)	15%	$ 76,618,926	$ -	$ 76,618,926
Department Initiatives	15%	$ 76,618,926	$ -	$ 76,618,926
Total Allocation of Available Funds		$ 492,143,311	$ 18,649,526	$ 510,792,837

(1) Service area population of less than 75,000.
(2) Service area population of 75,000 or more.

Financial Summary of the Fundable Projects

	Loans				
	Small and Non-Metropolitan Areas and Districts	Large Metropolitan Areas & Districts	Combined Sewer Overflow	Department Initiatives	Total
Allocation of Available Loan Funds	$ 185,667,609	$ 153,237,850	$ 76,618,926	$ 76,618,926	$ 492,143,311
Total Loans on Fundable List (1)	$ 100,663,717	$ 390,979,594	$ -	$ 500,000	$ 492,143,311
Transfers	$ (85,003,892)	$ 85,003,892			$ -
		$ 76,618,926	$ (76,618,926)		$ -
		$ 76,118,926		$ (76,118,926)	$ -
Funding Assistance Planned (2)	$ 100,663,717	$ 390,979,594	$ -	$ 500,000	$ 492,143,311
Balance Available after Projects Funded (3)	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*

	Additional Subsidization				
	Small and Non-Metropolitan Areas and Districts	Large Metropolitan Areas & Districts	Combined Sewer Overflow	Department Initiatives	Total
Allocation of Available Additional Subsidization Funds	$ 18,649,526	$ -	$ -	$ -	$ 18,649,526
Total Additional Subsidization on Fundable List (1)	$ 9,767,236	$ -	$ -	$ -	$ 9,767,236
Transfers	$ -	$ -	$ -	$ -	$ -
Funding Assistance Planned (2)	$ 18,649,526	$ -	$ -	$ -	$ 18,649,526
Balance Available after Additional Subsidization Funded (3)	*$ 8,882,290*	*$ -*	*$ -*	*$ -*	*$ 8,882,290*

(1) From the Project Lists on the subsequent pages.
(2) Funding Assistance Planned = Allocation + Transfers.
(3) Balances may be shifted to other categories to fund projects that are ready to proceed.

CWSRF Fiscal Year 2020 Project Priority Lists

Carryover	Priority Points	Applicant	Project #	Description/ Needs Category	Service Area Population	IUP Amount Requested	Loan Amount	Additional Subsidization Amount	NPDES #	Est. Financing Schedule FY - Quarter
Note: An explanation of the abbreviations and codes appears at the end of the project lists.										
FUNDABLE LIST (Debt instrument secured and facility plan submitted; fundable if funds become available)										
TOTAL AVAILABLE FUNDS							**$ 492,143,311**	**$ 18,649,526**		
Small and Non-Metropolitan Areas and Districts (Service area population of fewer than 75,000 people)							~~**$ 102,989,430**~~ **$ 100,663,717**	**$ 18,649,526**		
C	140	Northeast Public Sewer District Jefferson County	C295684-05	TP Impr; I	30,166	$ 5,000,000	$ 5,000,000	$ -	MO-0128490	20-2
C	110	Labadie Creek Watershed Sewer District of Franklin County	C295727-01	TP, Coll, Exp; II, IVA	963	$ 2,127,756	$ 2,127,756	$ -	Multiple	20-4
C	100	Windsor	C295512-01	TP Impr, I/I; I, IIIA, IIIB	3,087	$ 5,000,000	$ 3,000,000	$ 2,000,000	MO-0047325 MO-0047317	20-4
C	95	Greenfield	C295831-01	Coll Impr, FM; I	1,500	$ 1,454,350	$ 727,175	$ 727,175	MO-0055603 MO-0055590	20-3
C	90	**Perryville***	C295832-01	TP, Impr, PS; I	8,458	$ 27,509,650	~~**$ 27,509,650**~~ **$ 26,000,000**	**$ -**	MO-0051144	20-2
C	85	**Rolla***	C295836-01	TP, Exp; II	20,000	$ 28,830,000	~~**$ 28,830,000**~~ **$ 27,750,000**	**$ -**	MO-0047031 MO-0050652	~~**20-1**~~ **20-2**
C	80	Urbana	C295834-01	TP Impr, Coll, I/I; II, IIIA	417	$ 1,250,652	$ 625,326	$ 625,326	MO-0095176	20-4
	130	Gravois Arm Sewer District - Phase 5**	C295826-01	Coll Impr; IVA	300	$ 3,275,950	$ 1,495,475	$ 1,495,475	MO-0134821	20-3
	125	Lathrop **(Collection System)**	C295821-01	I/I, Rehab; IIIA, IIIB	2,086	~~**$ 5,745,200**~~ **$ 3,045,000**	~~**$ 5,745,200**~~ **$ 3,045,000**	**$ -**	MO-0112704	20-1
	125	**Lathrop (Treatment Plant)**	**C295821-02**	**TP Impr; II**	**2,086**	**$ 3,255,000**	**$ 2,755,000**	**$ -**	**MO-0112704**	**20-2**
	125	Weston	C295814-01	TP Impr, PS, Coll; I, II, IIIB	1,641	$ 3,533,430	$ 3,533,430	$ -	MO-0031585	~~**20-1**~~ **20-2**

Carryover	Priority Points	Applicant	Project #	Description/ Needs Category	Service Area Population	IUP Amount Requested	Loan Amount	Additional Subsidization Amount	NPDES #	Est. Financing Schedule FY - Quarter
	120	Troy	C295822-01	FM, PS, Impr; I	10,500	$ 18,579,000	$ 18,579,000	$ -	MO-0054623 MO-0131296	~~20-1~~ **20-2**
	115	Rocky Mount Sewer District**	C295838-01	Det, Coll; IVA	450	$ 2,937,000	$ 1,254,750	$ 1,254,750	MO-1336719	20-4
	110	Boone County Commission (Bolli Road Coll System)	C295375-25	IVA	37	$ 319,900	$ 319,900	$ -	N/A	20-3
	110	Meadville	C295801-01	TP Impr; I	512	$ 1,226,730	$ 613,365	$ 613,365	MO-0041114	20-3
	110	Skidmore	C295540-02	TP Impr, Rhab; II, IIIA	276	$ 1,178,457	$ 589,229	$ 589,228	MO-0022969	20-4
	95	East Lynne	C295695-01	TP Impr; I	303	$ 1,315,310	$ 657,655	$ 657,655	MO-0099961	~~20-3~~ **21-1**
	90	Boone County Commission (Phenora North Coll System)	C295375-24	Coll; IVA	102	$ 372,099	$ 372,099	$ -	MO-0137294	20-3
	90	**Boone County RSD (Highfield Acres)**	**C295375-29**	**Coll; IVA**	**200**	**$ 414,294**	**$ 414,294**	**$ -**	**MO-0053376**	**21-1**
	90	Miller	C295726-02	TP Impr, Coll; IIIA, II	725	~~$ 3,268,839~~ **$ 2,858,525**	~~$ 1,634,420~~ **$ 1,429,263**	~~$ 1,634,419~~ **$ 1,429,262**	MO-0041149	20-3
	80	Jasper	C295843-01	Impr; II	931	$ 750,000	$ 375,000	$ 375,000	MO-0044202	20-4
Small and Non-Metropolitan Areas and Districts Total						~~$ 113,674,323~~ **$ 114,233,103**	~~$ 102,989,430~~ **$ 100,663,717**	~~$ 9,972,393~~ **$ 9,767,236**		
Balance							**$ -**	**$ 8,882,290**		
Large Metropolitan Areas and Districts (Service area population of 75,000 or more people)							~~$ 388,653,881~~ **$ 390,979,594**	**$ -**		
C	175	MSD Public I/I Reduction Program - Phase 6	C295023-41	I/I; IIIA	1,300,000	$ 41,200,000	$ 41,200,000	$ -	Multiple	20-3
	155	MSD Public I/I Reduction Program - Phase 5	C295023-40	I/I; IIIA	1,300,000	$ 41,200,000	$ 41,200,000	$ -	Multiple	~~20-1~~ **20-2**

Carryover	Priority Points	Applicant	Project #	Description/ Needs Category	Service Area Population	IUP Amount Requested	Loan Amount	Additional Subsidization Amount	NPDES #	Est. Financing Schedule FY - Quarter
C	140	MSD Deer Creek Tunnel Pump Station	C295833-02	Coll; IVB	140,000	$ 22,000,000	$ 22,000,000	$ -	MO-0025151	20-3
C	135	Kansas City	C295840-01	TP; I	631,000	$ 80,000,000	$ 80,000,000	$ -	MO-0024911	~~20-3~~ **20-4**
	185	MSD Lower Meramec River System Improvements (Tunnel) - Balance of Amount Requested appears on Fundable Contingency List	C295072-01	Coll; IVA, V	32,000	$ 218,000,000	~~$ 204,253,881~~ **$ 206,579,594**	$ -	Multiple	20-4
					Large Metropolitan Areas and Districts Total	**$ 402,400,000**	~~$ 388,653,881~~ **$ 390,979,594**	**$ -**		
					Balance		**$ -**	**$ -**		
Combined Sewer Overflow							**$ 0**	**$ -**		
					Combined Sewer Overflow Total	**$ -**	**$ -**	**$ -**		
					Balance		**$ 0**	**$ -**		
Department Initiatives							**$ 500,000**	**$ -**		
	N/A	Missouri Agriculture & Small Business Development	C295212-10	NPS; VIIB	N/A	$ 500,000	$ 500,000	$ -	N/A	~~20-2~~ **20-4**
					Department Initiatives Total	**$ 500,000**	**$ 500,000**	**$ -**		
					Balance		**$ 0**	**$ -**		
					Total Fundable List Projects	~~$ 516,574,323~~ **$ 517,133,103**	**$ 492,143,311**	~~$ 9,972,393~~ **$ 9,767,236**		
					Balance of Fundable List		**$ -**	~~$ 8,677,133~~ **$ 8,882,290**		

Carryover	Priority Points	Applicant	Project #	Description/ Needs Category	Service Area Population	IUP Amount Requested	Loan Amount	Additional Subsidization Amount	NPDES #	Est. Financing Schedule FY - Quarter
FUNDABLE CONTINGENCY LIST (Debt instrument secured and facility plan submitted; fundable if funds become available)										
	185	MSD Lower Meramec River System Improvements (Tunnel)	C295072-01	Coll; IVA, V	32,000	Balance of Amount Requested from the Large Metropolitan Areas and Districts Fundable List	~~$ 13,746,119~~ **$ 11,420,406**	$ -		
						Total Fundable Contingency Projects	~~$ 13,746,119~~ **$ 11,420,406**	**$ -**		
CONTINGENCY LIST (Either debt instrument or facility plan has not been submitted)										
	95	Jefferson County Public Sewer District	C295844-01	Coll; IVA	170	$ 3,751,075	$ -	$ -	MO-0131024	~~20-1~~ **20-4**
						Total Contingency Projects	**$ 3,751,075**	**$ -**	**$ -**	
PLANNING LIST (Debt instrument and facility plan not yet secured/submitted) *Note: Information will be added to the shaded columns when the project moves to the fundable or contingency list.*										
	125	Jackson	C295839-01	TP Impr; IIIA, IIIB	14,869	$ 8,620,000			MO-0022853	
	105	Deer Run Reorganized Common Sewer District	C295815-01	TP, Coll; IIIA, I, IVA	385	$ 1,808,100			N/A	
	95	Huntsville	C295848-01	TP, Coll; IVA, IVB, IIIA	1,525	$ 4,626,125			Multiple	
C	95	Lancaster	C295804-01	Coll Rehab, TP; II, IIIA	940	$ 2,227,325			MO-0039691	
	~~90~~	~~Boone County RSD (Highfield Acres)~~	~~C295375-29~~	~~Coll; IVA~~	~~200~~	~~$ 414,294~~			~~MO-0053376~~	
	80	Lockwood	C295842-01	TP Impr, Coll, I/I; IIIA, IIIB	1,114	$ 2,139,310			MO-0030473	
	75	Peculiar	C295824-01	Coll, Impr, I, I/I; IIIA, IIIB	4,608	$ 8,691,880			MO-0089443	
C	70	Moberly (Sewer Installation)	C295648-02	Coll; IVA, IVB	13,974	$ 1,629,666			MO-0117960	

Carryover	Priority Points	Applicant	Project #	Description/ Needs Category	Service Area Population	IUP Amount Requested	Loan Amount	Additional Subsidization Amount	NPDES #	Est. Financing Schedule FY - Quarter
C	70	Moberly (Regional Lift Station)	C295648-03	Coll; IVA, IVB	13,974	$ 3,000,000			MO-0117960	
					Total Planning List Projects	~~**$ 33,156,700**~~				
						$ 32,742,406	**$ -**	**$ -**		

Description Reference List		Needs Category	
C	Carried over from the last Intended Use Plan	I	Secondary Treatment
Coll	Collection	II	Advanced Treatment
CSO	Combined Sewer Overflow	IIIA	I/I correction
Det	Detention	IIIB	Sewer replacement or rehabilitation
Exp	Expansion	IVA	New Collection
FM	Force Main	IVB	New Interceptors
Impr	Improvements	V	CSO
Int	Interceptor	VIIB	NPS: Animal
I/I	Inflow/Infiltration	VIID	NPS: Urban
NPDES	National Pollution Discharge Elimination System		
NPS	Non Point Source		
PS	Pump Station		
Rehab	Rehabilitation		
TP	Treatment Plant		

* Applicant has a max bonding capacity that the loan amount cannot exceed.

** Ineligible project costs deducted off total project costs.

Notes:

Final eligible costs will be determined as documents are submitted and the project progresses toward loan closing.

Financing schedule shown is for planning purposes only. Final scheduling will be determined as documents are submitted and approvals obtained.

Carry over projects from the fiscal year 2020 list must reapply to be considered for the fiscal year 2021 list.

Tab E3

Missouri Clean Water Commission Meeting
Department of Natural Resources
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri

January 9, 2020

Small Borrower Loan for the City of Ellsinore

Issue: The City of Ellsinore has requested a Small Borrower Loan in the amount of $100,000 to fund the costs of needed upgrades to the city's existing wastewater treatment facility.

Background: The City of Ellsinore, population 450, is located in Carter County. The community's sewer system consists of an influent lift station and oxidation ditch that discharge to a tributary of Cane Creek. The city applied for a Small Borrower Loan of $100,000 to construct and install a disinfection system. This system will enable the city to comply with the *E. coli* limits that will be effective November 1, 2020. The total project cost is estimated to be $124,500. The city will use their own funds for the remaining $24,500 and any cost overruns.

Small Borrower Loan funds come from the Rural Water and Sewer Revolving Loan Fund, which consists of repayments of loans originated with state Water Pollution Control bonds. There are adequate funds available for this loan. Small Borrower Loans are available to municipalities and sewer districts serving a population less than 1,000. Loan terms include a subsidized interest rate that is 30% of the municipal market rate at the time of loan closing. The loan term is typically 20 years or the project's design life.

The Department administers Small Borrower Loans on behalf of the Clean Water Commission, per 10 CSR 20-4.041. If the Clean Water Commission approves allocation of funds for this project, Financial Assistance Center staff will evaluate the city's proposed user rates to ensure the city has sufficient revenue to pay back the small borrower loan prior to the entering into the loan.

Recommended Action: The Department recommends the Missouri Clean Water Commission approve the allocation of funding in the amount of $100,000 for a Small Borrower Loan to the City of Ellsinore.

Suggested Motion Language: I move to approve the allocation of funding in the amount of $100,000 for a Small Borrower Loan for the City of Ellsinore.

Attachment: Copy of the City of Ellsinore's Small Borrower Loan application.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, FINANCIAL ASSISTANCE CENTER

SMALL BORROWER LOAN APPLICATION

Submit to: P.O. Box 176, Jefferson City, MO 65102-0176
Attn: Financial Assistance Center

This application is for a Small Borrower Loan

FOR OFFICE USE ONLY
DATE RECEIVED
LOAN NUMBER
PWS ID NUMBER

APPLICANT INFORMATION

APPLICANT NAME CITY OF ELLSINORE			
MAILING ADDRESS 11 W. CLEVELAND AVE			
CITY ELLSINORE	STATE MO	ZIP CODE + FOUR 63937	COUNTY CARTER
TELEPHONE NUMBER WITH AREA CODE 573-322-5333 Ext.		FAX NUMBER WITH AREA CODE 573-322-8376	
AUTHORIZED REPRESENTATIVE NAME DELAINA HATHAWAY		AUTHORIZED REPRESENTATIVE TITLE CITY CLERK	
NAME OF PERSON TO CONTACT ABOUT THIS APPLICATION DELAINA HATHAWAY		TELEPHONE NUMBER WITH AREA CODE 573-322-5333 Ext.	
CONSULTING ENGINEER JOHN S. SELIG, P.E.			
CONSULTANT MAILING ADDRESS 1901 N. WESTWOOD BLVD., SUITE 4			
CITY POPLAR BLUFF		STATE MO	ZIP CODE + FOUR 63901
CONSULTANT TELEPHONE NUMBER WITH AREA CODE 573-686-2488 Ext. 101		CONSULTANT FAX NUMBER WITH AREA CODE 573-686-2131	
POPULATION (CURRENT CENSUS) 450	POPULATION OF AREA TO BE SERVED 450	FEDERAL TAX ID NUMBER 43-1016025	
STATE SENATE DISTRICT NUMBER(S) FOR PROJECT		STATE REPRESENTATIVE DISTRICT NUMBER(S) FOR PROJECT	
OTHER FUNDS ANTICIPATED FOR THIS PROJECT NONE			

Is this a water project or a sewer project? INSTALLATION OF UV LIGHTING FOR THE WASTEWATER SEWER PLANT

ESTIMATED PROJECT COST INFORMATION		APPLICANT FINANCIAL INFORMATION
Cost Estimate Dated:		**Bond Information/Debt Instrument**
Development and Administration	$ 11,200	Date of Ballot Approval
Engineering (Construction Phase)	$ 8,400	Anticipated Date for Bond Election
Engineering Inspection	$	☐ General Obligation Bonds $
Construction	$ 34,900	☐ Revenue Bonds $
Equipment	$ 70,000	■ No Bonds Available
Other Costs specify:	$	
Contingencies	$	
Total Project Costs	$ 124,500	
Loan amount requested (Loan is limited to $100,000)	$ 100,000	

ANTICIPATED FUNDING

Total Costs	Applicant Contribution	Small Borrower Loan	Other Grants	Other Loan	Bonds
$ 124,500	$ 24,500	$ 100,000	$ N/A	$ N/A	$ N/A
Percentage of Total Costs	19 %	81 %	%	%	%

MO 780-2035 (2/09)

BONDED INDEBTEDNESS OF APPLICANT

Outstanding Balance of Bonds	Interest Rate	Purpose of Bond	Amortization Period	Payment Due Date	Installment Amount
$	%				$
$	%				$
$	%				$
$	%				$

General Obligation Bonding Capacity $ N/A

FINANCIAL REPORT OF APPLICANT

Does applicant have an adequate accounting system? ☑ Yes ☐ No

TAX REVENUES OF APPLICANT

TYPE OF PROPERTY	AGRICULTURAL	COMMERCIAL	INDUSTRIAL	RESIDENTIAL
Total Assessed Value	$	$ 3,478,177	$	$
Anticipated Annual Income	$	$ 349,869	$	$

How will the applicant repay the loan?
INCOME RECEIVED FROM THE CITY OF ELLSINORE

Median Household Income of project service area (as determined by latest census) $ 32,444

Projected Monthly User Charge for 5,000 gallons wastewater at completion of this project is $ 32.75
Current Monthly User Charge for 5,000 gallons wastewater is $ 22.75

Projected Monthly User Charge for 5,000 gallons drinking water at completion of this project is $ 17.75
Current Monthly User Charge for 5,000 gallons drinking water is $ 17.75

PROJECT DESCRIPTION

(ATTACH ENGINEERING REPORT, IF AVAILABLE)

PLEASE SEE ATTACHED ESTIMATE FROM JOHN SELIG, P.E.

CERTIFICATION

The undersigned representative certifies that the information submitted in this application is true and correct to the best of his/her knowledge and that he/she is authorized to sign and submit this application. The applicant agrees, if a loan is awarded on the basis of this application, to comply with all applicable rules and regulations of the Department of Natural Resources and the terms and conditions of the loan agreement. **Incomplete applications will be returned.**

SIGNATURE OF AUTHORIZED REPRESENTATIVE	DATE
Delaina Hathaway	10/09/2019
NAME AND OFFICIAL TITLE (TYPE OR PRINT)	TELEPHONE NUMBER WITH AREA CODE
CITY CLERK	573-322-5333 Ext.

PREPARER'S NAME AND SIGNATURE (IF APPLICABLE)

SIGNATURE OF PREPARER	DATE
NAME AND TITLE (PRINT OR TYPE)	TELEPHONE NUMBER WITH AREA CODE
	Ext.

MO 780-2035 (2/09)

John Selig
Civil Engineering Associates

ESTIMATED QUANTITIES AND COSTS
WASTEWATER TREATMENT FACILITY IMPROVEMENTS - UV DISINFECTION
CITY OF ELLSINORE, MISSOURI
AUGUST 2019

Item	Description	Units	Unit Cost	Subtotal
1	Concrete for New UV Equipment	1 L.S.	$8,000.00	$8,000.00
2	New UV Disinfection Equipment	1 L.S.	$70,000.00	$70,000.00
3	Yard Piping	1 L.S.	$5,000.00	$5,000.00
4	Roof Structure over UV Equipment	1 L.S.	$2,500.00	$2,500.00
5	Electrical	1 L.S.	$2,500.00	$2,500.00
6	New Weir Box	1 L.S.	$5,000.00	$5,000.00
TOTAL ESTIMATED CONSTRUCTION COST				**$93,000.00**
CONSTRUCTION CONTINGENCIES				**$9,300.00**
LEGAL FEE				**$2,600.00**
BASIC ENGINEERING FEE				**$11,200.00**
CONSTRUCTION INSPECTION FEE				**$8,400.00**
TOTAL PROJECT COST				***$124,500.00***

NOTES: THIS QUANTITIES ESTIMATE IS BASED ON A PRELIMINARY, NOT FINAL, DESIGN OF THE PROJECT. THE FINAL QUANTITIES MAY VARY BASED ON MORE DETAILED INFORMATION DEVELOPED DURING THE FINAL DESIGN PHASE.

THIS PRELIMINARY COST ESTIMATE IS BASED ON RECENT BIDS RECEIVED ON SIMILAR PROJECTS. ACTUAL COSTS MAY VARY DEPENDING ON CONTRACTOR'S METHODS, SOURCES OF PROJECT FUNDING, MODIFICATIONS TO THE PROJECT BY REVIEW AGENCIES OR CLIENT AFTER DATE OF ESTIMATE, MARKET CONDITIONS, TIME OF YEAR OF THE BID LETTING, AND AGE OF THE ESTIMATE

Tab F

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

New Business

Issue:

Any new business can be presented to the Commission.

Recommended Action:

None

List of Attachments:

None

Tab G

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Appeals and Variances

Issue:

This portion of the meeting allows for information to be presented to the Commission. The Commission can review and vote on specific actions as necessary.

Recommended Action:

Information only.

Missouri Clean Water Commission Meeting
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
Jefferson City, MO 65101
January 9, 2020

City of Joplin Variance Request CWC-V-1-20
Joplin Turkey Creek Wastewater Treatment Plant

Issue: The City of Joplin submitted a variance application on June 3, 2019 requesting a water quality standards (WQS) variance from the total recoverable zinc numeric water quality criteria for the Turkey Creek Wastewater Treatment Plant (TCWWTP) Missouri State Operating Permit #MO-0103349. The Department seeks the Clean Water Commission's decision to grant or deny this variance.

Background: A WQS variance is a tool that may be used to improve water quality over time. Variances establish time-limited criteria that provide dischargers the time and flexibility to make incremental water quality improvements reflecting the best that can be achieved in that given time period. There are seven factors that can be used when considering a WQS variance. The City of Joplin is requesting a variance based on the following factor: Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.

The City of Joplin is seeking a WQS variance from the total recoverable zinc criteria for the protection of aquatic life use. TCWWTP's permit includes water quality-based effluent limits for zinc that have been difficult for the facility to consistently meet due to the ubiquitous presence of zinc throughout the Joplin area from past mining practices. In addition to direct contamination of soil, groundwater, and surface water by mine wastes, the City of Joplin historically used mine tailings, or "chat", as bedding and backfill for sewer lines. The widespread contamination caused by historic mining activities and associated mine waste disposal within the Tri-State Mining District, and specifically within the Turkey Creek watershed and City of Joplin, is used as justification in the discharger-specific variance.

The City of Joplin has requested a ten-year term for this variance. During this term, permit limits that would typically be based on the zinc water quality criteria would be replaced with limits based on the highest attainable condition of the facility. The City of Joplin will also develop and implement a Zinc Minimization Plan, which is a structured set of activities to improve processes and pollution controls that will prevent and reduce zinc pollutant loadings. This will ensure that implementation of the variance will not result in the lowering of existing water quality. The Department presented the variance and supporting information to the Commission at its July 22, 2019 meeting, along with a recommendation for approval at a future meeting following public notice.

The variance documents and supporting information were placed on 30 day public notice August 12, 2019. The variance documents, any comments received during the public notice, and responses to those comments are attached.

The Department is recommending the Commission approve the variance. Once a WQS variance is approved, it must be incorporated into state regulation, which will include a second public notice period and CWC approval as a part of the rulemaking package.

Recommended Action: The Department recommends the Commission grant the Joplin Water Quality Standards Variance for Zinc as proposed.

Suggested Motion Language: The Department suggests the Commission motion to grant the City of Joplin Variance CWC-V-1-20 as proposed.

List of Attachments: Final City of Joplin Variance CWC-V-1-20, comment letters, and response letter.

Missouri Department of Natural Resources
City of Joplin Variance CWC-V-1-20
Joplin, Turkey Creek Wastewater Treatment Plant

The Missouri Department of Natural Resources and the Missouri Clean Water Commission hereby adopts a Water Quality Standards (WQS) variance for Missouri State Operating Permit #MO-0103349 from the numeric water quality criteria for total recoverable zinc for the protection of aquatic life use.

Joplin Turkey Creek Wastewater Treatment Plant (TCWWTP)

Permit Number: MO-0103349
County: Jasper

Treatment Type: Combined fixed growth and activated sludge
Treatment Components: Influent screening, grit removal, primary clarification, trickling filter biotowers, intermediate clarification, oxidation ditch aeration basins, final clarification, tertiary membrane filtration, ultraviolet disinfection, and step aeration
Design Flow: 15 million gallons per day

Turkey Creek

12-digit Hydrologic Unit Code (HUC) and Name: 11070207-0901, Turkey Creek
Water Body Identification (WBID) Number and Hydrologic Class: WBID 3216, Class P
Designated Uses: Protection of aquatic life – warm water habitat, human health protection, irrigation, livestock and wildlife protection, whole body contact recreation, and secondary contact recreation

Impairments: The 2016 Section 303(d) List of impaired waters lists cadmium, lead, and zinc impairments due to contamination from past mining activities associated with the Tri-State Mining District. A Total Maximum Daily Load (TMDL) was developed and approved in 2006 for zinc impairments in Center and Turkey Creek due to the Tri-State Abandoned Mine Lands. The TMDL can be found here: https://dnr.mo.gov/env/wpp/tmdl/docs/3203-center-3216-3217-turkey-cks-tmdl.pdf. The TMDL established wasteload allocations that were calculated using the current water quality criteria for total recoverable zinc for the protection of aquatic life designated use.

Factor Precluding Attainment

Factor: [40 CFR Section 131.10(g)(3)] Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place. The widespread contamination caused by historic mining activities and associated mine waste disposal within the Tri-State Mining District, and specifically within the Turkey Creek watershed and the City of Joplin, justifies this discharger-specific variance based on this factor. See Appendix C – Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc: City of Joplin, Missouri, Turkey Creek Wastewater Treatment Plant (WWTP) for supporting information.

Variance Requirements

This variance is the applicable WQS in effect for the purposes of developing Clean Water Act Section 301 National Pollutant Discharge Elimination System (NPDES) permit limits. This is a variance from the total recoverable zinc water quality criteria found in 10 CSR 20-7.031, which was used to calculate wasteload allocations for the Turkey Creek TMDL. The underlying designated use and associated criterion remain applicable for all other Clean Water Act purposes, and all other uses and associated criteria not specified in this variance remain applicable for all Clean Water Act purposes.

Currently Attained Water Quality: Implementation of this WQS variance will not result in the lowering of existing water quality. The TCWWTP is required to implement interim effluent conditions reflecting the greatest pollutant reduction achievable pursuant to 40 CFR Section 131.14, as well as a zinc minimization plan.

Greatest Pollution Reduction Achievable (GPRA): Because feasible zinc pollution reduction controls have been identified (inflow and infiltration correction), this WQS variance must reflect the interim effluent condition that reflects the greatest pollutant reduction achievable during the term specified in the variance. This effluent condition reflecting the greatest pollutant reduction with optimization of installed treatment was used to calculate the following GPRAs for total recoverable zinc:

Daily Maximum Effluent Concentration: 396 µg/L
Monthly Average Effluent Concentration: 228 µg/L

Zinc GPRAs were calculated using the TCWWTP's past five years of reported data for total recoverable zinc from effluent samples. The 95th and 99th percentiles were calculated for the monthly average and daily maximum respectively. Both of these values are below current instream concentrations in Turkey Creek, which are elevated due to historic mining practices.

Zinc Minimization Plan (ZMP): TCWWTP's ZMP is a structured set of activities to improve processes and zinc pollution controls that will prevent and reduce zinc pollution loadings. The Missouri State Operating Permit #MO-0103349 will contain a requirement for the implementation of the ZMP with annual reporting to the Department.

The City of Joplin has included the following activities in their ZMP (See Appendix B – Zinc Minimization Plan):

- Sampling within the collection system to identify potential sources
- Continued regulation of industrial contributions through the industrial pretreatment program
- Implementation of the inflow and infiltration reduction activities described in Section 4.4 of Appendix C – Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc: City of Joplin, Missouri, Turkey Creek WWTP
- Continuation of existing requirements for removal of metals in contaminated soils as a part of the City of Joplin's construction contracting process

Additional zinc reduction activities will be considered and included in the ZMP as appropriate.

Variance Conditions

Public Participation: Initial public participation prior to the request for approval by the Missouri Clean Water Commission and U.S. Environmental Protection Agency will occur per 10 CSR 20-7.031(12). Also, this variance will be incorporated into 10 CSR 20-7.031 Table J and will be subject to additional public review during the next WQS triennial review, as well as subsequent triennial reviews conducted by the Department until this variance expires. Finally, Missouri State Operating Permit #MO-0103349, which will reflect the conditions and requirements of the variance, will be public noticed per 10 CSR 20-6.020.

Term of Variance: The City of Joplin has requested the term of this variance be ten years, which is consistent with two terms of Missouri State Operating Permit #MO-0103349 for the TCWWTP. This will allow five years with a five-period following reevaluation for the highest attainable condition to be achieved.

Reevaluation: The term of this variance exceeds five years; therefore, a reevaluation after five years is required per 40 CFR Section 131.14(b)(1)(v). The Department will reevaluate the GPRAs and the need for the variance following five years of implementation of the TCWWTP's ZMP. Any adjustments will be incorporated into Missouri State Operating Permit #MO-0103349, which will follow the public participation process pursuant to 10 CSR 30-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.

If the Department does not complete a reevaluation of the variance no less than five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.

Other Considerations:
NPDES Permit Limits and Considerations. This variance will be used solely to establish effluent limits for total recoverable zinc and ZMP requirements in Missouri State Operating Permit #MO-0103349. This variance will not be used for any other Clean Water Act purposes.

Protections for endangered or threatened species and their critical habitat. It is not anticipated that the granting of this variance will jeopardize threatened or endangered species or result in the destruction or adverse modification of such species' critical habitat. The Missouri Department of Conservation's Natural Heritage Review queries records for species and natural communities of conservation concern. The Heritage Review returned no records of federal-listed species or critical habitats in the public land survey section or adjacent sections of the TCWWTP's outfall. The Heritage Review returned no records of state-listed endangered species near the TCWWTP's outfall; however, records identify Bluntface Shiner (*Cyprinella camura*, state ranked S2S3; imperiled, vulnerable) and Western Slim Minnow (Pimephales tenellus, state ranked S3; vulnerable) near the outfall. Also, Dry-mesic chert forest (state ranked S4; uncommon but not rare) occurs near the TCWWTP. There are no regulatory requirements associated with these statuses and it is not anticipated that this variance would cause an impact or modify such species' habitat.

Appendices

Appendix A – Crosswalk Table between City of Joplin Variance CWC-V-1-20 and 40 CFR Section 131.14 (Page 5)

Appendix B – Zinc Minimization Plan (Page 11)

Appendix C – Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc: City of Joplin, Turkey Creek WWTP (Page 14)

Appendix A – Crosswalk Table between City of Joplin Variance CWC-V-1-20 and 40 CFR Section 131.14

40 CFR 131.14	City of Joplin Variance CWC-V-1-20
131.14 Water quality standards variances. States may adopt WQS variances, as defined in § 131.3(o). Such a WQS variance is subject to the provisions of this section and public participation requirements at § 131.20(b). A WQS variance is a water quality standard subject to EPA review and approval or disapproval.	10 CSR 20-7.031 (12) Water Quality Standards Variances. A permittee or an applicant for a National Pollutant Discharge Elimination System (NPDES) or Missouri state operating permit may pursue a temporary variance pursuant to either section 644.061 or section 644.062, RSMo. A variance from water quality standards shall comply with 40 CFR 131.14.
(a) Applicability	
(1) A WQS variance may be adopted for a permittee(s) or water body/waterbody segment(s), but only applies to the permittee(s) or water body/waterbody segment(s) specified in the WQS variance.	This variance only applies to the Turkey Creek Wastewater Treatment Plant Missouri State Operating Permit #MO-0103349.
(2) Where a State adopts a WQS variance, the State must retain, in its standards, the underlying designated use and criterion addressed by the WQS variance, unless the State adopts and EPA approves a revision to the underlying designated use and criterion consistent with §§ 131.10 and 131.11. All other applicable standards not specifically addressed by the WQS variance remain applicable.	This variance request only varies the underlying WQS used for the development of Turkey Creek TMDL wasteload allocations for total recoverable zinc. All other WQS in 10 CSR 20-7.031 remain in-tact. The underlying aquatic life designated use and associated criterion will remain applicable for all other CWA purposes, and all other uses and associated criteria not specified in this WQS remain applicable for all CWA purposes.
(3) A WQS variance, once adopted by the State and approved by EPA, shall be the applicable standard for purposes of the Act under § 131.21(d) through (e), for the following limited purposes. An approved WQS variance applies for the purposes of developing NPDES permit limits and requirements under 301(b)(1)(C), where appropriate, consistent with paragraph (a)(1) of this section. States and other certifying entities may also use an approved WQS variance when issuing certifications under section 401 of the Act.	This WQS variance will be the applicable water quality standard in effect for the purposes of developing CWA Section 301(b)(1)(C) National Pollutant Discharge Elimination System (NPDES) permit limits. The only permit that will receive this variance is #MO-0049506 for the City of Joplin's Turkey Creek Wastewater Treatment Plant.

(4) A State may not adopt WQS variances if the designated use and criterion addressed by the WQS variance can be achieved by implementing technology-based effluent limits required under sections 301(b) and 306 of the Act.	Implementation of technology-based effluent limits will not allow TCWWTP the ability to achieve effluent quality to meet water quality standards for total recoverable zinc.
(b) Requirements for Submission to EPA	
(1) A WQS variance must include:	
(i) Identification of the pollutant(s) or water quality parameter(s), and the water body/waterbody segment(s) to which the WQS variance applies. Discharger(s) - specific WQS variances must also identify the permittee(s) subject to the WQS variance.	The City of Joplin requests a WQS variance from the total recoverable zinc water quality criteria for the protection of aquatic life use. The variance would apply to the City of Joplin's Turkey Creek Wastewater Treatment Plant #MO-0049506, which discharges to Turkey Creek. Turkey Creek is a class P stream with a water body identification number 3216. Turkey Creek is located in the Turkey Creek watershed, 12-digit Hydrologic Unit Code 11070207-0901.
(ii) The requirements that apply throughout the term of the WQS variance. The requirements shall represent the highest attainable condition of the water body or waterbody segment applicable throughout the term of the WQS variance based on the documentation required in (b)(2) of this section. The requirements shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(2) of this section. The State must specify the highest attainable condition of the water body or waterbody segment as a quantifiable expression that is one of the following: (A) For discharger(s)-specific WQS variances: (1) The highest attainable interim criterion; or (2) The interim effluent condition that reflects the greatest pollutant reduction achievable; or (3) If no additional feasible pollutant control technology can be identified,	Implementation of this WQS variance will not result in the lowering of existing water quality. Pursuant to 40 CFR Section 131.14, TCWWTP is required to implement the highest attainable conditions that will be established in Missouri State Operating Permit #MO-0103349. The interim effluent condition will reflect the greatest pollutant reduction achievable. This was calculated using the TCWWTP's past five years of reported data for total recoverable zinc from effluent samples. The 95th and 99th percentiles were calculated for the monthly average and daily maximum respectively. The City of Joplin must also implement their ZMP – Zinc Minimization Plan detailed in Appendix B of this document. The Missouri State Operating Permit #MO-0103349 will contain a requirement for the implementation of a ZMP with annual reporting to the Department.

the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program. (B) For WQS variances applicable to a water body or waterbody segment: (1) The highest attainable interim use and interim criterion; or (2) If no additional feasible pollutant control technology can be identified, the interim use and interim criterion that reflect the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.	
(iii) A statement providing that the requirements of the WQS variance are either the highest attainable condition identified at the time of the adoption of the WQS variance, or the highest attainable condition later identified during any reevaluation consistent with paragraph (b)(1)(v) of this section, whichever is more stringent.	Zinc GPRAs were calculated using the TCWWTP's past five years of reported data for total recoverable zinc from effluent samples. The 95th and 99th percentiles were calculated for the monthly average and daily maximum respectively. These are the highest attainable conditions that the plant can achieve in the interim. Upon reevaluation after the first five years, these values may be adjusted.
(iv) The term of the WQS variance, expressed as an interval of time from the date of EPA approval or a specific date. The term of the WQS variance must only be as long as necessary to achieve the highest attainable condition and consistent with the demonstration provided in paragraph (b)(2) of this section. The State may adopt a subsequent WQS variance consistent with this section.	The City of Joplin has requested the term of this variance be ten years, which is consistent with two terms of Missouri State Operating Permit #MO-0103349 for the TCWWTP. This will allow five years with a five-period following reevaluation for the highest attainable condition to be achieved.
(v) For a WQS variance with a term greater than five years, a specified frequency to reevaluate the highest	The Department will reevaluate the GPRAs and the need for the variance following five years of implementation of the TCWWTP's

attainable condition using all existing and readily available information and a provision specifying how the State intends to obtain public input on the reevaluation. Such reevaluations must occur no less frequently than every five years after EPA approval of the WQS variance and the results of such reevaluation must be submitted to EPA within 30 days of completion of the reevaluation.	ZMP. Any adjustments will be incorporated into Missouri State Operating Permit #MO-0103349, which will follow the public participation process pursuant to 10 CSR 20-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.
(vi) A provision that the WQS variance will no longer be the applicable water quality standard for purposes of the Act if the State does not conduct a reevaluation consistent with the frequency specified in the WQS variance or the results are not submitted to EPA as required by (b)(1)(v) of this section.	If the Department does not complete a reevaluation of the variance no less than five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.
(2) The supporting documentation must include:	
(i) Documentation demonstrating the need for a WQS variance. (A) For a WQS variance to a use specified in section 101(a)(2) of the Act or a sub-category of such a use, the State must demonstrate that attaining the designated use and criterion is not feasible throughout the term of the WQS variance because: (1) One of the factors listed in § 131.10(g) is met, or (2) Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use and criterion while the actions are being implemented. (B) For a WQS variance to a non-101(a)(2) use, the State must submit documentation justifying how its consideration of the use and value of the water for those uses listed in § 131.10(a) appropriately supports the WQS variance and term. A demonstration consistent with	The basis for this request is 40 CFR § 131.10(g)(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place. The widespread contamination caused by historic mining activities and associated mine waste disposal within the Tri-State Mining District, and specifically within the Turkey Creek watershed and the City of Joplin, justifies this discharger-specific variance based on this factor. See Appendix C – Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc: City of Joplin, Missouri, Turkey Creek WWTP for supporting information.

paragraph (b)(2)(i)(A) of this section may be used to satisfy this requirement.	
(ii) Documentation demonstrating that the term of the WQS variance is only as long as necessary to achieve the highest attainable condition. Such documentation must justify the term of the WQS variance by describing the pollutant control activities to achieve the highest attainable condition, including those activities identified through a Pollutant Minimization Program, which serve as milestones for the WQS variance.	The City of Joplin must follow the ZMP – Zinc Minimization Plan detailed in Appendix B of this document. The ZMP establishes milestones over the term of this variance.
(iii) In addition to paragraphs (b)(2)(i) and (ii) of this section, for a WQS variance that applies to a water body or waterbody segment: (A) Identification and documentation of any cost-effective and reasonable best management practices for nonpoint source controls related to the pollutant(s) or water quality parameter(s) and water body or waterbody segment(s) specified in the WQS variance that could be implemented to make progress towards attaining the underlying designated use and criterion. A State must provide public notice and comment for any such documentation. (B) Any subsequent WQS variance for a water body or waterbody segment must include documentation of whether and to what extent best management practices for nonpoint source controls were implemented to address the pollutant(s) or water quality parameter(s) subject to the WQS variance and the water quality progress achieved.	This provision does not apply.
(c) Implementing WQS variances in NPDES permits.	
A WQS variance serves as the applicable water quality standard for implementing NPDES permitting requirements pursuant to §	This variance will be used solely to establish effluent limits for total recoverable zinc within Missouri State Operating Permit

122.44(d) of this chapter for the term of the WQS variance. Any limitations and requirements necessary to implement the WQS variance shall be included as enforceable conditions of the NPDES permit for the permittee(s) subject to the WQS variance.	#MO-0103349. The variance will not be used for any other Clean Water Act or Missouri Clean Water Law Purposes.

Appendix B – Zinc Minimization Plan

City of Joplin, Missouri
Turkey Creek Wastewater Treatment Plant
MSOP MO-0103349

ZINC MINIMIZATION PLAN

DRAFT
June 13, 2019

SECTION I - PURPOSE
The purpose of this Zinc Pollutant Minimization Plan ("ZMP") is to describe best management practices through which the City of Joplin, Missouri will seek to reduce the amount of zinc discharged into its municipal wastewater system and, ultimately, to the environment. The ZMP compiles zinc reduction-related efforts to-date and potential future action items. It is designed to be a working document to help guide the City in its efforts to control zinc loadings discharged into its Publicly-Owned Treatment Works (POTW) by users of the sewer system. Such a reduction in loadings to the sewer system may translate to a reduction in the amount of zinc which is discharged from the treatment plant.

SECTION II – FACILITY DESCRIPTION
The Turkey Creek Wastewater Treatment Plant is a combined fixed growth and activated sludge type treatment facility located on the northwest side of Joplin. The facility was designed for an average flow of 15 million gallons per day (MGD) and currently discharges approximately 8.6 MGD. Treatment consists of influent screening, grit removal, primary clarification, trickling filter biotowers, intermediate clarification, oxidation ditch aeration basins, final clarification, tertiary membrane filtration, ultraviolet disinfection, and step aeration prior to discharge to Turkey Creek. While the WWTP removes considerable amounts of zinc, the facility is unable to meet the effluent limitations due to high influent loadings.

Zinc is not used in the treatment processes at the WWTP. Zinc may be introduced into the sewer system through a variety of sources, such as from industrial users and past mining practices. The zinc loadings to the WWTP are primarily from legacy mining sources, and the City is seeking a water quality standards variance for zinc.

SECTION III – PROGRAM PLAN

A. EVALUATION OF POTENTIAL NON-DOMESTIC SOURCES CONTRIBUTING ZINC TO THE POTW

Within four years of approval of the zinc variance, the City will evaluate available information to assess the potential for non-domestic users of the sewer system to contribute zinc to the system. The information to be reviewed may include: (1) POTW influent and effluent zinc data and trends; (2) industrial user permits and associated zinc monitoring data; (3) Toxics Release Inventory (TRI); (4) data and documents pertaining to the Oronogo-Duenweg Mining Belt

Superfund site, which was listed on the National Priorities List in 1990; and (5) monitoring data collected as part of the City's targeted inflow and infiltration (I&I) reduction program.

Within six months of approval of the variance, the City will develop a detailed monitoring plan to regularly monitor specific locations within the sewer system, to identify contributions of zinc from various sources. The City intends to conduct this monitoring program over the course of two to three years, including regular seasonal monitoring and additional targeted monitoring under wet weather conditions.

The City will continue to require monitoring for significant industrial users, and will conduct strategic sampling on a semi-annual basis to identify potential zinc sources. After two to three years of data collection, the data from both the City's monitoring program and any monitoring required of industrial permittees will be summarized to evaluate patterns and trends, and identify significant sources of zinc.

The City's ongoing efforts to reduce I&I have identified catchments contributing elevated zinc to the sewer system. This information will be used to assess zinc contributions and prioritize areas for potential sewer system renewal.

Based on the information collected, potential sources of zinc will be assessed. The evaluation of potential non-domestic sources of zinc to the sewer system will be updated every five years, as warranted by prior sampling results and any additional new potentially significant sources to the system.

B. ADDITIONAL CONTROL MEASURES

This ZMP identifies reasonable and cost-effective control measures to minimize zinc being discharged into the POTW. Below is a listing of initial BMPs for this POTW.

Industrial Users

Should monitoring data identify significant contributions of zinc from an industrial user, City staff will meet with the user and evaluate zinc loadings from the facility. The industry will be asked to incorporate best management practices to minimize zinc discharges. The City will continue diligent enforcement of industrial pretreatment program permits and policies.

Inflow & Infiltration

The City is committed to an I&I program that will minimize entry of zinc-containing infiltration, and will continue to invest in collection system rehabilitation projects in accordance with the 2026 plan. The plan will be revisited and refined following evaluation of progress.

Pollution Prevention

Substances used at the WWTP will be evaluated to determine if they contain zinc or zinc-based compounds. Any such chemicals will be evaluated for substitution with non-zinc-containing substances.

Housekeeping, Spill Control and Collection, and Education

The City will develop procedures to minimize the possibility of any spill or release at the WWTP involving zinc containing substances.

Public Outreach

The City does not plan on doing any public outreach at this time, because household sources are not typically a significant source of excess zinc.

C. TRACKING AND MONITORING

In order to assess the implementation of the control measures, the City proposes to undertake the following evaluations beginning after the first full year that this ZMP is implemented:

1. Survey annually at least ten percent (10%) of any non-domestic users identified as possible significant sources of zinc to the POTW;
2. Track the implementation of the programs outlined above;
3. Monitor influent zinc weekly. Require significant non-domestic sources of zinc to monitor periodically, as warranted; and
4. Measure effluent zinc as required by the NPDES permit.

These efforts will allow the City to establish a baseline of influent and effluent zinc levels to assist in identifying any trends in zinc contributions from domestic and non-domestic users of the sewer system. This baseline will be tracked annually.

SECTION IV - IMPLEMENTATION OF CONTROL MEASURES

The City has already undertaken zinc control efforts through its industrial pretreatment program and I&I reduction efforts. In addition, the City requires removal of metals-contaminated soils as part of its construction contracting process, which further reduces zinc loads to the WWTP. These efforts will continue.

The City will implement the control measures summarized in Section III over the permit term and will update this ZMP as warranted.

SECTION V – REPORTING

A summary of the ZMP activities will be submitted to MDNR by December 31, 2023. Subsequent reports, as appropriate, will be submitted as part of the NPDES permit renewal process.

Appendix C - Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc: City of Joplin, Turkey Creek WWTP

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Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc:

City of Joplin, Missouri Turkey Creek WWTP

Prepared for:
City of Joplin

May 1, 2019

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Evaluations Supporting Application for Discharger-Specific Water Quality Standards Variance for Zinc:

City of Joplin, Missouri
Turkey Creek WWTP

Prepared for:
City of Joplin, Missouri

Under Contract to:
Burns & McDonnell Engineering

May 1, 2019

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1 Introduction

The City of Joplin and Missouri Department of Natural Resources (MDNR) have been in the process of renewing the National Pollution Discharge Elimination System / Missouri State Operating Permit (NPDES/MSOP) permit for the Turkey Creek Wastewater Treatment Plant (TCWWTP). The current permit expired in 2012, but has been administratively continued during the renewal process. Difficulties in developing appropriate and achievable metals limits are the primary reason for the delay in renewing the MSOP. The permit includes water quality-based effluent limitations (WQBELs) for zinc that have been difficult for the facility to consistently meet due to the ubiquitous presence of zinc throughout the Joplin area from past mining practices. The MDNR has developed the WQBELs to meet State water quality standards for aquatic life uses. The limits are, however, much lower than existing upstream background concentrations in Turkey Creek. Upstream zinc concentrations consistently exceed concentrations below the TCWWTP discharge. Turkey Creek zinc concentrations routinely exceed the state water quality standards, due to human-caused conditions from past mining practices. The City of Joplin is therefore applying for a discharger-specific water quality standards variance for zinc in the TCWWTP MSOP, based on 40 CFR 131.10(g) Factor 3 (human-caused conditions). A discharger-specific variance is a temporary form of regulatory relief in comparison to a more permanent Use Attainability Analysis, which could also be an appropriate approach under the circumstances.

1.1 Turkey Creek WWTP

The Turkey Creek Wastewater Treatment Plant is a combined fixed growth and activated sludge type treatment facility located on the northwest side of Joplin (Figure 2-1). The facility was designed for an average flow of 15 million gallons per day (MGD) and currently discharges approximately 8.6 MGD. Treatment consists of influent screening, grit removal, primary clarification, trickling filter biotowers, intermediate clarification, oxidation ditch aeration basins, final clarification, tertiary membrane filtration, ultraviolet disinfection, and step aeration prior to discharge to Turkey Creek. Drawings of the WWTP are provided in Attachment 1. Discharges to Turkey Creek are permitted by MSOP MO-0103349.

1.2 Turkey Creek Watershed

Turkey Creek originates east of the City of Joplin and flows in a northwesterly direction to its confluence with the Spring River in Kansas (Figure 2-1). Turkey Creek (Water Body ID 3216) is a Class P stream in Missouri's Water Quality Standards Regulation and has designated uses for the protection of warmwater aquatic habitat, human health protection, irrigation, livestock and wildlife watering, whole body contact recreation, and secondary contact recreation (fishing, wading, boating). Turkey Creek is located in the Spring River 8-digit hydrologic unit. Turkey Creek and its tributaries are impaired due to exceedances of state water quality criteria to protect aquatic life designated uses; Turkey Creek is listed on Missouri's 2016 Section 303(d) list of impaired waters due to metals (including zinc) from the Tri-State Mining District.

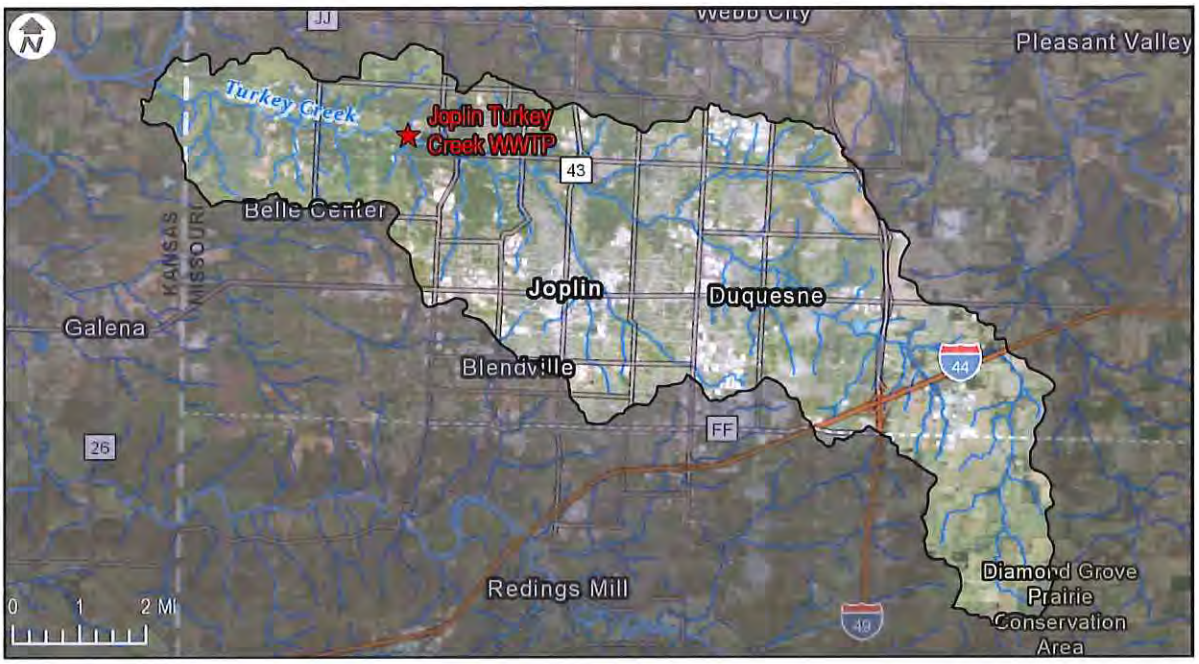

Figure 1-1. Turkey Creek Watershed

1.3 Regulatory Background

A discharger-specific water quality variance is a time-limited water quality criterion change for a specific pollutant, allowing the City of Joplin relief from meeting the zinc WQBEL. Federal and state regulations allow the flexibility to adopt a variance based upon one of the six use attainability factors outlined in 40 CFR §131.10(g). A variance serves as the applicable water quality standard for the permit, and only applies to the permittee (in this case, the City of Joplin) specified in the variance. Federal regulations require that where a state adopts a water quality standards variance, the state must retain the underlying designated use and criterion addressed by the variance; all other applicable standards not specifically addressed by the variance remain in effect.

The six use attainability factors (40 CFR §131.10(g)) that may be used to justify a variance include:

1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
5. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

6. Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.

In this case, the proposed variance is based on Factor 3 (Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place).

1.4 Basis for Variance

The widespread contamination caused by historic mining activities and associated mine waste disposal within the Tri-State Mining District, and specifically within the Turkey Creek watershed and City of Joplin, justifies a discharger-specific variance based on Factor 3, human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place. The following sections of this report address specific parts of Factor 3 to support the variance request:

- Is the source of pollution human-caused?
- Is attainment of the use prevented?
- Can the human-caused condition be remedied?

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2 Are the sources of pollution human caused?

The first determination to be made is whether the sources of zinc are human-caused. This section describes the history of the watershed and human activities that have led to the zinc contamination in Turkey Creek.

2.1 History of the Watershed

Joplin is located in the Tri-State Mining District (TSMD), which spans portions of Kansas, Missouri, and Oklahoma. The Missouri portion includes Barry, Christian, Greene, Lawrence, Jasper, and Newton Counties. Commercial mining began in this area in the mid-1800s and continued until the 1970s (EPA, 2003). Commercial smelters were used in all three states. At first, lead was of primary interest; however, the ore was rich in zinc deposits and zinc production became increasingly important over time. The TSMD was historically the top producer of zinc within the United States (USFWS, 2018). As a result of the mining and related activities, large amounts of metals, including cadmium, lead, and zinc, were released into the environment.

Due to the widespread metals contamination, several parts of the TSMD are listed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priority List ("Superfund"). The Joplin area is included in the Oronogo-Duenweg Mining Belt Superfund site, which was listed on the National Priorities List in 1990. Approximately 11,000 acres were contaminated with surface mining wastes; over 10 million tons of waste remain on the site (EPA, 2017). Leachate and runoff from the waste piles entered groundwater and surface streams, and sampling showed that soil, groundwater, and surface water were all contaminated with metals, including zinc, from the mining and smelting activities (EPA, 2003).

2.1.1 CERCLA Information

EPA's CERCLA documents provide additional information about the history of the contamination (EPA, 2013):

> *The Oronogo-Duenweg Mining Belt Superfund Site is located in Jasper County and portions of Newton County, Missouri. The Site is a concern because of mining wastes on the surface which constitute a significant source of heavy metals contamination with potential for exposure to people and environmental receptors. Past mining and milling practices resulted in the contamination of surface soil, sediments, surface water, and groundwater in the shallow aquifer with heavy metals, primarily lead, cadmium and zinc. The Site includes the mining wastes in and around 11 former mining areas, or designated areas (DAs), located within about 270 square miles of Jasper and Newton counties. The DAs include Snap, Neck/Alba, Thorns, Joplin, Oronogo/Duenweg, Carl Junction, Klondike, Iron Gates, Iron Gates Extension, Belleville, and Waco....*
>
> *Historically, approximately 160 million short tons of crude ore were mined in the DAs of which approximately 5 percent was recovered as zinc/lead concentrates, leaving an estimated 150 million short tons of discarded mill waste on the surface. Approximately 90 percent of this material has since been removed for various commercial purposes. During the early years of mining, lead concentrates were smelted in a large number of crude log furnaces. Advances in smelter technology and increasing specialization by operators led to Centralization, and by 1873 there were only 17 lead smelters in the Joplin area. By 1894, the number had decreased to three, and was down to one by the 1920s. Most zinc concentrates were shipped to smelters located*

outside the district in areas where fossil fuel was abundant, as the smelting of zinc required considerably more heat than lead.

The EPA listed the Site on the National Priorities List (NPL) in 1990. The NPL is a national list of Superfund sites that prioritizes cleanups in order of the most serious contamination problems and greatest threats to human health and the environment. After listing, the EPA divided the Site into four Operable Units (OUs) for cleanup activities because of the multimedia nature of contamination. The OUs include OU-1, Mining and Milling Waste; OU-2, Smelter Waste Residential Yards; OU-3, Mine Waste Residential Yards; and OU-4, Groundwater. The 2004 ROD and this proposed ROD Amendment address OU-1 and include those areas in and around the DAs where mining, milling and smelter wastes are located.

A site-wide investigation was initiated in 1991, collecting data primarily on mined materials, soils, surface water, groundwater, terrestrial and aquatic biota, land use and demography, air quality, and human food sources. The results of this sampling program were presented in the Remedial Investigation Report (RI) completed in 1995, and document significant contamination levels in soil, surface water and groundwater, as well as in mining wastes themselves. Contamination levels were found in all media at levels presenting an unacceptable risk to human health and environmental receptors. A detailed discussion of the site characteristics, nature of the contamination, and risk to people and the environment are found in the Administrative Record.

A Feasibility Study (FS) was completed in 2003. The FS combined the information about the nature and extent of contamination in and around the DAs described in the RI with the investigations characterizing and evaluating the DAs, and developed alternatives for remedial action for the entire Site. Additional studies were conducted by the EPA, MDNR, and the Potentially Responsible Parties (PRPs) to assist in developing and supporting the remedial alternatives in the FS.

The EPA issued the OU-1 Proposed Plan for public comment in July 2004, and completed the OU-1 ROD in September 2004, after holding a public meeting and receiving and addressing public comments on the Proposed Plan. The cleanup of mining and milling wastes under the ROD is necessary to mitigate the principal threat for OU-1, which is the risk to aquatic and terrestrial ecosystems from exposure to mill wastes, soils, sediments, surface water and groundwater. The main component of the remedy includes excavating and disposing of source materials in selected on-site mine subsidence pits suitable from an engineering perspective for subaqueous disposal. This same remedial component, excavation/disposal, is essential to provide long-term protection of human health from exposure to the mine and mill wastes.

The Oronogo-Duenweg Mining Belt Superfund site encompasses approximately 20 square miles near Joplin. Much of the land in the City has been affected by mining waste and historical smelting activities. Figure 2-1 shows the areas in and around Joplin and the Turkey Creek watershed that have been contaminated by historic mine waste and smelting activities. The figure also shows the Turkey Creek watershed and location of the TCWWTP. From this figure, it is clear that there are large areas of contamination within the Turkey Creek watershed. Further, Turkey Creek upstream of the TCWWTP is impaired by high metals concentrations (MDNR, 2018). The most recent five-year CERCLA review report (EPA, 2017) indicated that completion of the remedy for OU-1 (the mining and milling waste) is expected to take an additional three to five years.

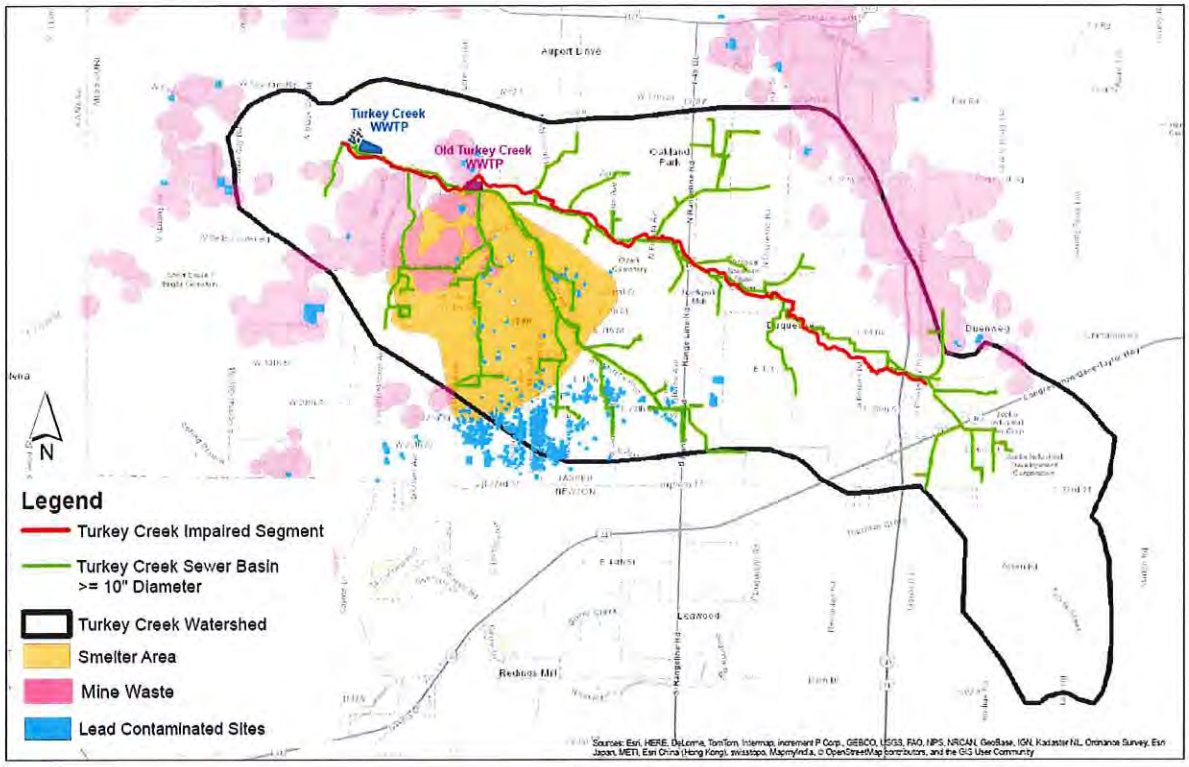

Figure 2-1. Historic Mining Contamination within the Joplin Area

2.2 Sources of Contamination

As noted above, soil and groundwater throughout the TSMD is contaminated by metals, including zinc. As described by the Interstate Technology & Regulatory Council (ITRC):

> *In general, the primary sources of contamination are the residual metal sulfides in the abandoned mine workings, chat piles, and tailing impoundments as well as historical impacts from smelting operations. Upon atmospheric exposure, metal sulfides can become oxidized and mobilize as dissolved metal compounds. These mobilized compounds create mining-influenced water that can further leach metals from bedrock, allowing high concentrations of dissolved metals to migrate into groundwater or run off into surface waters.*
>
> *Mining activities were often conducted below the water table. Groundwater was continually pumped out of this shallow aquifer to enable mining activities to take place. When operations ceased however, pumping ceased and mine shafts refilled by natural recharge. Heavy metals including lead, cadmium, and zinc leached out of the oxidized mine waste and have contaminated shallow groundwater.* (ITRC, 2017)

In addition to direct contamination of soil, groundwater, and surface water by the mine wastes, the TSMD has a long history of using mine tailings, or "chat," for a variety of purposes, including in asphalt and cement (ITRC, 2017). Within the City of Joplin, chat was historically used as bedding and backfill for sewer lines, as well as for storm sewers, house foundations, street construction, and gas lines (Burns & McDonnell, 2017). The ubiquitous use of chat throughout the watershed contributes to the high concentrations of zinc in Turkey Creek.

2.3 Conclusion

Historic mining activities and waste disposal practices have led to widespread contamination throughout the Turkey Creek watershed. The inability of Turkey Creek to attain water quality standards is therefore human-caused.

3 Is attainment of the use prevented?

The second determination to be made in evaluating Factor 3 is whether conditions in Turkey Creek prevent the attainment of the existing statewide water quality criteria. As described below, zinc concentrations in Turkey Creek upstream of the TCWWTP consistently exceed both acute and chronic water quality criteria.

3.1 Applicable Water Quality Criteria

Missouri's water quality standards specify both acute and chronic criteria for zinc that are hardness-dependent. In the most recent proposed draft permit, MDNR used a hardness of 200 mg/l to calculate the criterial. Based on a hardness of 200 mg/l, the statewide water quality criteria for dissolved zinc are shown in Table 1.

Table 1. Water quality criteria for dissolved zinc

	Acute criterion (µg/L)	Chronic criterion (µg/L)
Dissolved Zinc	211	211

Note that for zinc, the acute and chronic water quality criteria are the same. The evaluations described in this section of the report therefore address both acute and chronic criteria.

3.2 Attainment of Criteria in Turkey Creek

The City measures dissolved zinc both upstream and downstream of the TCWWTP discharge on a quarterly basis, dating back to 2011 (data provided in Attachment 2). Concentrations upstream of the discharge consistently exceed water quality criteria (Figure 3-1, Table 2). Downstream concentrations are considerably lower than upstream concentrations due to the TCWWTP discharge, which lowers instream concentrations, but downstream levels still usually exceed the zinc criteria. In-stream zinc concentrations are almost always higher upstream of the TCWWTP discharge point, compared to downstream (again, due to the beneficial impact of the TCWWTP discharge).

Table 2. Median Zinc Concentrations in Turkey Creek (2011-2018)

	Median Concentration Upstream of WWTP (µg/L)	Median Concentration Downstream of WWTP (µg/L)	Water Quality Criterion
Dissolved Zinc	540	310	211

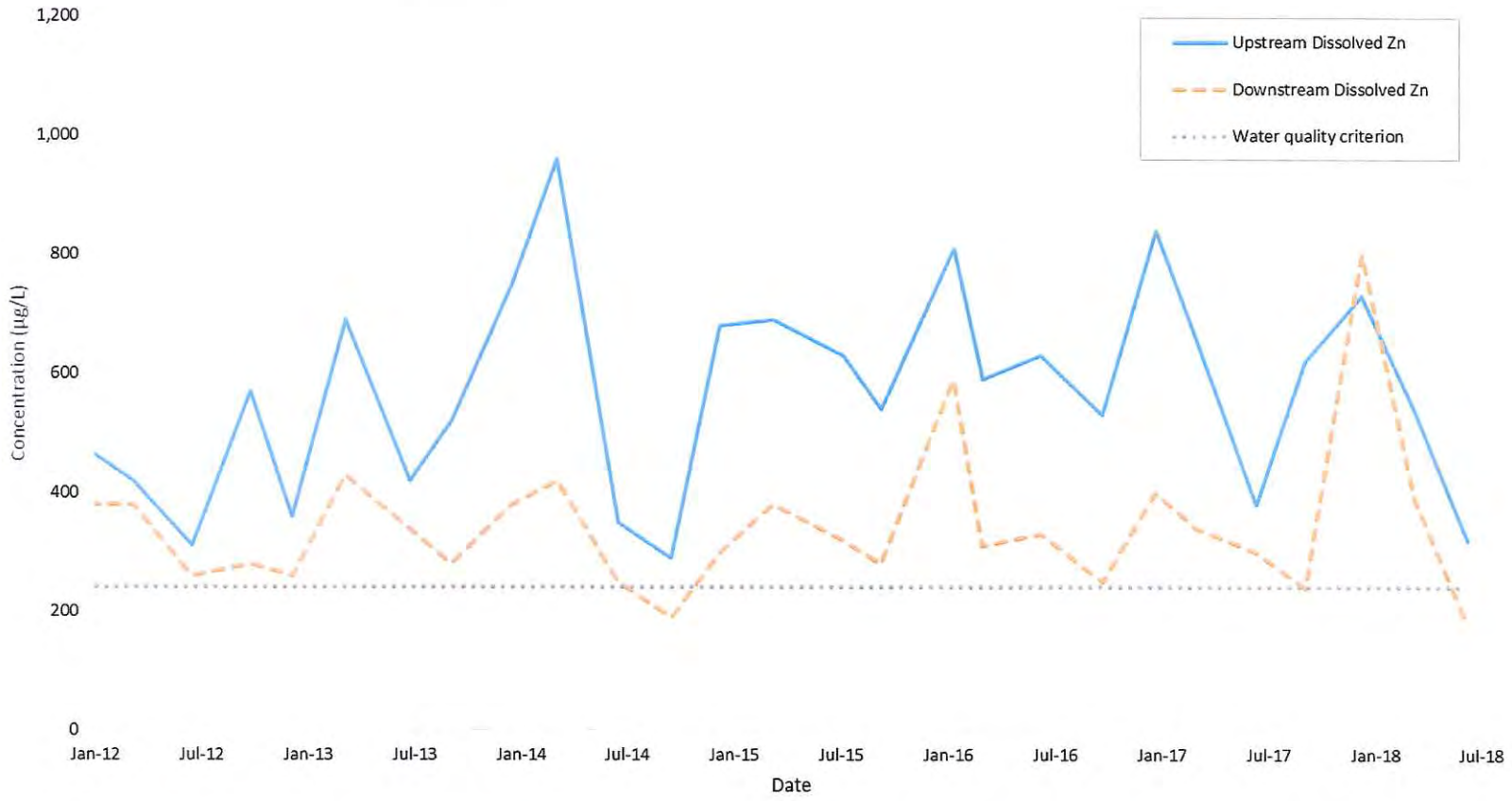

Figure 3-1. Dissolved Zinc Concentrations in Turkey Creek Upstream and Downstream of the WWTP Discharge, 2012-2018

The data show no discernable temporal trend to suggest that the upstream concentrations are improving. Rather, a linear model of concentration and time suggests that the concentrations upstream are increasing (Figure 3-2). Therefore, criteria will not be attained in the foreseeable future without a significant change to the system.

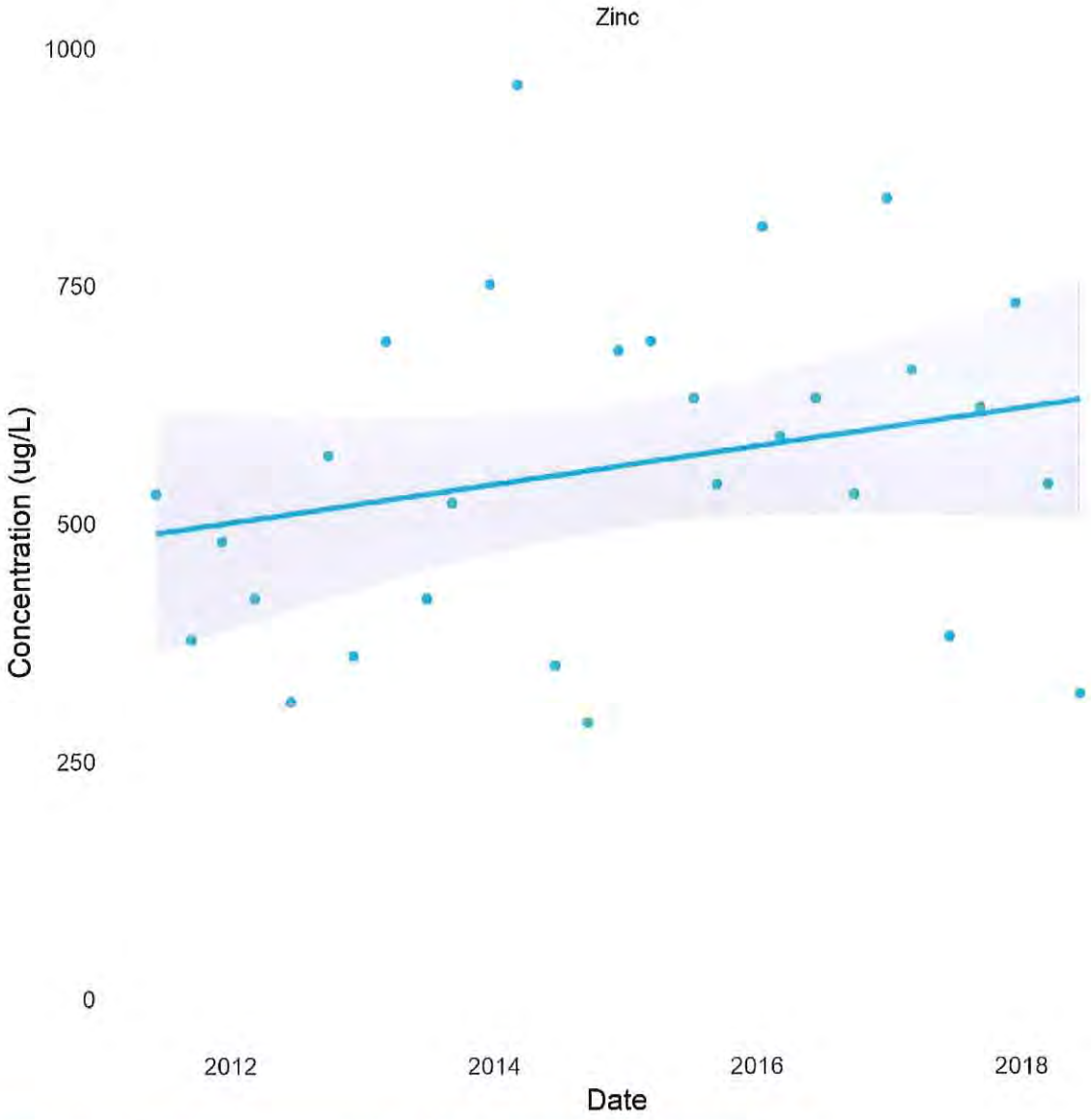

Figure 3-2. Zinc Concentrations (µg/L) Upstream of Turkey Creek WWTP

3.3 Conclusion

Based on the above information, the statewide water quality criteria for zinc are not being attained in Turkey Creek, and are not anticipated to be attained within the term of the proposed variance. Upstream zinc concentrations are much higher than the criteria. In fact, the TCWWTP consistently produces effluent with much lower zinc levels than those upstream of the discharge, and is the reason downstream concentrations are routinely below upstream levels.

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4 Can the human caused condition be remedied during the term of the variance?

The final question to be addressed with regard to Factor 3 is whether the human-caused conditions can be remedied during the term of the variance. The term of the variance would be five years, consistent with the term of the TCWWTP MSOP. It could be renewed, as appropriate, for future permit terms based upon a showing that the factors addressed in this report have not changed. This section of the report discusses TCWWTP performance, treatment alternatives, and remediation activities.

4.1 Turkey Creek WWTP Performance

The median TCWWTP effluent zinc concentration (2007-2018; data provided in Attachment 3) was 120 µg/L. The facility's existing MSOP includes a monthly average limit of 110 µg/L. The facility is unable to meet this limit, with 61% of the monthly average concentrations (2007-2018) exceeding the limit (Figure 4-1). While the TCWWTP removes considerable amounts of zinc, as discussed below, the facility is unable to meet the effluent limitations due to the high influent loadings. Nevertheless, the plant effluent quality is routinely below background levels in Turkey Creek, resulting in lower concentrations downstream.

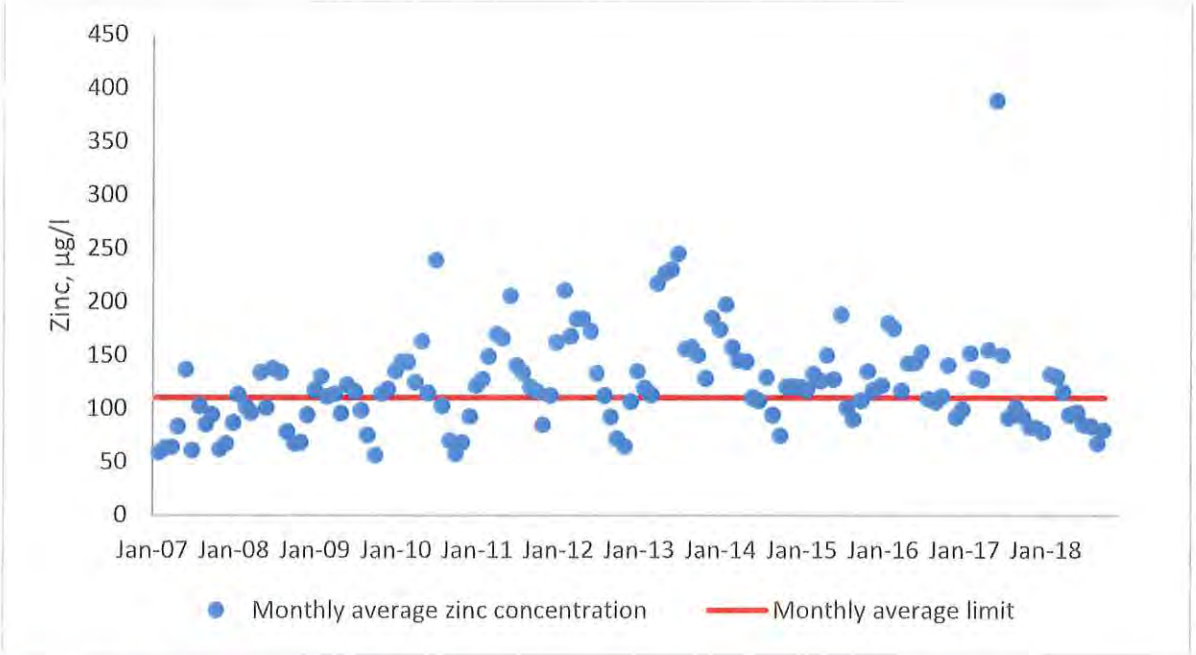

Figure 4-1. Turkey Creek WWTP monthly average zinc concentrations, 2007-2018

MDNR provided the City with a preliminary draft MSOP in 2017 that included revised zinc limits (daily maximum 216 µg/L, monthly average 137.5 µg/L). Recent changes to the Missouri water quality standards provide for use of the median hardness in calculating metals criteria; MDNR is awaiting formal approval of these changes from the U.S. EPA. Calculations indicate that using the median hardness from the USGS station on Turkey Creek near Joplin (237 mg/L) would increase the TCWWTP zinc limits, to a daily maximum of 249 µg/L and a monthly average of 159 µg/L. As shown in Figure 4-2, the facility would not be able to consistently meet even these higher zinc limitations.

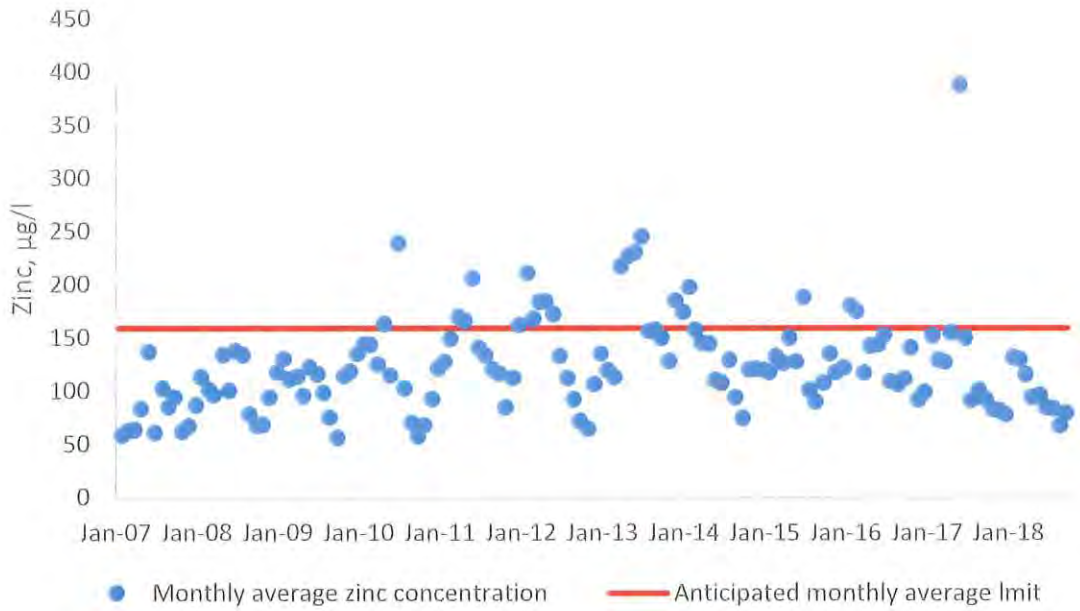

Figure 4-2. Comparison of TCWWTP monthly average effluent concentrations to anticipated zinc limits

The facility's inability to attain WQBELs for zinc is not, however, due to deficiencies at the facility. An evaluation of treatment facility performance indicates that median WWTP removal efficiency is approximately 68% for zinc, with a typical (quartile) range of 58-76%. This is consistent with removals at similar facilities, as shown in Table 3. Evaluation of influent data indicates that removal of more than 90% of influent zinc would be needed to consistently meet the WQBELs in the existing permit, and removal of greater than 80% of influent zinc would be required to attain the anticipated zinc limits in the renewed permit. While the TCWWTP often attains this level of efficiency, it is not a realistic goal for day to day operation of the existing treatment system.

Table 3. Zinc removal efficiencies at POTWs

Type of Facility	Median Removal Efficiency	Efficiency Range	Source
Joplin TCWWTP	68%	23-96%	2005-2018 data
Trickling filter plants	67%	14-90%	U.S. EPA, 2004
Tertiary treatment plants	78%	1-90%	U.S. EPA, 2004

A comparison of zinc removal efficiency with influent concentrations (Figure 4-3) indicates greater removal at higher influent concentrations. This is important from a water quality and compliance standout; the more zinc in the influent, the greater the removal required to achieve limits. The facility typically attains a removal efficiency greater than 60%; Figure 4-3 demonstrates that sampling dates having low zinc removal efficiencies almost always corresponded to days with low influent zinc concentrations. The data indicate that there were only six instances between 2005 and 2018 in which zinc removal was less than 50% and the facility did not meet the existing maximum daily effluent limitation (note also that three of those six instances occurred during May 2017, a particularly wet month in which the TCWWTP experienced significant operational challenges). These data confirm that the TCWWTP is operated appropriately with regard to removing the influent zinc.

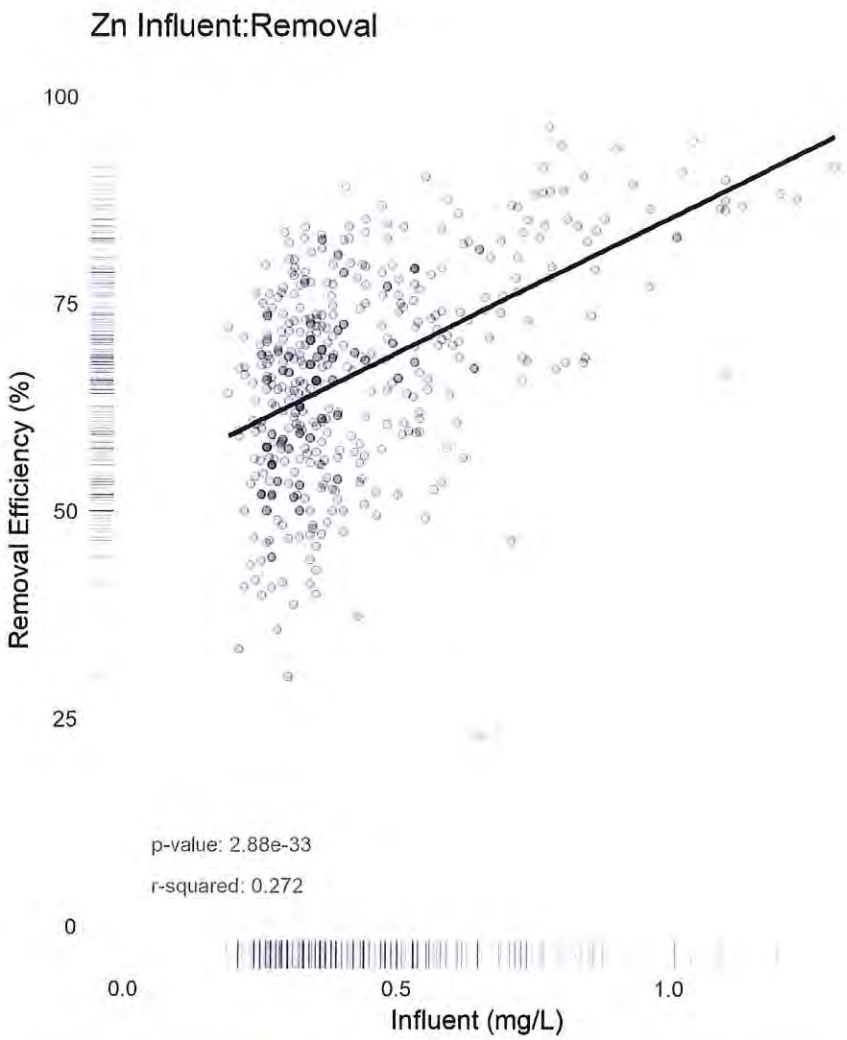

Figure 4-3. Removal efficiency vs. influent zinc concentrations at the TCWWTP

Overall, the TCWWTP monitoring data confirm that the TCWWTP is operated appropriately and consistent with industry standards for metals removal at municipal wastewater treatment facilities; however, the existing treatment technology at the facility cannot consistently meet the WQBELs.

4.2 Treatment Alternatives

Based on experience with facilities designed to remove metals, the City's engineering consultant, Burns & McDonnell performed an evaluation to identify the effectiveness and range of anticipated cost for a zinc-related treatment upgrade for the TCWWTP (Attachment 4). Facilities evaluated for metals reduction included (1) anaerobic biological treatment, (2) membrane bioreactor followed by ion exchange, (3) precipitation and gravity settling, and (4) wetlands. The capital costs for these facilities were extrapolated to account for scale up to a 15 MGD municipal wastewater treatment facility. Extrapolated costs ranged from nearly $50M to over $200M in initial capital costs. Life cycle costs would be substantially higher.

Further, even if the TCWWTP were able to consistently attain greater than 90% removal of influent zinc, the existing upstream zinc concentrations would remain and water quality criteria would still not be attained in Turkey Creek.

4.3 Industrial Contributions

Some municipal WWTPs have significant contributions of metals from wastewater discharges from industrial users. Data from Joplin's industrial pretreatment program were evaluated to assess the zinc contributions from industrial users. Monitoring data for five significant industrial users that monitor zinc (Commercial Metals, Eagle-Picher Couples, Lozier Corporation, Mid America Precision Products, and Modine Manufacturing) indicate that contributions to influent zinc are very low. In 2017, the average load from these industries combined represented only 0.11% of the total influent zinc load to the TCWWTP, while in 2018, the load contributed by these industries was only 0.02% of the total influent load. This evaluation confirms that industrial contributions are an inconsequential source of zinc at the TCWWTP, and do not affect compliance with TCWWTP's WQBELs, nor attainment of water quality criteria in Turkey Creek.

4.4 Inflow and Infiltration

The City has made efforts in recent years to reduce inflow and infiltration (I&I) in the wastewater collection system through a sewer rehabilitation program (Burns & McDonnell, 2017; Attachment 5). As part of a targeted I&I reduction program, the City conducted flow and metals monitoring in 2017. This information was used to identify areas of high I&I and high metals contributions to the sewer system. Initially, it was thought that a direct correlation would be found between I&I and metals concentrations, and that these findings would be used to develop and implement an overall I&I reduction program that would also reduce metals loadings. However, the findings of the investigation determined that there was no consistent relationship between high I&I areas and high zinc levels. Table 4 compares the rankings of the catchments having the five highest zinc concentrations with the rankings of the same catchments in terms of inflow and infiltration (rankings are based on a total of 51 catchments). The areas having the highest zinc concentrations were not necessarily the areas having the highest I&I.

Table 4. Relative Rankings of Zinc Concentrations and Inflow/Infiltration among 51 Catchments

Meter Catchment	Zinc Concentration (µg/L)		Zinc Rank	Rankings of I&I Volumes		
	Maximum	Average		Total I&I	Inflow Only	Infiltration Only
N10-10	84,000	8,248	1	10	16	6
K10-205	4,000	1,737	2	32	40	28
N11-140	3,100	1,188	3	21	20	15
K07-55	2,600	1,390	4	14	15	14
M09-315	2,000	621	5	6	7	5

The flow monitoring data and associated analysis during wet weather events was used to quantify portions of the collection system that experienced significant inflow and infiltration for use in the rehabilitation program. Areas with more significant infiltration may correlate to areas of higher metals loading, as infiltration would first pass through subsurface material and bedding contaminated with zinc. However, there is insufficient data to make a strong correlation between infiltration and metals loading. Reduction in infiltration will likely reduce the conveyance of elevated concentrations of zinc to the collection system. However, this will need to be balanced with collection system rehabilitation needs in areas of higher inflow.

Further, the I&I evaluation determined that, while reducing excessive I&I makes sense for capacity purposes, such reduction actually has the potential to increase metals loadings to Turkey Creek, because the groundwater containing zinc and other legacy metals that currently enters the sewer system and is treated at the TCWWTP, would migrate directly to Turkey Creek (Burns & McDonnell, 2017). Thus,

reductions in I&I to the City's collection system would not facilitate attainment of water quality criteria in Turkey Creek, and might even exacerbate instream metals concentrations.

Nevertheless, the City is committed to an I&I program that will facilitate reduction of peak flows associated with wet weather. The program entails an approach that allocates funding to areas that exhibit the greatest need for system renewal. System renewal via investment in collection system rehabilitation will take place throughout the period of the variance.

4.5 Remediation Efforts

As a CERCLA site, the Oronogo-Duenweg Mining Belt has undergone extensive remediation efforts; these efforts are ongoing. Activities have included excavating mining waste piles, removing contaminated soil and sediments, and plugging mine shafts (EPA, 2017). Cleanup of the mine wastes and piles was initiated in 2007 and is ongoing, with expected completion between 2020 and 2022 (EPA, 2017). However, even with completion of the remediation, Turkey Creek concentrations will remain elevated, because long-term monitoring data suggest that these cleanup activities have not had an apparent effect on zinc concentrations in Turkey Creek. Figure 4-4 shows dissolved zinc concentrations at the USGS monitoring station just downstream of the TCWWTP discharge (USGS 07186600, Turkey Creek near Joplin, MO) from 2007, when remediation started, to the present (data provided in Attachment 6). While there appears to be a declining trend in zinc concentrations over the 11 years since remediation activities were initiated, the data suggest that it will at best be many years before the aquatic life criteria are attained. (Recall also that Joplin's monitoring data, shown in Figure 3-2, indicated increasing zinc concentrations upstream of TCWWTP, further highlighting that attainment of the criteria is unlikely in the near future). Thus, while the CERCLA remediation activities address some of the zinc sources within the Turkey Creek watershed, completion of the remediation is not expected to remedy the exceedances of the water quality criteria over the term of the variance.

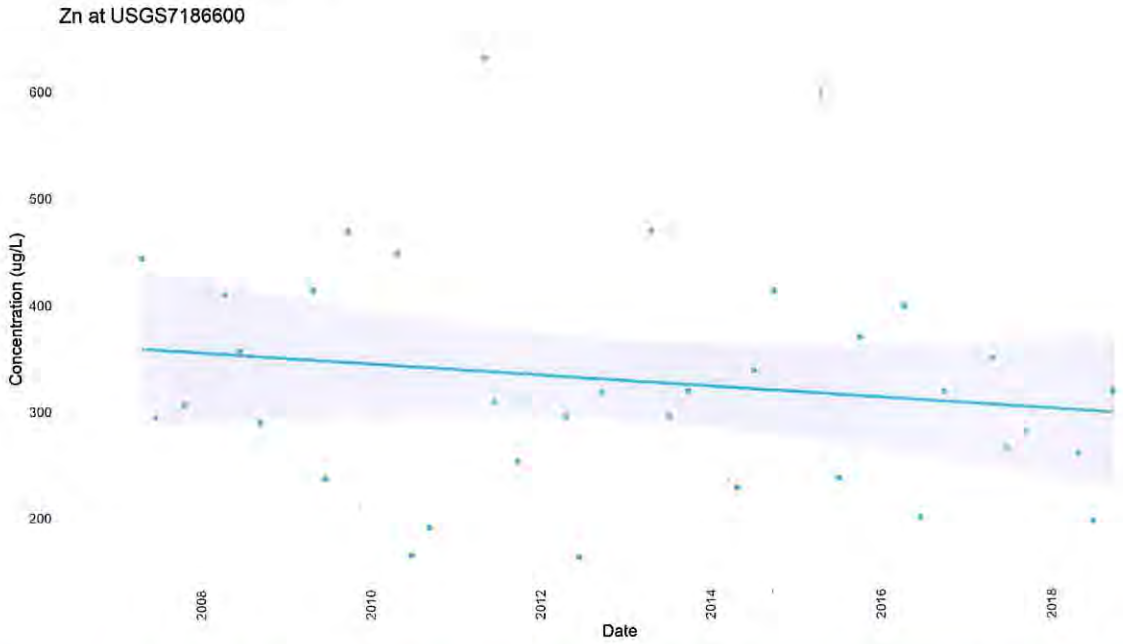

Figure 4-4. Dissolved zinc concentrations in Turkey Creek Downstream of TCWWTP, 2007-2018

As noted previously, mining chat was used extensively throughout the Joplin area, including as sewer bedding, backfill, etc. Thus, even when the CERCLA remediation of the waste piles is completed, there will

still be extensive soil and groundwater contamination throughout the area. This will likely continue to affect water quality in Turkey Creek for the foreseeable future.

4.6 Conclusion

Zinc removal at the TCWWTP and remediation of contaminated areas under the CERCLA program will not provide for attainment of water quality criteria for zinc in Turkey Creek over the life of the variance. The zinc loadings to the TCWWTP are from legacy mining sources that cannot be controlled by the City. The available data suggest that the water quality criteria for zinc are unlikely to be attainable for many years.

5 Conclusions

The widespread contamination caused by historic mining activities and associated mine waste disposal within the Tri-State Mining District, and specifically within the Turkey Creek watershed and City of Joplin, justifies a discharger-specific variance for zinc based on 40 CFR §131.10(g) Factor 3, human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place. Specifically, evaluations in this report have demonstrated:

- The source of pollution is human-caused;
- Attainment of the use is prevented; and
- The human-caused condition cannot be remedied over the term of the variance.

The discharger-specific variance for zinc is a limited and narrowly tailored regulatory solution to address the background zinc concentrations in Turkey Creek.

The City of Joplin, in its Variance Application, has proposed Highest Attainable Conditions of 396 µg/l as a daily maximum, and 228 µg/l as a monthly average, based on MDNR's evaluation of the facility's effluent data, which determined that these were 99th and 95th percentile concentrations, respectively. Consistent with Federal Regulations (40 CFR 131.14(b)(1)(ii), the City will adopt and implement a Pollutant Minimization Program (PMP) for zinc. The City anticipates that the renewed NPDES permit will contain a requirement for development and implementation of the PMP. It is anticipated that the PMP will include sampling within the collection system to identify potential sources, continued regulation of industrial contributions through the industrial pretreatment program, implementation of the I&I activities described in Section 4.4 of this report, and continuation of existing requirements for removal of metals-contaminated soils as part of the City's construction contracting process. Additional zinc reduction activities will be considered and included in the PMP as appropriate.

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Attachment 1. TCWWTP Process Diagrams

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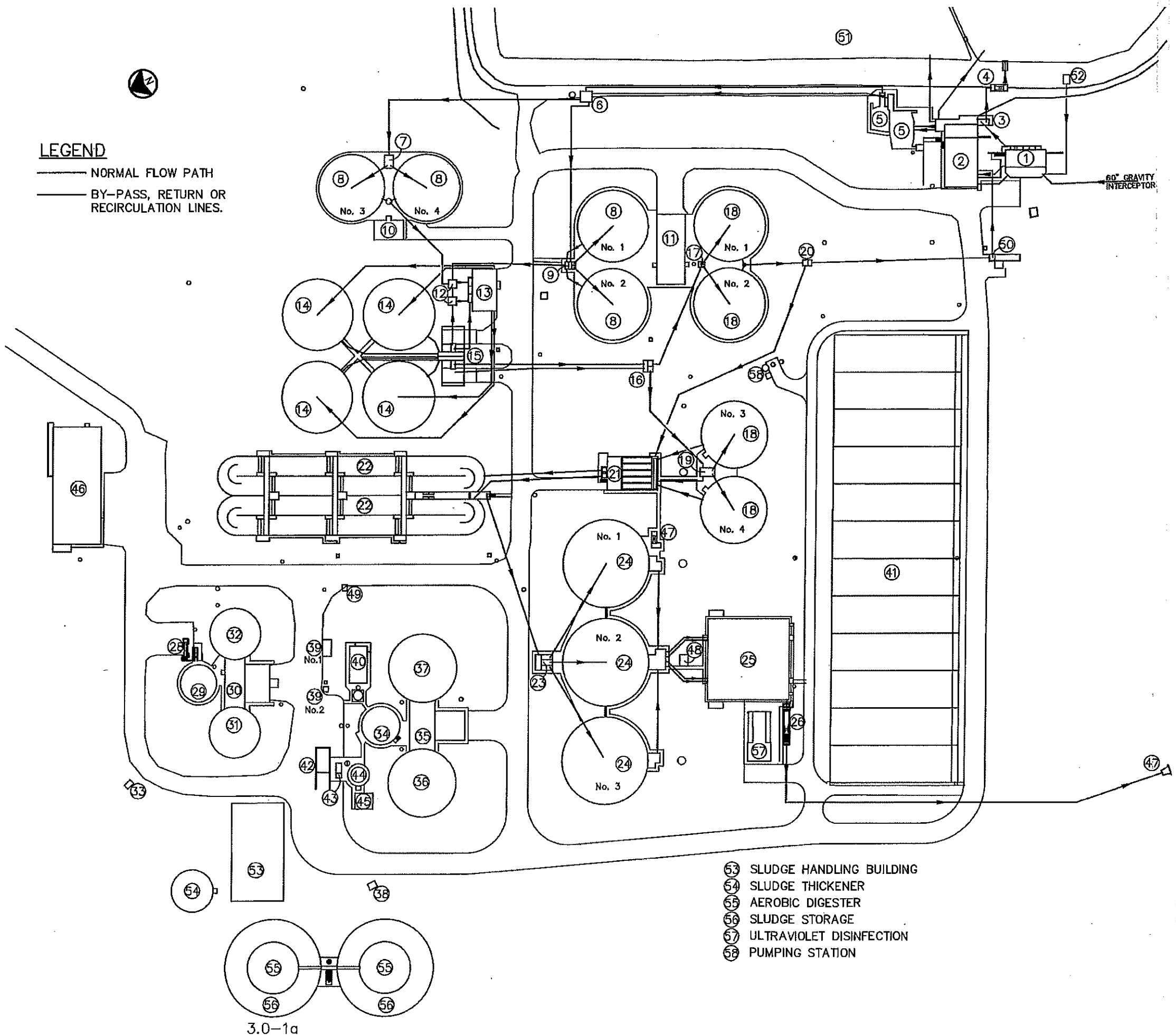

1. PEAK FLOW PUMPING STRUCTURE
2. INLET STRUCTURE
3. PEAK FLOW DIVERSION STRUCTURE
4. PEAK FLOW MEASUREMENT STRUCTURE
5. GRIT REMOVAL STRUCTURE
6. PRIMARY CLARIFIERS FLOW CONTROL STRUCTURE
7. PRIMARY CLARIFIER SPLITTER BOX (Clar. 1 & 2)
8. PRIMARY CLARIFIER(S)
9. PRIMARY CLARIFIER SPLITTER BOX (Clar. 3 & 4)
10. SLUDGE PUMP BUILDING
11. MAINTENANCE & PUMP BUILDING
12. PRIMARY CLARIFIER EFFLUENT FLOW CONTROL STRUCTURE(S)
13. TRICKLING FILTER PUMP BUILDING
14. TRICKLING FILTER(S)
15. SNAIL REMOVAL STRUCTURE
16. INTERMEDIATE CLARIFIERS FLOW CONTROL STRUCTURE
17. INTERMEDIATE CLARIFIER SPLITTER BOX (Clar. 1 & 2)
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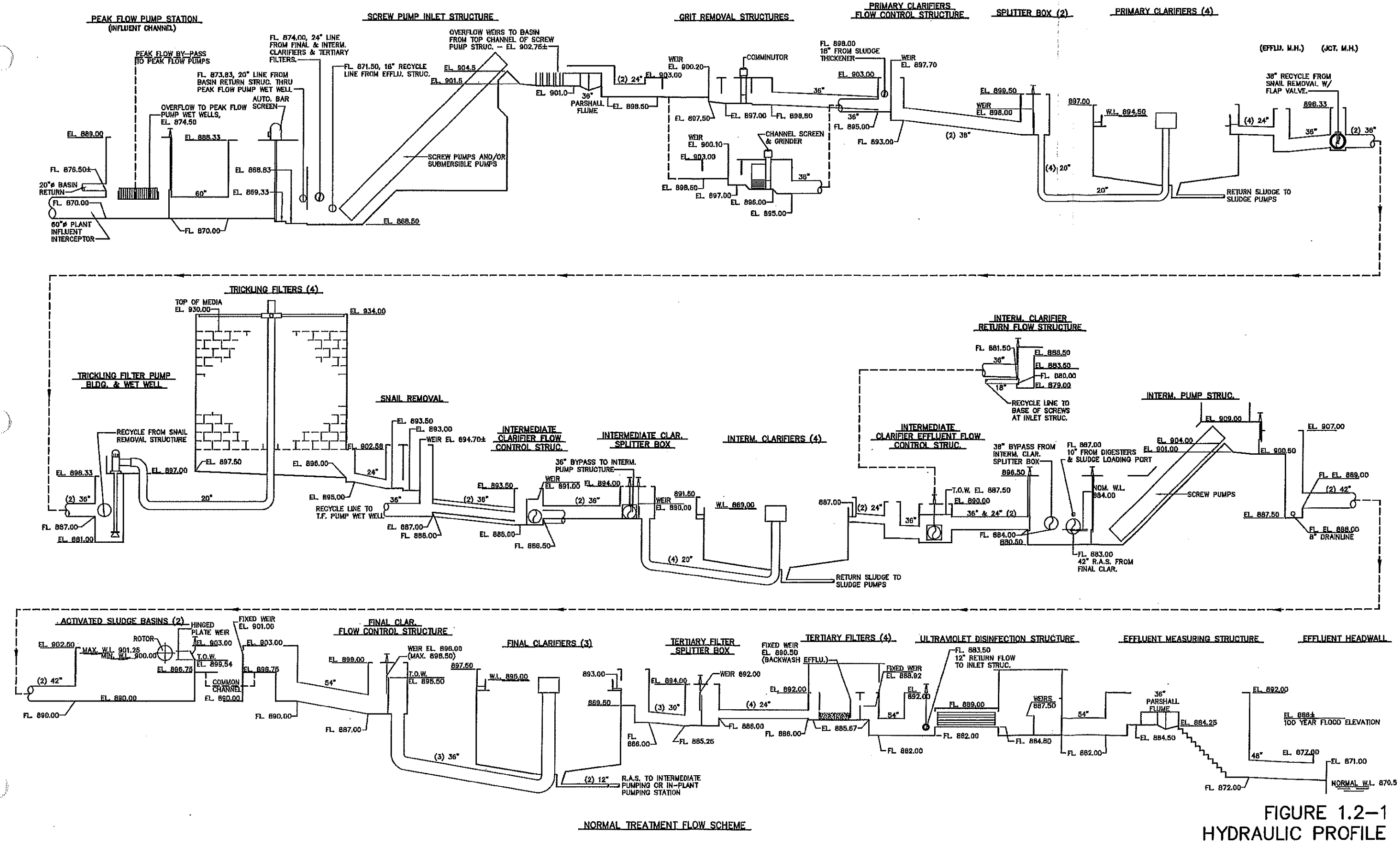
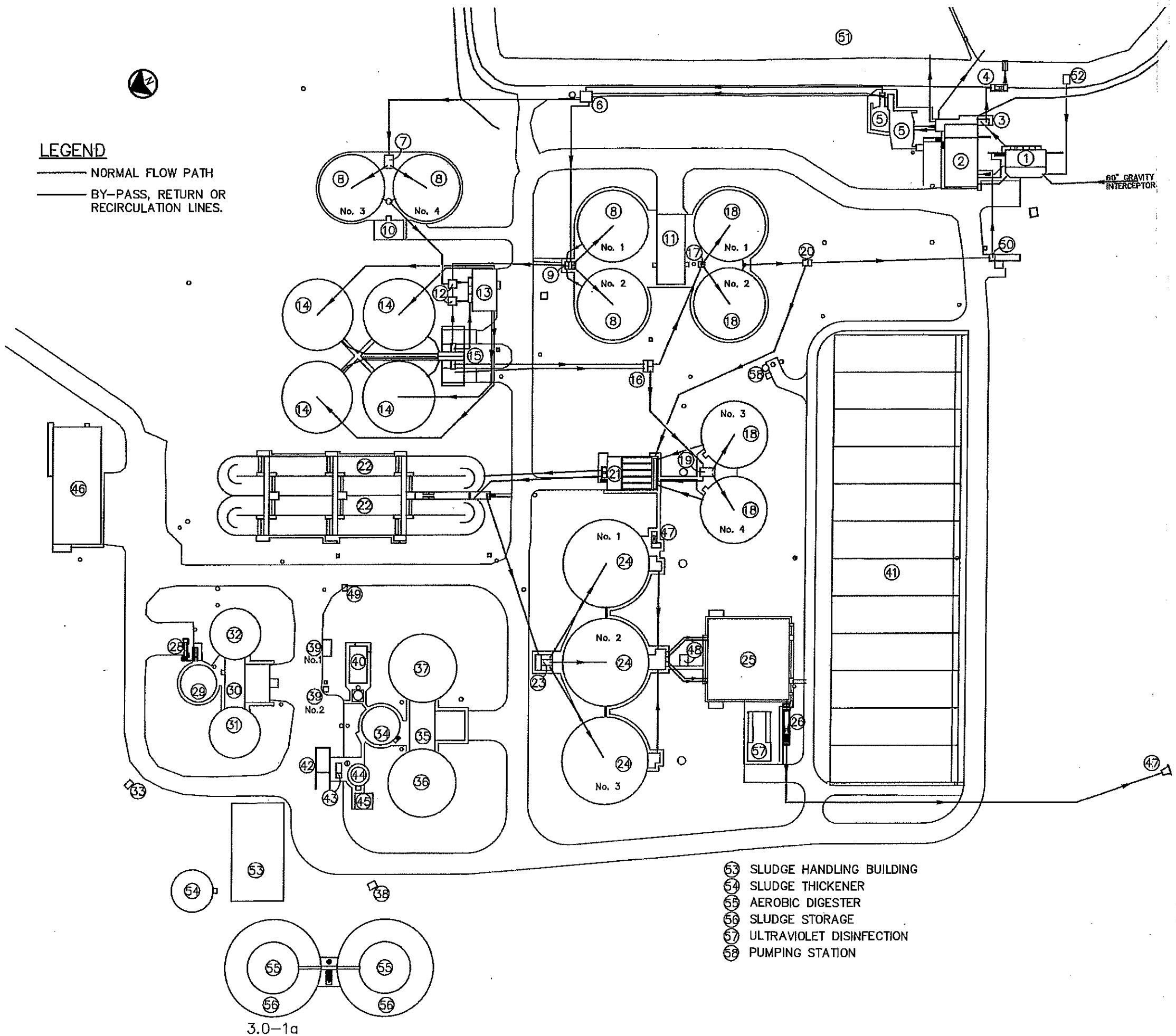
21. INTERMEDIATE PUMPING STRUCTURE
22. ACTIVATED SLUDGE BASIN(S)
23. FINAL CLARIFIER INFLUENT SPLITTER BOX
24. FINAL CLARIFIER(S)
25. TERTIARY FILTER BUILDING
26. EFFLUENT FLOW MEASUREMENT STRUCTURE
27. EFFLUENT HEADWALL
28. CYCLONE GRIT SEPARATOR & GRIT CLASSIFIER
29. NORTH SLUDGE THICKENER
30. NORTH DIGESTER BUILDING
31. NORTH PRIMARY DIGESTER
32. NORTH SECONDARY DIGESTER
33. NORTH WASTE SLUDGE GAS BURNER
34. SOUTH SLUDGE THICKENER
35. SOUTH DIGESTER BUILDING
36. SOUTH PRIMARY DIGESTER
37. SOUTH SECONDARY DIGESTER
38. SOUTH WASTE SLUDGE GAS BURNER
39. SLUDGE TRUCK LOADING PORTS NO. 1 & 2
40. SLUDGE HOLDING TANK & LIME SILO
41. SLUDGE DRYING BEDS
42. SEPTAGE DUMPING STRUCTURE
43. MECHANICAL SCREEN
44. SEPTAGE RECEIVING TANK
45. SEPTAGE PUMPING STRUCTURE
46. LABORATORY & ADMINISTRATION BUILDING
47. R.A.S. FLOW MEASUREMENT STRUCTURE
48. DRAWDOWN STRUCTURE
49. VALVE BOX 4A
50. INTERMEDIATE CLARIFIER RETURN FLOW STRUCTURE
51. FLOW EQUALIZATION BASIN
52. BASIN RETURN FLOW STRUCTURE
53. SLUDGE HANDLING BUILDING
54. SLUDGE THICKENER
55. AEROBIC DIGESTER
56. SLUDGE STORAGE
57. ULTRAVIOLET DISINFECTION
58. PUMPING STATION

FIGURE 3.0-1
PLANT LAYOUT &
WASTEWATER PIPING



NORMAL TREATMENT FLOW SCHEME

FIGURE 1.2–1
HYDRAULIC PROFILE
WASTEWATER FLOW



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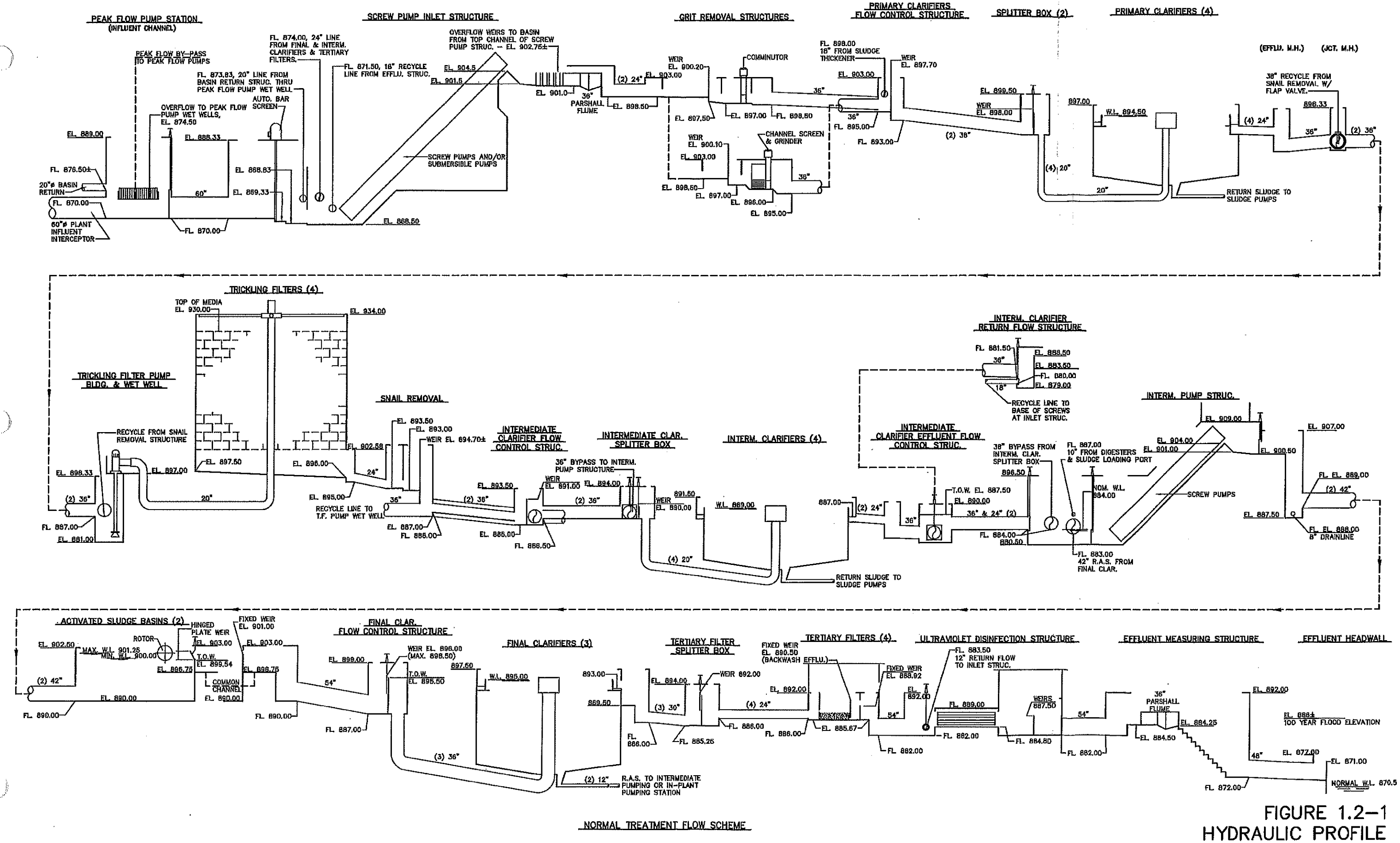

NORMAL TREATMENT FLOW SCHEME

FIGURE 1.2–1
HYDRAULIC PROFILE
WASTEWATER FLOW

Attachment 2. Instream Zinc Concentrations

Date	Upstream Dissolved Zinc (µg/L)	Downstream Dissolved Zinc (µg/L)
3/2/2011	-[1]	450
6/7/2011	530	310
9/13/2011	377	197
12/6/2011	480	380
3/6/2012	420	380
6/14/2012	311	260
9/24/2012	570	280
12/4/2012	360	260
3/5/2013	690	430
6/25/2013	420	< 5
9/4/2013	520	280
12/17/2013	750	380
3/4/2014	960	420
6/17/2014	350	250
9/16/2014	290	190
12/9/2014	680	300
3/10/2015	690	380
7/7/2015	630	320
9/10/2015	540	280
1/12/2016	810	590
3/2/2016	590	310
6/9/2016	630	330
9/23/2016	530	250
12/23/2016	840	400
3/2/2017	660	340
6/13/2017	380	300
9/6/2017	620	240
12/12/2017	730	800
3/12/2018	540	390
6/11/2018	320	180
# of samples	29	30
Minimum	290	180
Maximum	960	800
Average	559	341
Median	540	310

[1] Apparent outlier (12 µg/L) not included in analysis. This value was uncharacteristically low, and is not consistent with the downstream concentration (450 µg/L) and the associated effluent contribution that day (181 µg/L).

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Attachment 3. Influent & Effluent Zinc Data

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
1/11/2005	1.100	0.370
4/12/2005	0.440	0.140
7/12/2005	0.190	0.068
10/18/2005	0.330	0.052
1/17/2006	0.290	0.093
4/11/2006	0.260	0.092
7/11/2006	0.260	0.068
10/10/2006	0.190	0.053
1/2/2007		0.040
1/11/2007		0.059
1/16/2007		0.058
1/25/2007		0.063
1/30/2007		0.073
2/6/2007		0.080
2/13/2007		0.052
2/20/2007		0.064
2/27/2007		0.055
3/6/2007		0.068
3/13/2007		0.070
3/20/2007	0.550	0.053
3/28/2007		0.063
4/3/2007		0.095
4/10/2007		0.110
4/17/2007		0.048
4/24/2007		0.080
5/1/2007		0.056
5/8/2007		0.380
5/15/2007		0.080
5/22/2007		0.100
5/29/2007		0.067
6/5/2007		0.046
6/12/2007		0.044
6/19/2007		0.067
6/26/2007	0.610	0.086
7/3/2007		0.100
7/10/2007		0.120
7/17/2007		0.089
7/24/2007		0.093

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
7/31/2007		0.110
8/7/2007		0.130
8/14/2007		0.087
8/21/2007		0.059
8/28/2007		0.064
9/11/2007	0.690	0.120
9/18/2007		0.084
9/25/2007		0.078
10/2/2007		0.099
10/9/2007		0.012
10/16/2007		0.071
10/23/2007		0.058
10/30/2007		0.069
11/6/2007		0.067
11/13/2007		0.064
11/20/2007		0.071
11/27/2007		0.066
11/30/2007		
12/4/2007		0.076
12/8/2007		0.079
12/18/2007	0.620	0.110
12/24/2007		0.080
12/31/2007		0.088
1/8/2008		0.099
1/15/2008		0.110
1/22/2008		0.130
2/5/2008		0.120
2/12/2008		0.096
2/19/2008		0.089
2/26/2008		0.100
3/4/2008		0.039
3/11/2008		0.130
3/18/2008	0.810	0.120
4/1/2008		0.110
4/8/2008		0.140
4/15/2008		0.160
4/22/2008		0.140
4/29/2008		0.120

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
5/6/2008		0.120
5/13/2008		0.013
5/20/2008		0.140
5/27/2008		0.130
6/3/2008		0.110
6/10/2008	0.880	0.130
6/17/2008		0.140
6/24/2008		0.170
7/1/2008		0.150
7/8/2008		0.130
7/15/2008		0.150
7/22/2008		0.120
7/29/2008		0.120
8/5/2008		0.100
8/12/2008		0.073
8/19/2008		0.076
8/26/2008		0.063
9/2/2008		0.070
9/9/2008	0.390	0.074
9/16/2008		0.080
9/23/2008		0.061
9/30/2008		0.051
10/7/2008		0.067
10/14/2008		0.069
10/21/2008		0.077
10/28/2008		0.060
11/4/2008		0.074
11/11/2008		0.097
11/19/2008		0.084
11/25/2008		0.120
12/2/2008	0.247	0.074
12/9/2008		0.120
12/16/2008		0.130
12/23/2008		0.120
12/30/2008		0.110
1/6/2009		0.110
1/13/2009		0.130
1/20/2009		0.130
1/29/2009		0.150
2/3/2009		0.120
2/10/2009		0.110

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
2/17/2009		0.095
2/24/2009		0.120
3/2/2009		0.120
3/10/2009	0.312	0.108
3/17/2009		0.120
3/24/2009		0.110
3/31/2009		0.110
4/7/2009		0.088
4/14/2009		0.100
4/21/2009		0.097
4/28/2009		0.097
5/5/2009		0.117
5/12/2009		0.122
5/19/2009		0.110
5/26/2009		0.140
6/2/2009		0.148
6/9/2009	0.301	0.107
6/16/2009		0.106
6/23/2009		0.107
6/30/2009		0.104
7/7/2009		0.124
7/14/2009		0.097
7/21/2009		0.095
7/28/2009		0.077
8/4/2009		0.088
8/11/2009		0.084
8/18/2009		0.063
8/25/2009		0.066
9/1/2009		0.057
9/8/2009	0.273	0.114
9/15/2009		0.059
9/22/2009		0.060
9/29/2009		0.061
10/6/2009		0.077
10/13/2009		0.113
10/20/2009		0.144
10/27/2009		0.121
11/3/2009		0.136
11/10/2009		0.086
11/17/2009		0.131
11/24/2009		0.120

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
12/1/2009		0.132
12/8/2009	0.403	0.044
12/15/2009		0.150
12/22/2009		0.124
12/29/2009		0.122
1/5/2010		0.140
1/12/2010		0.144
1/19/2010		0.155
1/26/2010		0.136
2/2/2010		0.135
2/9/2010		0.134
2/16/2010		0.144
2/23/2010		0.161
3/2/2010	0.471	0.113
3/9/2010		0.129
3/16/2009		0.130
3/23/2010		0.099
3/30/2010		0.152
4/6/2010		0.188
4/13/2010		0.159
4/20/2010		0.146
4/27/2010		0.160
5/4/2010	0.314	0.124
5/11/2010	0.320	0.119
5/18/2010	0.766	0.089
5/25/2010	0.504	0.126
6/1/2010	0.433	0.136
6/8/2010	0.350	0.139
6/15/2010	0.604	0.658
6/22/2010	0.417	0.138
6/29/2010	0.265	0.123
7/6/2010	0.390	0.110
7/13/2010	1.020	0.092
7/20/2010	0.367	0.116
7/28/2010	0.378	0.091
8/3/2010	0.287	0.068
8/10/2010	0.320	0.073
8/17/2010	0.341	0.094
8/24/2010	0.257	0.052
8/31/2010	0.252	0.063
9/8/2010		0.063

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
9/14/2010	1.040	0.055
9/21/2010		0.053
9/28/2010		0.059
10/6/2010	0.328	0.056
10/12/2010	0.217	0.063
10/19/2010	0.369	0.083
10/26/2010	0.330	0.070
11/2/2010	0.234	0.081
11/9/2010	0.268	0.091
11/16/2010	0.281	0.087
11/23/2010	0.265	0.084
11/30/2010	0.382	0.119
12/7/2010	0.318	0.114
12/15/2010		0.138
12/21/2010	0.328	0.114
12/28/2010	0.312	0.119
1/5/2011	0.332	0.119
1/11/2011	0.269	0.129
1/18/2011	0.288	0.120
1/25/2011	0.265	0.142
2/3/2011	0.293	0.129
2/8/2011	0.761	0.130
2/15/2011	0.864	0.140
2/22/2011	0.554	0.196
3/2/2011	0.612	0.181
3/8/2011	0.573	0.172
3/15/2011	1.010	0.170
3/22/2011	0.694	0.167
3/29/2011	0.614	0.160
4/5/2011	0.539	0.218
4/12/2011	0.531	0.148
4/19/2011	0.536	0.146
4/26/2011	1.230	0.151
5/3/2011	0.807	0.259
5/10/2011	0.538	0.205
5/17/2011	0.528	0.191
5/24/2011	1.090	0.147
5/31/2011	0.855	0.226
6/7/2011	0.566	0.268
6/14/2011	0.489	0.169
6/21/2011	0.528	0.130

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
6/23/2011		0.120
6/28/2011	0.362	0.142
7/6/2011	0.361	0.118
7/12/2011	0.280	0.143
7/19/2011	0.251	0.151
7/26/2011	0.287	0.122
8/2/2011	0.299	0.127
8/9/2011	0.368	0.143
8/16/2011	0.274	0.120
8/23/2011	0.231	0.108
8/30/2011	0.323	0.103
9/6/2011	0.235	0.092
9/13/2011	0.238	0.104
9/20/2011	0.538	0.125
9/27/2011	0.334	0.144
10/5/2011	0.288	0.101
10/11/2011	0.286	0.081
10/18/2011	0.434	0.088
10/25/2011	0.261	0.069
11/1/2011	0.359	0.060
11/8/2011	0.803	0.091
11/15/2011	0.368	0.103
11/22/2011	0.718	0.157
11/29/2011	0.568	0.150
12/6/2011	0.490	0.146
12/13/2011	1.100	0.138
12/20/2011	1.130	0.149
12/27/2011	0.533	0.216
1/3/2012	0.439	0.216
1/10/2012	0.427	0.268
1/17/2012	0.439	0.190
1/24/2012	0.434	0.200
1/31/2012	0.345	0.180
2/7/2012	0.356	0.158
2/14/2012	0.385	0.183
2/21/2012	0.415	0.170
2/28/2012	0.365	0.160
3/6/2012	0.491	0.146
3/13/2012	0.476	0.151
3/20/2012	1.010	0.172
3/27/2012	0.844	0.266

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
4/3/2012	0.554	0.189
4/10/2012	0.508	0.207
4/18/2012	0.848	0.148
4/24/2012	0.613	0.193
5/1/2012	0.783	0.161
5/8/2012	0.511	0.201
5/15/2012	0.394	0.168
5/22/2012	0.363	0.170
5/29/2012	ND	0.161
6/6/2012	0.316	0.152
6/12/2012	0.311	0.141
6/19/2012	0.352	0.111
6/26/2012	0.301	0.128
7/3/2012	0.248	0.109
7/10/2012	0.264	0.115
7/17/2012	0.322	0.128
7/24/2012	0.262	0.082
7/31/2012	0.237	0.126
8/7/2012	0.253	0.115
8/14/2012	0.276	0.103
8/21/2012	0.290	0.067
8/28/2012	0.208	0.084
9/5/2012	0.767	0.066
9/11/2012	0.306	0.065
9/18/2012	0.412	0.083
9/25/2012	0.329	0.073
10/2/2012	0.292	0.048
10/9/2012	0.264	0.063
10/16/2012	0.480	0.074
10/23/2012	0.341	0.064
10/30/2012	0.329	0.074
11/6/2012	0.321	0.082
11/13/2012	0.425	0.093
11/20/2012	0.326	0.124
11/27/2012	0.317	0.127
12/4/2012	0.344	0.178
12/11/2012	0.325	0.131
12/20/2012	0.346	0.136
12/26/2012	0.305	0.094
1/2/2013	0.327	0.106
1/9/2013	0.286	0.120

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
1/15/2013	0.365	0.127
1/22/2013	0.310	0.150
1/29/2013	0.299	0.094
2/5/2013	0.391	0.149
2/12/2013	0.408	0.133
2/19/2013	0.374	0.141
2/26/2013	0.778	0.028
3/5/2013	0.595	0.214
3/12/2013	0.738	0.236
3/19/2013	0.461	0.233
3/26/2013	0.516	0.185
4/2/2013	0.668	0.195
4/9/2013	0.460	0.220
4/16/2013	0.470	0.200
4/23/2013	0.730	0.250
4/30/2013	0.840	0.270
5/8/2013	0.620	0.270
5/14/2013	0.610	0.240
5/21/2013	0.740	0.200
5/28/2013	0.640	0.210
6/4/2013	0.790	0.260
6/11/2013	0.550	0.280
6/18/2013	0.730	0.230
6/25/2013	0.520	0.210
7/2/2013	0.340	0.200
7/9/2013	0.320	0.150
7/16/2013	0.240	0.110
7/23/2013	0.270	0.150
7/30/2013	0.630	0.170
8/6/2013	0.730	0.120
8/13/2013	0.500	0.170
8/20/2013	0.440	0.170
8/27/2013	0.340	0.170
9/4/2013	0.290	0.120
9/10/2013	0.300	0.160
9/17/2013	0.320	0.170
9/24/2013	0.320	0.150
10/2/2013	0.270	0.120
10/8/2013	0.340	0.100
10/15/2013	0.380	0.130
10/22/2013	0.320	0.130

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
10/29/2013	0.660	0.160
11/5/2013	0.780	0.170
11/12/2013	0.360	0.190
11/19/2013	0.380	0.190
11/26/2013	0.350	0.190
12/3/2013	0.270	0.160
12/10/2013	0.310	0.190
12/17/2013	0.430	0.180
12/24/2013	0.570	0.160
12/31/2013	0.380	0.180
1/7/2014	0.400	0.210
1/14/2014	0.540	0.210
1/21/2014	0.530	0.170
1/28/2014	0.350	0.200
2/4/2014	0.390	0.180
2/11/2014	0.320	0.160
2/18/2014	0.340	0.140
2/25/2014	0.340	0.150
3/4/2014	0.300	0.140
3/11/2014	0.380	0.130
3/18/2014	0.650	0.120
3/25/2014	0.390	0.190
4/2/2014	0.350	0.210
4/8/2014	0.350	0.150
4/15/2014	0.340	0.110
4/22/2014	0.320	0.130
4/29/2014	0.320	0.120
5/6/2014	0.260	0.130
5/13/2014	0.470	0.100
5/20/2014	0.340	0.110
5/27/2014	0.490	0.100
6/3/2014	0.530	0.110
6/10/2014	0.780	0.089
6/17/2014	0.370	0.120
6/24/2014	0.400	0.110
7/2/2014	0.320	0.110
7/8/2014	0.290	0.096
7/15/2014	0.300	0.210
7/22/2014	0.260	0.110
7/29/2014	0.270	0.120
8/5/2014	0.250	0.078

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
8/12/2014	0.300	0.100
8/19/2014	0.260	0.077
8/26/2014	0.250	0.120
9/3/2014	0.470	0.062
9/9/2014	0.310	0.084
9/16/2014	0.290	0.085
9/23/2014	0.400	0.085
9/30/2014	0.240	0.057
10/2/2014	0.900	0.056
10/7/2014	0.280	0.086
10/14/2014	0.960	0.130
10/21/2014	0.400	0.200
10/28/2014	0.470	0.130
11/4/2014	0.560	0.150
11/11/2014	0.350	0.120
11/18/2014	0.350	0.120
11/25/2014	0.580	0.092
12/2/2014	0.310	0.110
12/9/2014	0.370	0.150
12/16/2014	0.500	0.120
12/23/2014	0.480	0.110
12/30/2014	0.430	0.110
1/6/2015	0.480	0.110
1/13/2015	0.380	0.120
1/20/2015	0.560	0.120
1/27/2015	0.350	0.120
2/3/2015	0.360	0.110
2/10/2015	1.200	0.140
2/17/2015	0.330	0.140
2/24/2015	0.450	0.140
3/3/2015	0.420	0.130
3/10/2015	0.480	0.140
3/17/2015	0.580	0.120
3/24/2015	0.530	0.110
3/31/2015	0.500	0.130
4/7/2015	0.720	0.140
4/14/2015	0.540	0.180
4/21/2015	1.100	0.150
4/28/2015	0.830	0.130
5/5/2015	0.530	0.160
5/12/2015	0.530	0.120

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
5/19/2015	0.770	0.120
5/29/2015	1.300	0.110
6/2/2015	0.960	0.220
6/9/2015	0.640	0.210
6/16/2015	0.600	0.180
6/23/2015	0.690	0.180
6/30/2015	0.580	0.150
7/7/2015	0.500	0.110
7/14/2015	0.530	0.110
7/21/2015	0.350	0.097
7/28/2015	0.300	0.085
8/4/2015	0.310	0.064
8/11/2015	0.260	0.075
8/18/2015	0.260	0.110
8/25/2015	0.630	0.110
9/1/2015	0.360	0.110
9/8/2015	0.400	0.085
9/15/2015	0.300	0.094
9/22/2015	0.300	0.110
9/29/2015	0.360	0.140
10/6/2015	0.230	0.130
10/13/2015	0.260	0.140
10/20/2015	0.210	0.140
10/27/2015	0.260	0.130
11/3/2015	0.270	0.110
11/10/2015	0.270	0.120
11/17/2015	0.670	0.130
11/24/2015	0.360	0.110
12/2/2015	0.650	0.120
12/8/2015	0.370	0.170
12/15/2015	0.930	0.099
12/22/2015	0.390	0.110
12/29/2015	1.100	0.110
1/5/2016	0.660	0.170
1/12/2016	0.590	0.170
1/19/2016	0.480	0.190
1/26/2016	0.430	0.190
2/2/2016	0.370	0.190
2/9/2016	0.290	0.170
2/16/2016	0.280	0.180
2/23/2016	0.330	0.160

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
3/2/2016	0.240	0.140
3/8/2016	0.270	0.100
3/15/2016	0.290	0.110
3/22/2016	0.360	0.095
3/29/2016	0.360	0.140
4/5/2016	0.320	0.140
4/12/2016	0.390	0.150
4/19/2016	0.390	0.170
4/26/2016	0.340	0.110
5/3/2016	0.530	0.170
5/10/2016	0.380	0.110
5/17/2016	0.720	0.096
5/24/2016	0.430	0.200
5/31/2016	0.440	0.140
6/7/2016	0.480	0.170
6/14/2016	0.390	0.150
6/21/2016	0.420	0.180
6/28/2016	0.370	0.110
7/5/2016	0.440	0.110
7/12/2016	0.380	0.086
7/19/2016	0.340	0.120
7/26/2016	0.290	0.120
8/2/2016	0.320	0.120
8/9/2016	0.510	0.080
8/16/2016	0.380	0.100
8/23/2016	0.400	0.110
8/30/2016	0.270	0.120
9/6/2016	0.270	0.130
9/13/2016	0.320	0.100
9/20/2016	0.350	0.120
9/27/2016	0.320	0.096
10/6/2016	0.340	0.190
10/11/2016	0.340	0.093
10/18/2016	0.340	0.180
10/25/2016	0.340	0.100
11/1/2016	0.340	0.098
11/8/2016	0.400	0.120
11/15/2016	0.300	0.082
11/22/2016	0.280	0.085
11/29/2016	0.310	0.074
12/6/2016	0.250	0.081

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
12/13/2016	0.340	0.100
12/20/2016	0.300	0.120
12/27/2016	0.270	0.094
1/3/2017	0.260	0.110
1/10/2017	0.220	0.130
1/17/2017	0.720	0.170
1/24/2017	0.580	0.170
1/31/2017	0.390	0.180
2/8/2017	0.340	0.140
2/14/2017	0.310	0.150
2/21/2017	0.290	0.096
2/28/2017	0.280	0.130
3/7/2017	0.320	0.160
3/14/2017	0.250	0.140
3/21/2017	0.250	0.120
3/28/2017	0.330	0.089
4/4/2017	0.380	0.120
4/11/2017	0.290	0.150
4/18/2017	0.350	0.100
4/25/2017	0.590	0.250
5/2/2017	0.260	0.550
5/9/2017	0.650	0.500
5/16/2017	0.500	0.240
5/23/2017	0.710	0.380
5/30/2017	0.580	0.270
6/6/2017	0.500	0.170
6/13/2017	0.360	0.160
6/20/2017	0.360	0.150
6/27/2017	0.350	0.120
7/5/2017	0.440	0.090
7/11/2017	0.300	0.100
7/18/2017	0.340	0.076
7/25/2017	0.250	0.100
8/1/2017	0.240	0.095
8/8/2017	0.260	0.089
8/15/2017	0.280	0.130
8/22/2017	0.320	0.091
8/29/2017	0.250	0.098
9/6/2017	0.220	0.110
9/12/2017	0.260	0.110
9/19/2017	0.250	0.078

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
9/26/2017	0.220	0.072
10/3/2017	0.440	0.065
10/10/2017	0.330	0.099
10/17/2017	0.290	0.076
10/24/2017	0.340	0.091
10/31/2017		0.082
11/7/2017	0.260	0.069
11/14/2017	0.220	0.074
11/21/2017	0.260	0.088
11/28/2017	0.240	0.097
12/5/2017	0.240	0.088
12/12/2017	0.210	0.086
12/19/2017	0.260	0.084
12/26/2017	0.360	0.062
1/3/2018	0.270	0.150
1/9/2018	0.280	0.099
1/16/2018	0.250	0.120
1/23/2018	0.360	0.170
1/30/2018	0.320	0.120
2/6/2018	0.310	0.120
2/13/2018	0.270	0.130
2/20/2018	0.750	0.089
2/27/2018	0.860	0.180
3/6/2018	0.510	0.130
3/13/2018	0.420	0.130
3/20/2018	0.350	0.092
3/27/2018	0.740	0.110
4/3/2018	0.440	0.072
4/10/2018	0.350	0.110
4/17/2018	0.360	0.100
4/24/2018	0.350	0.094
5/2/2018	0.360	0.066
5/8/2018	0.380	0.096
5/15/2018	0.450	0.160
5/22/2018	0.480	0.082
5/29/2018	0.380	0.077
6/5/2018	0.840	0.081
6/12/2018	0.710	0.093
6/19/2018	0.310	0.098
6/26/2018	0.310	0.067
7/3/2018	0.260	0.076

	Influent Zinc (mg/L)	Effluent Zinc (mg/L)
7/10/2018	0.002	0.093
7/19/2018	0.270	0.110
7/24/2018	0.210	0.069
7/31/2018	0.280	0.068
8/7/2018	0.260	0.089
8/14/2018	0.400	0.069
8/21/2018	0.800	0.047
8/28/2018	0.410	0.064
9/5/2018	0.410	0.070
9/11/2018	0.590	0.073
9/18/2018	0.440	0.100
9/25/2018	0.390	0.075
10/9/2018	0.300	0.053
10/16/2018	0.310	0.061
10/23/2018	0.300	0.059
10/30/2018	0.270	0.069
11/6/2018	0.360	0.062

Attachment 4. Treatment Cost Information

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Flow (gpm)	800	28		833		160			10,400	
Technology	Biological-Anaerobic	MBR & filtration		Precipitation		Wetlands			TBD	
Pollutant	Selenium	Cadmium	Zinc	Lead	Zinc	Selenium	Arsenic	Mercury	Zinc	Cadmium
In	1.64 lb/day	0.018 mg/l	7.9 mg/l	0.49 mg/l	12 mg/l	0.1 mg/L	0.175 mg/L	0.0008 mg/L	0.2 mg/L	0.001 mg/L
Out	0.55 lb/day	0.0017 mg/l	6.0 mg/l	0.005 mg/l	0.14 mg/l	0.00757 mg/L	0.031 mg/L	ND	0.11 mg/L	0.0004 mg/L
Removal Efficiency	66%	91%	24%	99%	99%	92%	82%	ND	45%	60%
Capital Cost	$ 12,000,000	$ 7,000,000		$ 10,000,000		$ 20,000,000			TBD	
Facility Type	Highly Industrial	Commercial		Light Industry		Highly Industrial			Municipal	
TIC Estimate for POTW	$ 55,900,000	$ 243,800,000		$ 45,500,000		$ 244,800,000			TBD	

Attachment 5. I&I Program Summary

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1.0 EXECUTIVE SUMMARY

The City of Joplin (the City) has made efforts in recent years to reduce inflow and infiltration (I&I) in the wastewater collection system through a sewer rehabilitation program based largely on pipe condition data within some older portions of town. As part of a targeted I&I reduction program, the City conducted flow monitoring in the spring of 2017 to evaluate the current condition of the sewer system and to identify remaining areas of high I&I and metals loadings. Assessment of the City's sanitary sewer system has been documented in this memorandum. This memorandum documents how the flows within the City's sanitary sewer system reacts to rainfall. The objective of the first step in the work plan developed for the City was to identify I&I by means of flow metering and rank basins based on quantity of I&I. Metals sampling of zinc, copper, and lead was also completed at manhole locations where flow meters were installed. Metals concentration data was required for evaluating their impact on the sewer system.

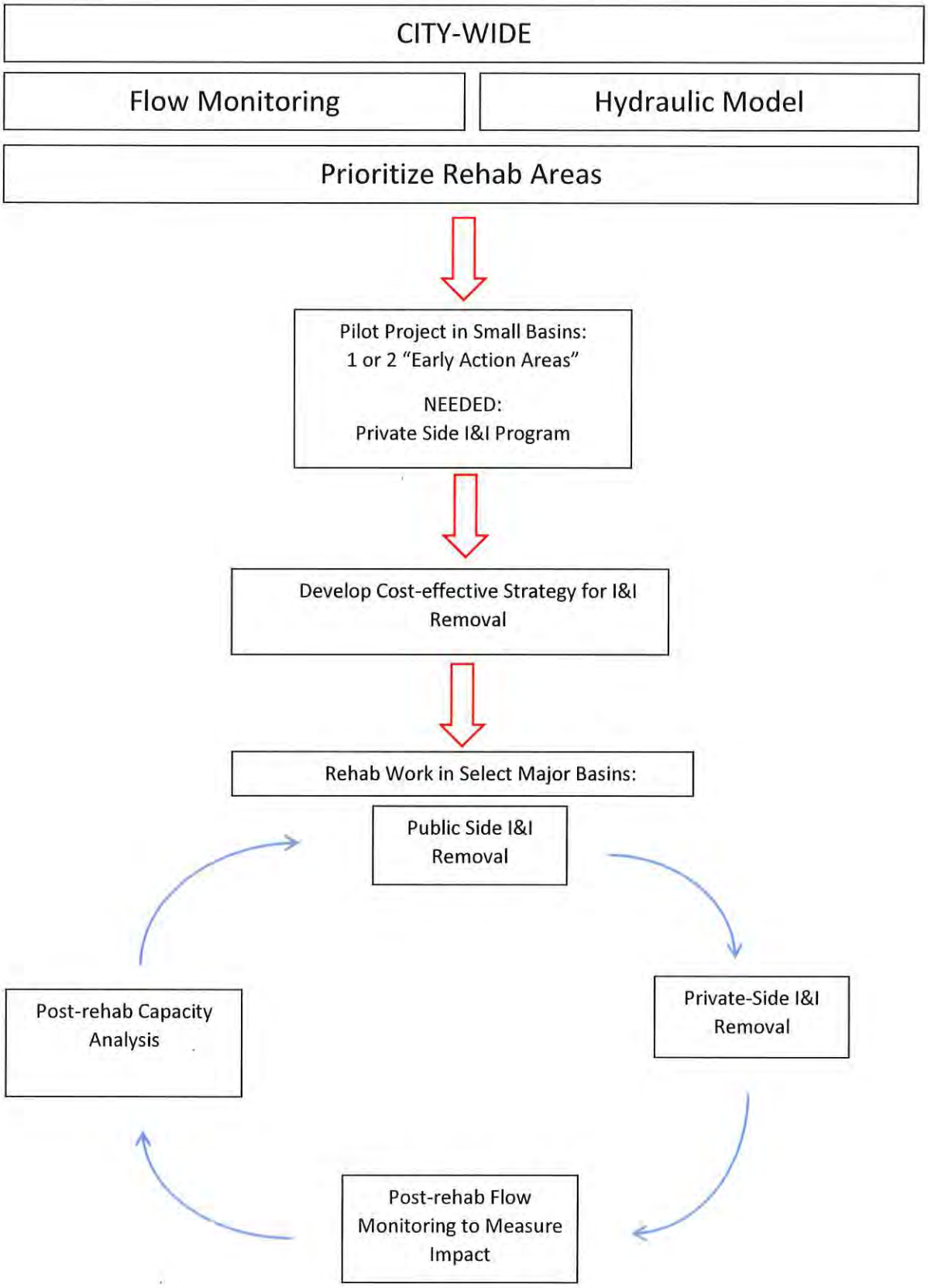
The next steps in the work plan are shown in Figure 1-1. This flow metering data, metals sampling, and I&I analysis will be incorporated into the hydraulic model. The hydraulic model is a tool that can be used to optimize the City's collection system hydraulics.

The hydraulic model will then be used to analyze the system in several ways including:

- Analysis of the metering data will develop a prioritized list of areas for cost-effective I&I removal. The hydraulic model can be used to predict where I&I reduction is more cost effective than other strategies for capital improvements.
- Estimate the incremental and cumulative impacts of I&I reduction efforts to sewer system capacity and level of service.
- Estimate the impacts of rerouting flows from overloaded parts of the system to underutilized parts.
- Evaluate pumping station control logic and SCADA changes and pumping station and/or force main consolidation possibilities.
- Evaluate impacts of future development and population growth on collection system capacity.
- Optimize sewer collection system improvements for size, location, year, and cost.

After the hydraulic model has been developed, reconstruction work can begin in select basins, which will be prioritized by incorporating several factors including, but not limited to, high levels of I&I. As work begins on public infrastructure within any "Early Action Areas", discussions will be initiated regarding efforts to establish a private side I&I program.

FIGURE 1-1


CITY-WIDE
Flow Monitoring
Hydraulic Model
Prioritize Rehab Areas
Pilot Project in Small Basins:
1 or 2 "Early Action Areas"
NEEDED:
Private Side I&I Program
Develop Cost-effective Strategy for I&I Removal
Rehab Work in Select Major Basins:
Public Side I&I Removal
Private-Side I&I Removal
Post-rehab Flow Monitoring to Measure Impact
Post-rehab Capacity Analysis

These three areas (flow monitoring and metals sampling, system hydraulic model and private side I&I program) will all be utilized together to provide the City with additional tools to implement a comprehensive, cost-effective I&I reduction plan for its wastewater collection system.

1.1 Flow and Rainfall Monitoring

Flow and rainfall monitoring was performed to establish a relationship between precipitation (rainfall intensity and rainfall volume) and system flow rates. The system was divided into 51 meter catchments for metering purposes. The flow and rainfall data was collected between March 2017 and June 2017. Figure 3-1 shows the locations of the flow meters.

Flow monitoring was performed to obtain system flow rates during both dry and wet weather conditions. Rainfall monitoring was performed to correlate wet weather flows with rainfall. 35 rainfall events totaling over 25 inches of rain were recorded. Rainfall data is presented in Table 4-3. The flow-rainfall relationship was used to rank the meter catchments by amount of I&I.

1.2 Flow and Rainfall Analysis

The flow analysis deconstructed the flow meter hydrographs into the various components of sanitary sewer system flow (see Figure 4-1.) A typical flow pattern consists of an average daily diurnal pattern where peak flows occur during the morning and late evening.

During rain events, rainwater enters the sanitary sewer collection system through illicit sources. This flow reaction is considered inflow. As the ground becomes saturated, the water begins to seep through additional sources that are further below the surface. This slow seepage is considered infiltration.

1.3 Summary of I&I Assessment

Data from the flow, rainfall and metals testing was analyzed under numerous scenarios and by various methods as described and presented in detail within the report to follow.

Table 1-1 identifies the 5 sewer catchments ranked highest for I&I. within the City sewer system. Figure 1-4 highlights the areas of the system that exceed USEPA's guidelines for infiltration. These rankings can be used to prioritize future investigations and ultimately cost-effective I&I removal projects.

Table 1-1: Top 5 Ranked Total I&I Meter Catchments

Meter Catchment	Basin	Combined I&I Ranking	Combined Inflow Ranking	Combined Infiltration Ranking	Overall Rank
P08-220B	Turkey Creek	1	1	1	1
FMM10-340	Turkey Creek	2	4	2	2
FMK12-170	Turkey Creek	5	5	4	3
FMM09-315	Turkey Creek	6	7	5	4
FMM09-235	Turkey Creek	3	2	16	5
FMM09-255	Turkey Creek	3	2	16	5

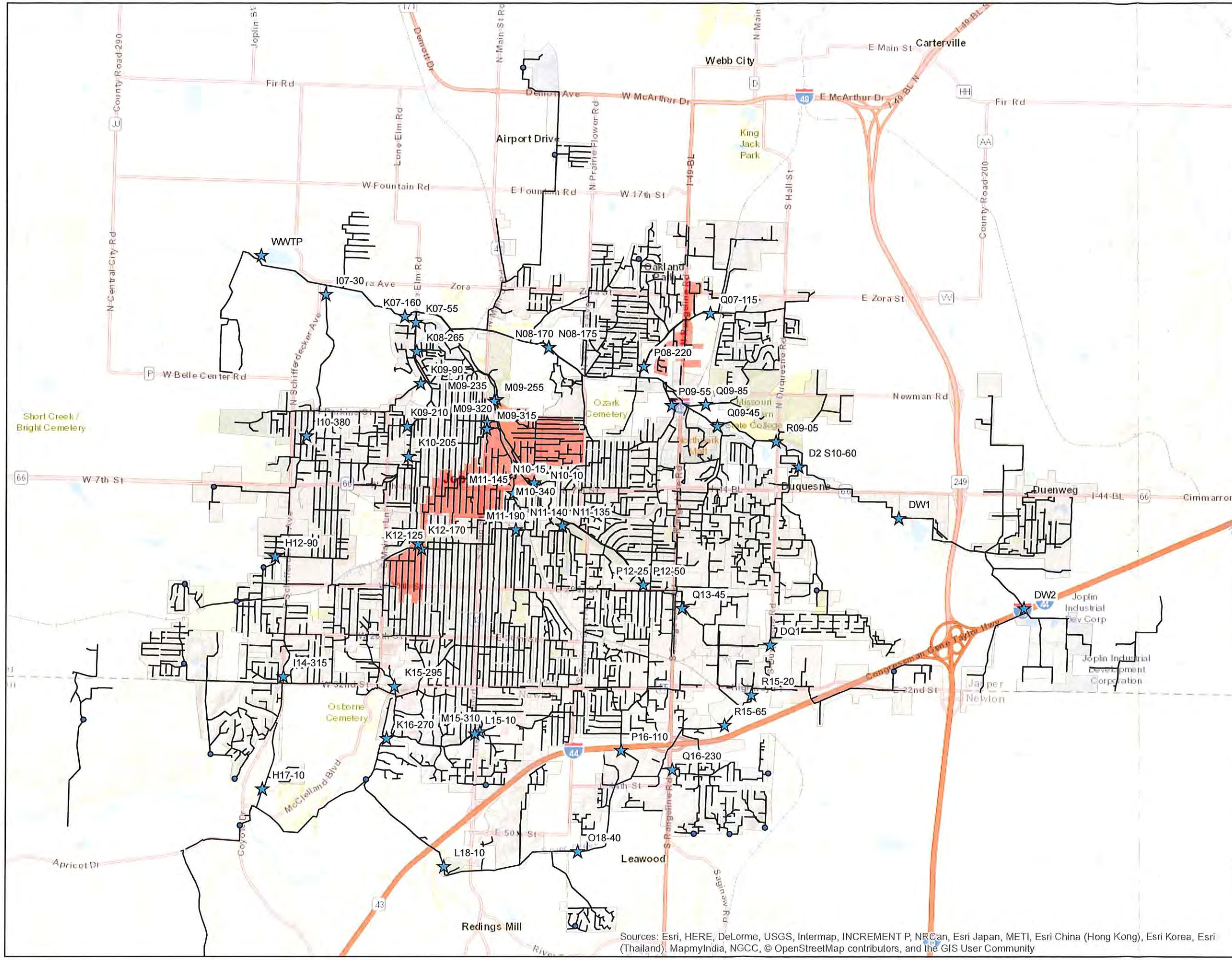
The rankings identified in Table 1-1 were produced by evaluating three I&I volume-to-rainfall indices to eliminate biases in the data to specific meter catchment characteristics, such as large meter catchment area or high linear feet of pipes.

Based on the indices of total I&I volume, inflow volume, and infiltration volume, the individual rankings were cumulated and ranked to produce an overall rank for each meter catchment.

Figure 1-2
City of Joplin
Top 5 Catchments
With Excessive I&I

CITY OF JOPLIN MISSOURI

BURNS McDONNELL



N
W E
S

Legend

- Flow Meters
- Sanitary Sewer
- Tier 1
- Tier 2 and Above

As part of this system-wide flow monitoring effort, metals sampling in the collection system was done to identify basins with high contamination levels of lead, zinc, and copper. Initially, it was thought that a direct correlation would be found between I&I and metals concentrations, and that the findings would be used to develop and implement an overall I&I reduction program which would also reduce the metals loadings. Table 1-2, below, shows that the findings of this investigation do not support this conceptual strategy. Based on the rankings of zinc loadings and I&I, Table 1-2 indicates that there is no relationship between high I&I areas and high metals (zinc) loading areas. Accordingly, reducing excessive I&I for capacity purposes will make sense, but reducing I&I to reduce metals loadings may result in increased metals loadings to area streams, since groundwater tainted with metals would bypass the wastewater treatment process. Thus, the result of removing infiltration from the sewer system may result in persistent, elevated background metals levels in area waters.

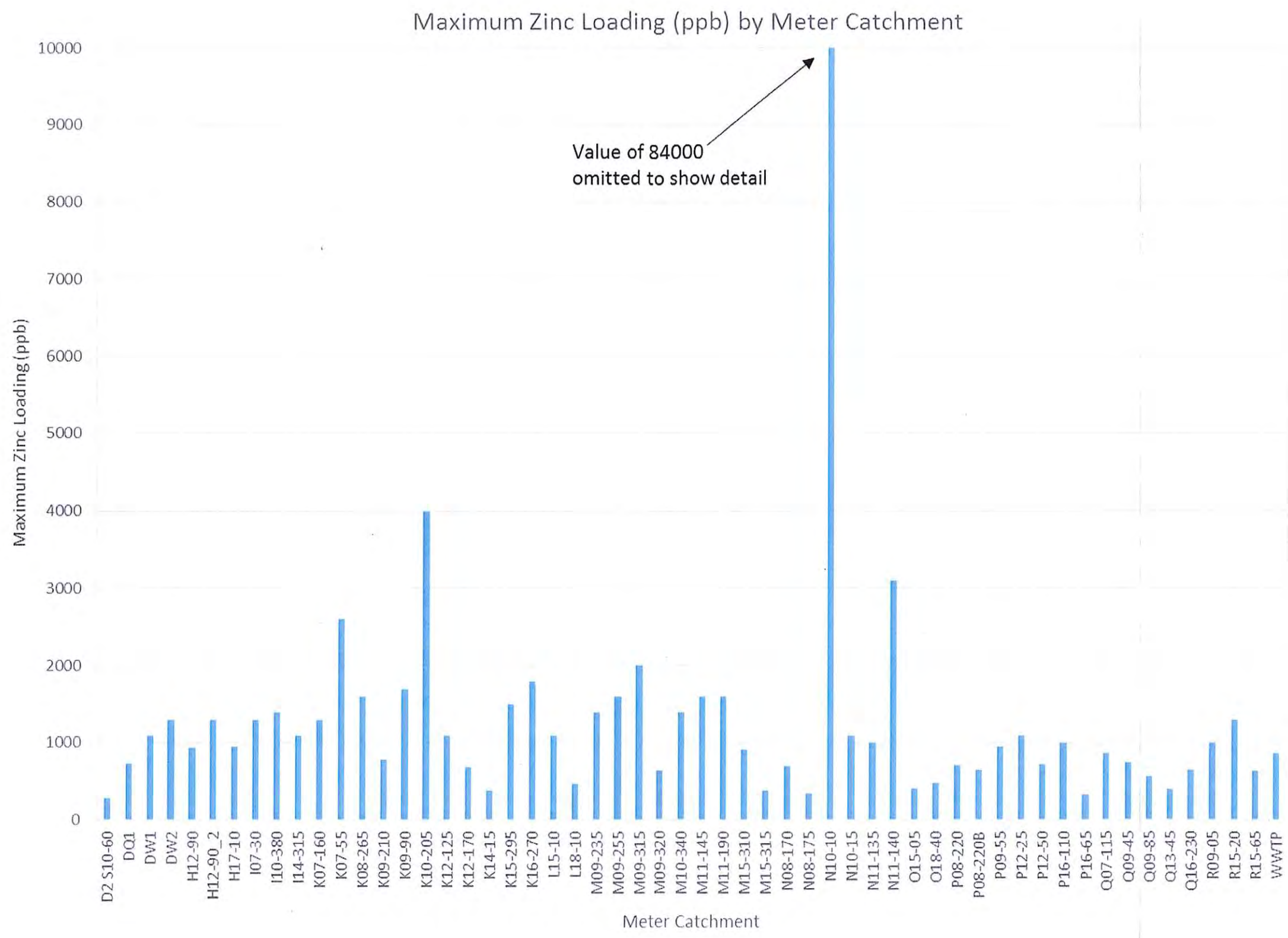
Years ago, local mine tailings or "chat" as it is locally known, were used as bedding and backfill for sewer lines. Metals from those tailings/ 'chat' are now leaching into the sewers and being treated at the treatment plant. In fact, these mine tailings/ 'chat' were prevalently used for all sorts of infrastructure throughout the City in applications such as for storm sewers, house foundations, asphalt, concrete, street construction, gas lines, and other backfill uses. The ubiquitous use of this material around the City is, in part, the reason that the instream concentrations are higher than those in the treatment plant discharge.

Table 1-2 presents the maximum and average zinc loadings in parts per billion (ppb) and ranking of the top five associated meter catchments based on maximum zinc loading. The associated I&I ranking for these meter catchments is also included. Rankings are from highest to lowest priority and are based on cumulative values. Figure 1-3 presents the maximum zinc loadings by meter catchment.

Table 1-2: Top 5 Ranked Zinc Loading Meter Catchments

Meter Catchment	Cumulative Zinc (ppb)		Zinc Rank	I&I Rank
	Maximum	Average		
N10-10	84,000	8,248	1	8
K10-205	4,000	1,737	2	33
N11-140	3,100	1,188	3	21
K07-55	2,600	1,390	4	15
M09-315	2,000	621	5	4

Figure 1-3: Maximum Zinc Loading by Meter Catchment

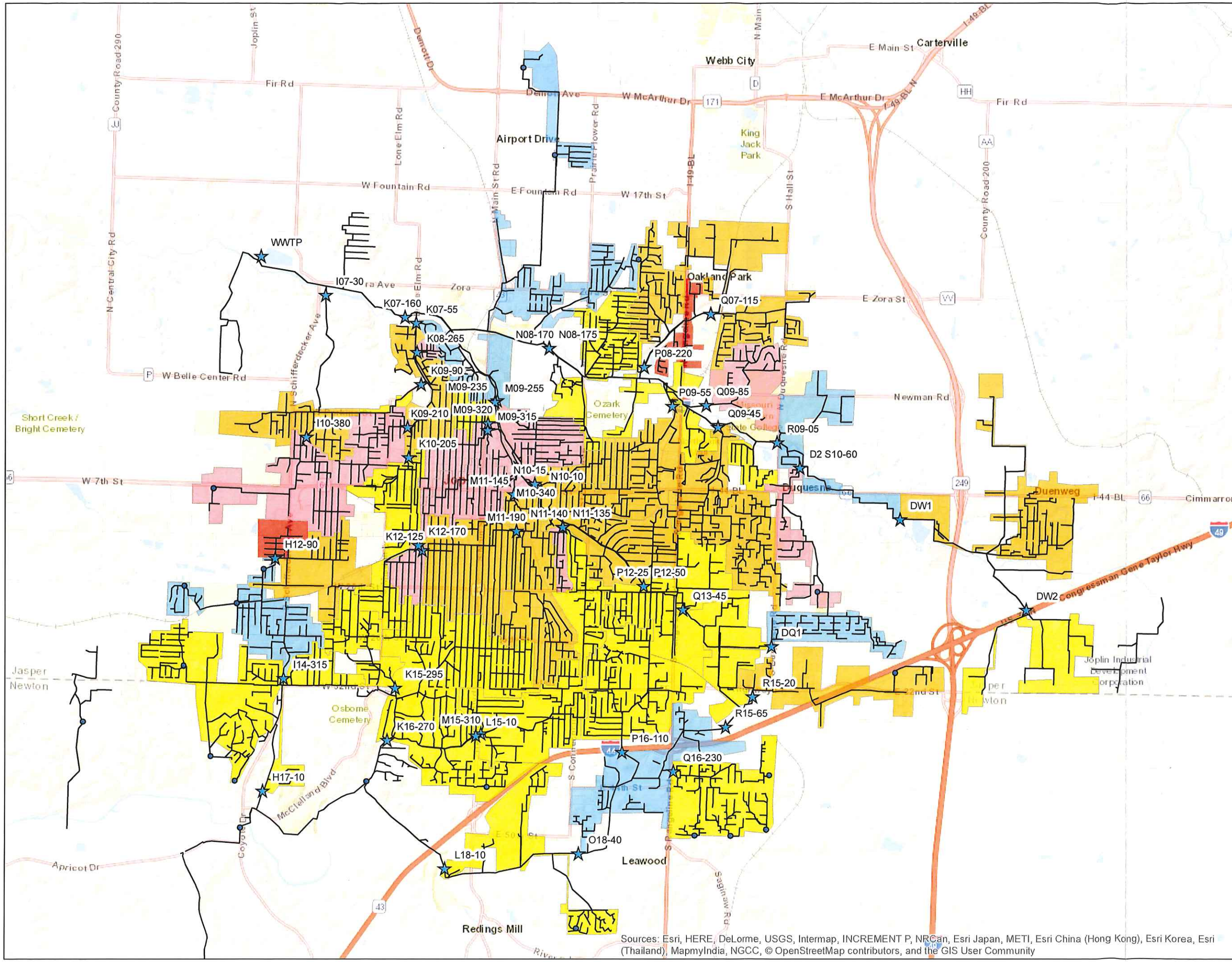


The I&I rankings, not the metals rankings, should serve as a guide for prioritization of future investigation and determination of projects for ultimately cost-effective I&I removal. While the six meter catchments listed in Table 1-1 represent the highest recorded levels of I&I within the system, it should be noted that 47 of the 51 meter catchments were found to have infiltration rates that exceed established USEPA recommended guidelines. Figure 1-4 presents areas of the City's wastewater collection system that exceed the established USEPA infiltration guidelines.

Figure 1-4
City of Joplin Volume of Infiltration per Meter Catchment

CITY OF JOPLIN MISSOURI

BURNS McDONNELL



1.4 Metals Sampling and Analysis

Metals sampling was conducted concurrent with the flow monitoring, and at the same locations. Samples were taken during routine flow monitor maintenance visits and tested for zinc, lead, and copper. The top ten highest prioritized areas were visually compared to rainfall events recorded during the sampling period. Prioritization was based on incremental metal concentrations.

1.5 Metals Sampling Results

The lag time in rainfall peak and zinc loading peak may be indicative of groundwater influences. This is somewhat corroborated by the elevated loadings which are sustained over several weeks. Hydraulic modeling of flows and pollutants may provide clarification of the operational mechanisms causing the elevated readings.

1.6 Zinc Pollutant and I&I Rankings

The meter catchments were ranked in order of severity of I&I and recorded zinc loadings for the purposes of identifying cost-effective locations for proposed sewer improvements and rehabilitation.

Attachment 6. USGS Data

Date	Dissolved Zinc (µg/L)
11/2/1999	408
5/23/2000	336
7/26/2000	236
11/29/2000	377
5/23/2001	275
11/27/2001	199
5/21/2002	457
7/24/2002	383
11/6/2002	413
5/13/2003	382
7/8/2003	320
11/4/2003	304
5/11/2004	488
7/20/2004	255
11/16/2004	503
5/23/2005	150
7/25/2005	190
11/14/2005	257
5/24/2006	336
7/26/2006	168
11/13/2006	185
5/15/2007	443
7/11/2007	294
11/14/2007	306
5/5/2008	409
7/8/2008	356
10/6/2008	288
5/21/2009	413
7/15/2009	236
10/19/2009	468
5/17/2010	447
7/19/2010	164
10/4/2010	190
5/25/2011	630
7/7/2011	308
10/17/2011	252

Date	Dissolved Zinc (µg/L)
5/15/2012	294
7/9/2012	162
10/15/2012	317
5/13/2013	468
7/29/2013	294
10/21/2013	318
5/20/2014	227
7/30/2014	337
10/21/2014	412
5/13/2015	596
7/28/2015	236
10/28/2015	368
5/2/2016	397
7/13/2016	199
10/24/2016	317
5/16/2017	348
7/18/2017	264
10/3/2017	279
5/22/2018	258
7/24/2018	195
10/17/2018	317

MPUA

Serving Municipal Utilities

September 11, 2019

Department of Natural Resources
Attn: Angela Falls
PO Box 176
Jefferson City, MO 65102

Dear Mrs. Falls:

The Missouri Public Utility Alliance (MPUA) is in support of the City of Joplin Variance CWC-V-19 that was placed on public notice on August 12, 2019. We recognize the need for the variance from the current numeric water quality criteria for total recoverable zinc due to human caused conditions that prevent the attainment of the use of protection of aquatic life. The widespread contamination of Turkey Creek caused by historic mining activities is justification to use 40 CFR §131.10(g)(3) as the basis for the variance. MPUA is in support of the zinc pollutant minimization plan as written. The evaluation of potential non-domestic sources of zinc contributing to the publicly owned treatment works will allow the city to collect information on potential contributors. This allows the community time to develop an informed plan on how best to reduce zinc from entering into the system. The additional control measures identified are appropriate measures for the city to take in order to continuously reduce the amount of zinc entering into the collection system and the wastewater treatment plant. We support the use of the greatest pollutant reduction achievable method and the effluent concentrations derived using the 95th and 99th percentiles of the past 5 years of zinc effluent concentration data reported at the Joplin WWTP permitted outfall.

Thank you for the opportunity to comment on the City of Joplin Variance CWC-V-19. MPUA supports necessary water quality standard variances that are written in compliance with 40 CFR § 131.14 and 10 CSR 20-7.031(12) with achievable pollutant minimization plans. We understand that unique circumstances call for unique solutions, including, practicable and measurable improvements to wastewater and collection system infrastructure that facilitate water quality restoration over time. Please contact me with any questions or comments you might have.

Sincerely,

Lacey Hirschvogel

Lacey Hirschvogel
Environmental and Public Policy Manager
Missouri Public Utility Alliance
573-825-7244

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

SEP 13 2019

Mr. Chris Weiberg, Director
Water Protection Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missousri 65102-0176

Re: City of Joplin Variance CWC-V-1-19 Comments

Dear Mr. Weiberg:

The U.S. Environmental Protection Agency appreciates the opportunity to provide comments on the Joplin Variance CWC-V-1-19. The variance is being proposed in order to address zinc non-compliance at the Joplin Turkey Creek Wastewater Treatment Plant.

We appreciate the modifications that occurred following our previous discussion and offer the following in regard to the Variance that is currently on Public Notice and open for comment:

1. We believe a simpler path to achieve the same result would be a Schedule of Compliance in a permit, in lieu of a variance. As you are aware, the variance is a water quality standard that requires submission and approval by EPA, adoption via the prescribed public notification requirements, adoption as a Missouri regulation via Missouri's regulation adoption process, and the eventual repeal of the variance after its 10-year term.

   In contrast, a permit with a SOC could be placed on public notice for 30-days and issued assuming no substantial comments. Like the variance and per 40 CFR 122.47, the SOC must require compliance as soon as possible. "As soon as possible" may span multiple permit cycles - in this case two cycles, or 10 years. Thus, a permit with an SOC can be a more expedient tool in this instance.

2. If a variance is the chosen mechanism for addressing the zinc non-compliance, items that could bolster the variance include:

   a. More robust justification for the 10-year variance timeframe. Since the justification for the variance is Factor 3 - "*Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied*" - the case is being made that the overall disruption due to legacy mining in the area is the basis for Factor 3, not the discharge from the Turkey Creek Public Owned Treatment Works. In Appendix C of the Variance,

the City's consultant makes the statements on pages 17 and 18 of their evaluation that:

i. "*Thus, even when the CERCLA remediation of the waste piles is completed, there will still be extensive soil and groundwater contamination throughout the area. This will likely* [emphasis added] *continue to affect water quality in the Turkey Creek for the foreseeable future.*"

ii. *The available data suggest that the water quality criteria for zinc are unlikely* [emphasis added] *to be attainable for many years.*"

Has the Superfund program at the Missouri Department of Natural Resources performed any studies on the remediation of Turkey Creek's zinc impairment-at least for a period of time longer than the variance? Are there any other definitive studies?

3. On Page 12 of the Zinc Minimization Plan there is a statement that "*The City is committed to an I&I program that will minimize entry of zinc-containing infiltration and will continue to invest in collection system rehabilitation projects in accordance with the 2026 plan.*" Does the plan require a minimum amount of funding, or a minimum number of miles of sewer rehab be completed each year? If not, it might be prudent to specify in the ZMP of the permit that the City will spend $X or rehab X miles of targeted sewer each year.

4. The first report to MoDNR on the status of the Variance appears to be December 21, 2023, – just prior to the mandatory 5-year re-evaluation. However, since there are annual actions required of the permittee, it might prove to be prudent to require annual reports to ensure all planned activities are taking place annually.

The EPA appreciates Missouri's continuing efforts to protect and restore water quality and the state's overall commitment to the WQS review and revision process. We look forward to working with the MDNR on the Joplin variance or, alternatively a permit with a SOC as well as future WQS issues. If you would like to discuss the above comments in this letter, please contact me at 913-551-7146, or at robichaud.jeffery@epa.gov.

Sincerely,

Jeffery Robichaud
Director
Water Division

cc: Angela Falls, MDNR
Amy Shields, EPA R7

Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Michael L. Parson, Governor
Carol S. Comer, Director

NOV 26 2019

Mr. Jeffery Robichaud, Director
Water Division
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, KS 66219

Dear Mr. Robichaud,

Thank you for your letter dated September 13, 2019, in which you commented on the draft Joplin Variance CWC-V-1-20. Your comments are summarized below with our responses.

1. **A simpler path to achieve the same result would be a Schedule of Compliance in a permit, in lieu of a variance.** The Missouri Department of Natural Resources agrees that establishing a Schedule of Compliance (SOC) in a permit is an additional compliance tool other than a water quality standards variance; however, following discussions with the Department about both options, the City of Joplin prefers taking the variance route.

2. **A more robust justification for the 10-year variance timeframe could bolster the variance.** The discharger-specific Joplin variance sets the term at 10 years to allow for two permit terms with one variance reevaluation in between. The City of Joplin will be working on reducing the levels of zinc entering their collection system, which is the activity that sets the term of the variance. Activities related to remediation of the mine waste piles do not set the term of this variance as soil and groundwater contamination will continue to affect the water quality in Turkey Creek for many years into the future.

3. **It might be prudent to specify in the Zinc Minimization Plan permit requirement that the City will spend $X or rehabilitate X miles of targeted sewer each year.** The Department will require through the permit that the City of Joplin implement activities in their Zinc Minimization Plan and identify and reduce sources of inflow and infiltration into their collection system; however, we do not want to dictate the manner in which the city conducts their work. The Department finds it is best when these plans are adaptive, and requiring something specific such as miles of collection system would make the plan less flexible.

Recycled paper

4. **The first report to the Department on the status of the variance appears to be December 31, 2023; however, it might be prudent to require annual reports to ensure all planned activities are taking place annually.** December 31, 2023, is the deadline that the City of Joplin has established in their Zinc Minimization Plan to have the details of their plan finalized and reported to the Department. This requirement will be established in their permit as well as a requirement to report annually on efforts made to identify and reduce inflow and infiltration into the collection system. Annual reporting will be a requirement in the permit and it is stated as such on page 2 of the variance under "Variance Requirements."

We appreciate your comments and hope this letter adequately responds to your concerns. If you have any questions, please contact Ms. Angela Falls, of my staff, by phone at 573-751-1419, by e-mail at angela.falls@dnr.mo.gov, or by mail at Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, MO 65102. Thank you.

Sincerely,

WATER PROTECTION PROGRAM

Chris Wieberg
Director

CW:afh

Tab G2

Missouri Clean Water Commission Meeting
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
Jefferson City, MO 65101
January 9, 2020

City of Bolivar Variance Request CWC-V-3-20
Bolivar Wastewater Treatment Facility

Issue: The City of Bolivar submitted a variance application on October 25, 2019 requesting a water quality standards (WQS) variance for the Bolivar Wastewater Treatment Facility, Missouri State Operating Permit MO-0022373. The variance is from the from the underlying water quality standards utilized for the development of the Piper Creek Total Maximum Daily Load (TMDL) wasteload allocations for total nitrogen, total phosphorus, and 5-day carbonaceous biochemical oxygen demand for the protection of aquatic life use. The Department seeks the Clean Water Commission's decision to grant or deny this variance.

Background: A WQS variance is a tool that may be used to improve water quality over time. Variances establish time-limited criteria that provide dischargers the time and flexibility to make incremental water quality improvements reflecting the best that can be achieved in that given time period. There are seven factors that can be used when considering a WQS variance. The City of Bolivar is requesting a variance based on the following factor: Controls more stringent than those required by sections 301(b) and 306 of the federal Clean Water Act would result in substantial and widespread economic and social impact.

The City of Bolivar has requested a 24-year term for this variance. During this term, permit limits that would typically be based on the underlying water quality standards utilized for the development of the Piper Creek TMDL wasteload allocations would be replaced with limits based on the "highest attainable condition" (HAC) of the facility. The City of Bolivar will also develop and implement a Pollutant Minimization Program (PMP), which is a structured set of activities to improve processes and pollution controls that will prevent and reduce pollutant loadings. The HAC and PMP will ensure that implementation of the variance will not result in the lowering of existing water quality. The Department presented the variance and supporting information to the Commission via memorandum dated October 30, 2019, along with a recommendation for approval at a future meeting following public notice.

The variance documents and supporting information were placed on 30 day public notice October 28, 2019. The Department received no comments.

The Department is recommending the Commission approve the variance. Once a WQS variance is approved, it must be incorporated into state regulation, which will include a second public notice period and CWC approval as a part of the rulemaking package.

Recommended Action: The Department recommends the Commission grant the Bolivar Water Quality Standards Variance as proposed.

Suggested Motion Language: The Department suggests the Commission motion to grant the City of Bolivar Variance CWC-V-3-20 as proposed.

List of Attachments: Final City of Bolivar Variance CWC-V-3-20

Missouri Department of Natural Resources
City of Bolivar Variance CWC-V-3-20
Bolivar Wastewater Treatment Facility

The Missouri Department of Natural Resources and the Missouri Clean Water Commission hereby adopts a Water Quality Standards (WQS) variance for Missouri State Operating Permit #MO-0022373 from the underlying water quality standards utilized for the development of the Piper Creek Watershed Total Maximum Daily Load (TMDL) wasteload allocations (WLAs) for total nitrogen, total phosphorus, and 5-day biochemical oxygen demand (BOD_5) for the protection of aquatic life use.

Bolivar Wastewater Treatment Facility (WWTF)

Permit Number: MO-0022373
County: Polk

Treatment Type: Activated sludge
Treatment Components: Manual basket screen, influent pump station, mechanical bar screen, manual bar screen, grit removal unit, two oxidation ditches, two final clarifiers, ultraviolet disinfection, cascade reaeration, effluent pump station (for high stream flow events), five aerobic sludge digesters, and biosolids are land applied or hauled to another solids handling facility.
Design Flow: 2,550,000 gallons per day

Town Branch

12-digit Hydrologic Unit Code (HUC) and Name: 10290107-0303, Piper Creek
Water Body Identification (WBID) Number and Hydrologic Class: WBID 3822, Class P
Designated Uses: Protection of aquatic life – warm water habitat, human health protection, irrigation, livestock and wildlife protection, whole body contact recreation, and secondary contact recreation

Impairments: A TMDL was developed and approved in 2010 for organic sediment and unknown impairments in Piper Creek. The TMDL can be found here: https://dnr.mo.gov/env/wpp/tmdl/docs/3822-town-br-1444-piper-ck-tmdl.pdf. The TMDL established the following WLAs for Bolivar WWTF:

Pollutant	Concentration Limits	WLA at Design Flow	Variance
$CBOD_5$*	4.03 mg/L	86 lbs/day	Yes
$NBOD_5$*	1.17 mg/L	25 lbs/day	Yes
Total Nitrogen	0.289 mg/L	6.17 lbs/day	Yes
Total Phosphorus	0.007 mg/L	0.15 lbs/day	Yes
Ammonia	1.4 mg/L	30 lbs/day	No
TSS	27 mg/L	575 lbs/day	No

*5-day Nitrogenous Biochemical Oxygen Demand ($NBOD_5$) is the difference between BOD_5 and 5-day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$). BOD_5 was used in Bolivar's variance request and will be used for this variance.

Factor Precluding Attainment

Factor: [40 CFR Section 131.10(g)(6)] Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact. The City of Bolivar evaluated various wastewater treatment alternatives for the improvement of their current facility, to address peak flows, and for nutrient removal.

Alternative I – Chemical Phosphorus Removal
Alternative II – Biological Nutrient Removal
Alternative III – Enhanced Nutrient Removal
Alternative IV – Limits of Technology

Each alternative includes base improvements to the current facility and wet weather storage. See Appendix C – City of Bolivar's Request for Variance from the Piper Creek Total Maximum Daily Load for more detailed information on treatment alternatives.

Anticipated effluent quality for each of these treatment alternatives are as follows:

Pollutant	Average Effluent Concentrations (mg/L) for each Alternative					
	TMDL WLA	Base and Wet Weather Only	I	II	III	IV
BOD_5	5.2	25	25	10	5	3
Total Nitrogen	0.289	18	18	10	5	3
Total Phosphorus	0.007	2.5	1	1	0.5	0.1

The TMDL WLAs for total nitrogen and total phosphorus are not achievable even with the most advanced treatment technologies; therefore, water quality standards cannot be met, and a WQS variance is required for these pollutants at any scenario. Per Factor 6, variances may be granted if the necessary pollution controls beyond technology-based standards cause, "substantial and widespread economic and social impact." The City of Bolivar has conducted analyses to demonstrate that treatment scenarios beyond Alternative I are not economically feasible and

would cause substantial and widespread economic and social impacts in the city with current funding sources. See Appendix C – City of Bolivar's Request for Variance from the Piper Creek Total Maximum Daily Load for supporting information.

Variance Requirements

This variance is the applicable WQS in effect for the purposes of developing Clean Water Act Section 301 National Pollutant Discharge Elimination System (NPDES) permit limits. This is a variance from the underlying water quality standards used to develop the WLAs for the Bolivar WWTF included within the Piper Creek TMDL for total nitrogen, total phosphorus, and BOD_5. The underlying designated use and associated criterion remain applicable for all other Clean Water Act purposes, and all other uses and associated criteria not specified in this variance remain applicable for all Clean Water Act purposes.

Currently Attained Water Quality: Implementation of this WQS variance will not result in the lowering of existing water quality. A WQS variance must include requirements that represent the highest attainable condition (HAC) of the water body, which must be specified as a quantifiable expression. For this variance, the HAC is established pursuant to 40 CFR Section 131.14(b)(1)(ii)(A)(3): If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program. The Bolivar WWTF is required to implement interim effluent conditions reflecting the greatest pollutant reduction achievable, as well as a PMP.

Greatest Pollution Reduction Achievable (GPRA): This WQS variance must reflect the interim effluent condition that reflects the greatest pollutant reduction achievable during the term specified in the variance. The City of Bolivar plans to address WWTF improvements in a step-wise manner:

Pollutant	Base Improvements (2027)	Alternative I (2044)
BOD_5	25	25
Total Nitrogen	18	18
Total Phosphorus	2.5	1

Pollutant Minimization Program (PMP): The Bolivar WWTF's PMP is a structured set of activities to improve processes and pollution controls that will prevent and reduce pollution loadings. The Missouri State Operating Permit #MO-0022373 will contain a requirement for the implementation of the PMP with annual reporting to the Department.

For details on the activities the City of Bolivar has included in their PMP, See Appendix B – Pollutant Minimization Program for the Bolivar WWTF. Additional pollutant reduction activities will be considered and included in the PMP as appropriate.

Variance Conditions

Public Participation: Initial public participation prior to the request for approval by the Missouri Clean Water Commission and U.S. Environmental Protection Agency will occur per 10 CSR 20-7.031(12). Also, this variance will be incorporated into 10 CSR 20-7.031 Table J and will be subject to additional public review during the next WQS triennial review, as well as subsequent triennial reviews conducted by the Department until this variance expires. Finally, Missouri State Operating Permit #MO-0022373, which will reflect the conditions and requirements of the variance, will be public noticed per 10 CSR 20-6.020.

Term of Variance: The term of the variance must only be as long as necessary to achieve the highest attainable condition. The City of Bolivar has requested the term of this variance be 24 years (2044), which will allow time to upgrade the WWTF to Alternative I treatment technologies, optimize operations, and mitigate impacts to the city's financial capability. The term of the variance may need to be modified in the future as new information becomes available.

Reevaluation: The term of this variance exceeds five years; therefore, a reevaluation after five years is required per 40 CFR Section 131.14(b)(1)(v). The Department will reevaluate the highest attainable condition using all existing and readily available information every five years. Any adjustments will be incorporated into Missouri State Operating Permit #MO-0022373, which will follow the public participation process pursuant to 10 CSR 30-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.

If the Department does not complete a reevaluation of the variance no less frequently than every five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.

Other Considerations:
NPDES Permit Limits and Considerations. This variance will be used solely to establish effluent limits for total nitrogen, total phosphorus, and BOD_5 and PMP requirements in Missouri State Operating Permit #MO-0022373. This variance will not be used for any other Clean Water Act purposes.

Protections for endangered or threatened species and their critical habitat. It is not anticipated that the granting of this variance will jeopardize threatened or endangered species or result in the destruction or adverse modification of such species' critical habitat. The Missouri Department of Conservation's Natural Heritage Review queries records for species and natural communities of conservation concern. Based on the Heritage Review for Bolivar WWTF, the following federally or state-listed threatened or endangered species or critical habitats were identified near the project site:

- Indiana bats (Myotis sodalist, federal and state-listed endangered)

- Northern longeared bats (Myotis septentrionalis, federal-listed threatened)

It is not anticipated that the granting of this variance request will jeopardize threatened or endangered species or modify such species' critical habitat. As described in the Heritage Review, concerns regarding the construction and operation of wastewater systems "are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any 'Clean Water Permit' conditions."

Appendices

Appendix A – Crosswalk Table between City of Bolivar Variance CWC-V-3-20 and 40 CFR Section 131.14 (Page 6)

Appendix B – Pollutant Minimization Program for the Bolivar WWTF (Page 12)

Appendix C – City of Bolivar's Request for Variance from the Piper Creek Total Maximum Daily Load (Page 13)

Appendix A – Crosswalk Table between City of Bolivar Variance CWC-V-3-20 and 40 CFR Section 131.14

40 CFR 131.14	City of Bolivar Variance CWC-V-3-20
131.14 Water quality standards variances. States may adopt WQS variances, as defined in § 131.3(o). Such a WQS variance is subject to the provisions of this section and public participation requirements at § 131.20(b). A WQS variance is a water quality standard subject to EPA review and approval or disapproval.	10 CSR 20-7.031 (12) Water Quality Standards Variances. A permittee or an applicant for a National Pollutant Discharge Elimination System (NPDES) or Missouri state operating permit may pursue a temporary variance pursuant to either section 644.061 or section 644.062, RSMo. A variance from water quality standards shall comply with 40 CFR 131.14.
(a) Applicability	
(1) A WQS variance may be adopted for a permittee(s) or water body/waterbody segment(s), but only applies to the permittee(s) or water body/waterbody segment(s) specified in the WQS variance.	This variance only applies to the Bolivar Wastewater Treatment Facility Missouri State Operating Permit #MO-0022373.
(2) Where a State adopts a WQS variance, the State must retain, in its standards, the underlying designated use and criterion addressed by the WQS variance, unless the State adopts and EPA approves a revision to the underlying designated use and criterion consistent with §§ 131.10 and 131.11. All other applicable standards not specifically addressed by the WQS variance remain applicable.	This variance request only varies the underlying WQS used for the development of Piper Creek TMDL wasteload allocations for total nitrogen, total phosphorus, and BOD_5. All other WQS in 10 CSR 20-7.031 remain in-tact. The underlying aquatic life designated use and associated criterion will remain applicable for all other CWA purposes, and all other uses and associated criteria not specified in this WQS remain applicable for all CWA purposes.
(3) A WQS variance, once adopted by the State and approved by EPA, shall be the applicable standard for purposes of the Act under § 131.21(d) through (e), for the following limited purposes. An approved WQS variance applies for the purposes of developing NPDES permit limits and requirements under 301(b)(1)(C), where appropriate, consistent with paragraph (a)(1) of this section. States and other certifying entities may also use an approved WQS variance when issuing certifications under section 401 of the Act.	This WQS variance will be the applicable water quality standard in effect for the purposes of developing CWA Section 301(b)(1)(C) National Pollutant Discharge Elimination System (NPDES) permit limits. The only permit that will receive this variance is #MO-0022373 for the City of Bolivar's Wastewater Treatment Facility.

(4) A State may not adopt WQS variances if the designated use and criterion addressed by the WQS variance can be achieved by implementing technology-based effluent limits required under sections 301(b) and 306 of the Act.	Implementation of technology-based effluent limits will not allow Bolivar Wastewater Treatment Facility the ability to achieve effluent quality to meet underlying WQS utilized for the development of the Piper Creek TMDL WLAs for total nitrogen, total phosphorus, and BOD_5.
(b) Requirements for Submission to EPA	
(1) A WQS variance must include:	
(i) Identification of the pollutant(s) or water quality parameter(s), and the water body/waterbody segment(s) to which the WQS variance applies. Discharger(s) - specific WQS variances must also identify the permittee(s) subject to the WQS variance.	The City of Bolivar requests a WQS variance from the underlying WQS utilized for the development of the Piper Creek TMDL WLAs for total nitrogen, total phosphorus, and BOD5 for the protection of aquatic life use. The variance would apply to the City of Bolivar's WWTF #MO-0022373, which discharges to Town Branch. Town Branch is a class P stream with a water body identification number 3822. Town Branch is located in the Piper Creek watershed, 12-digit Hydrologic Unit Code 10290107-0303.
(ii) The requirements that apply throughout the term of the WQS variance. The requirements shall represent the highest attainable condition of the water body or waterbody segment applicable throughout the term of the WQS variance based on the documentation required in (b)(2) of this section. The requirements shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(2) of this section. The State must specify the highest attainable condition of the water body or waterbody segment as a quantifiable expression that is one of the following: (A) For discharger(s)-specific WQS variances: (1) The highest attainable interim criterion; or (2) The interim effluent condition that reflects the greatest pollutant reduction achievable; or	Implementation of this WQS variance will not result in the lowering of existing water quality. Pursuant to 40 CFR Section 131.14, the Bolivar Wastewater Treatment Facility is required to implement the highest attainable conditions that will be established in Missouri State Operating Permit #MO-0022373. This WQS variance must reflect the interim effluent condition that reflects the greatest pollutant reduction achievable during the term specified in the variance. Interim effluent conditions established in this variance were calculated based on current performance of the facility and expected performance of future upgrades to treatment technology. The City of Bolivar must also implement their PMP detailed in Appendix B of this document. The Missouri State Operating Permit #MO-0022373 will contain a requirement for the implementation of a PMP with annual reporting to the Department.

(3) If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program. (B) For WQS variances applicable to a water body or waterbody segment: (1) The highest attainable interim use and interim criterion; or (2) If no additional feasible pollutant control technology can be identified, the interim use and interim criterion that reflect the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.	
(iii) A statement providing that the requirements of the WQS variance are either the highest attainable condition identified at the time of the adoption of the WQS variance, or the highest attainable condition later identified during any reevaluation consistent with paragraph (b)(1)(v) of this section, whichever is more stringent.	Interim effluent conditions established in this variance were calculated based on current performance of the facility and expected performance of future upgrades to treatment technology. These are the highest attainable conditions that the plant can achieve in the interim. Upon reevaluation no less than every five years, these values may be adjusted.
(iv) The term of the WQS variance, expressed as an interval of time from the date of EPA approval or a specific date. The term of the WQS variance must only be as long as necessary to achieve the highest attainable condition and consistent with the demonstration provided in paragraph (b)(2) of this section. The State may adopt a subsequent WQS variance consistent with this section.	The City of Bolivar has requested the term of this variance be 24 years (2044). This will allow to upgrade the WWTF to Alternative I treatment technologies, optimize operations, and mitigate impacts to the city's financial capability for the highest attainable condition to be achieved.
(v) For a WQS variance with a term greater than five years, a specified	The Department will reevaluate the highest attainable condition every five years. Any

frequency to reevaluate the highest attainable condition using all existing and readily available information and a provision specifying how the State intends to obtain public input on the reevaluation. Such reevaluations must occur no less frequently than every five years after EPA approval of the WQS variance and the results of such reevaluation must be submitted to EPA within 30 days of completion of the reevaluation.	adjustments will be incorporated into Missouri State Operating Permit #MO-0022373, which will follow the public participation process pursuant to 10 CSR 20-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.
(vi) A provision that the WQS variance will no longer be the applicable water quality standard for purposes of the Act if the State does not conduct a reevaluation consistent with the frequency specified in the WQS variance or the results are not submitted to EPA as required by (b)(1)(v) of this section.	If the Department does not complete a reevaluation of the variance no less than every five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.
(2) The supporting documentation must include:	
(i) Documentation demonstrating the need for a WQS variance. (A) For a WQS variance to a use specified in section 101(a)(2) of the Act or a sub-category of such a use, the State must demonstrate that attaining the designated use and criterion is not feasible throughout the term of the WQS variance because: (1) One of the factors listed in § 131.10(g) is met, or (2) Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use and criterion while the actions are being implemented. (B) For a WQS variance to a non-101(a)(2) use, the State must submit documentation justifying how its consideration of the use and value of the water for those uses listed in § 131.10(a) appropriately supports the WQS variance and term. A	The basis for this request is 40 CFR § 131.10(g)(6) Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact. The City of Bolivar evaluated various wastewater treatment alternatives for the improvement of their current facility, to address peak flows, and for nutrient removal. Per Factor 6, variances may be granted if the necessary pollution controls beyond technology-based standards cause, "substantial and widespread economic and social impact." The City of Bolivar has conducted analyses to demonstrate that treatment scenarios beyond Alternative I are not economically feasible and would cause substantial and widespread economic and social impacts in the city with current funding sources. See Appendix C – City of Bolivar's Request for Variance from the Piper Creek Total Maximum Daily Load for supporting information.

demonstration consistent with paragraph (b)(2)(i)(A) of this section may be used to satisfy this requirement.	
(ii) Documentation demonstrating that the term of the WQS variance is only as long as necessary to achieve the highest attainable condition. Such documentation must justify the term of the WQS variance by describing the pollutant control activities to achieve the highest attainable condition, including those activities identified through a Pollutant Minimization Program, which serve as milestones for the WQS variance.	The City of Bolivar must follow the PMP detailed in Appendix B of this document. The PMP establishes milestones over the term of this variance.
(iii) In addition to paragraphs (b)(2)(i) and (ii) of this section, for a WQS variance that applies to a water body or waterbody segment: (A) Identification and documentation of any cost-effective and reasonable best management practices for nonpoint source controls related to the pollutant(s) or water quality parameter(s) and water body or waterbody segment(s) specified in the WQS variance that could be implemented to make progress towards attaining the underlying designated use and criterion. A State must provide public notice and comment for any such documentation. (B) Any subsequent WQS variance for a water body or waterbody segment must include documentation of whether and to what extent best management practices for nonpoint source controls were implemented to address the pollutant(s) or water quality parameter(s) subject to the WQS variance and the water quality progress achieved.	This provision does not apply.
(c) Implementing WQS variances in NPDES permits.	
A WQS variance serves as the applicable water quality standard for implementing	This variance will be used solely to establish effluent limits for total nitrogen, total

NPDES permitting requirements pursuant to § 122.44(d) of this chapter for the term of the WQS variance. Any limitations and requirements necessary to implement the WQS variance shall be included as enforceable conditions of the NPDES permit for the permittee(s) subject to the WQS variance.	phosphorus, and BOD_5 within Missouri State Operating Permit #MO-0022373. The variance will not be used for any other Clean Water Act or Missouri Clean Water Law Purposes.

Appendix B – Pollutant Minimization Program for the Bolivar WWTF

Per 40 CFR § 131.14 (b)(1)(ii), a Pollutant Minimization Program (PMP) is required for any water quality standards variance when no additional feasible control technology can be identified and the highest attainable effluent condition is adopted by the State as the water quality standard. The PMP is defined at 40 CFR Section 131.3(p) as "a structured set of activities to improve processes and pollutant controls that will prevent and reduce pollutant loadings." The City is already committed to implementing a number of improvements at its WWTF and in its collection system that will result in improved water quality. These activities, which constitute the PMP, are described below.

The City currently spends an average of $150,000 per year rehabilitating the collection system through sewer lining projects. As needed, the City also implements capital projects to reduce inflow and infiltration into the collection system, replaces sewer lines, and encourages regionalization. The City intends to continue these practices and may increase expenditures to address issues more expeditiously throughout the term of the variance.

The following are pollutant minimization activities that the City will conduct during the term of the variance:

- The City will develop a collection system asset management program to formalize their current practices and better inform future collection system improvement needs, maintenance activities, and investment requirements.

- The City will conduct monitoring to confirm flow assumptions and wet weather storage needs prior to implementing the storage alternative for peak flow control. If data from the flow monitoring studies indicate that a different wet weather solution is appropriate, the variance projects, schedule, and endpoints may need to be reevaluated.

- The existing facility requires base improvements due to poor condition of existing equipment and to address undersized unit processes. Base improvements include construction of a new vortex grit removal unit, relocation of the RAS discharge location to downstream of grit removal, construction of a new oxidation ditch splitter structure, addition of a sludge digestion and storage tank, and yard pipe improvements. These improvements will renew the existing facility and help to optimize current treatment practices and operations. Optimization will likely include a period of structured influent and process monitoring, followed by development of an operations manual.

Request for Variance from the Piper Creek Total Maximum Daily Load

Bolivar WWTF Improvements

Bolivar, Missouri

October 25, 2019

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Appendix A Bolivar Wastewater Treatment Facility Evaluation
Appendix B Heritage Review

1.Introduction

The City of Bolivar, Missouri (City) is pursuing a discharge-specific variance from the underlying water quality standards used to develop wasteload allocations (WLA) included in the Piper Creek Total Maximum Daily Load (TMDL)[1] for the Bolivar Wastewater Treatment Facility (WWTF). The WLAs prescribed in the TMDL pose wastewater treatment challenges with currently available proven technologies. Further, the TMDL requirements would present affordability issues that will result in widespread economic and social impacts and compromises the City's ability to address other infrastructure needs.

This variance request will only be used to establish effluent limits for 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), 5-day nitrogenous biochemical oxygen demand ($NBOD_5$), total nitrogen (TN), and total phosphorus (TP) for the City's future National Pollutant Discharge Elimination System (NPDES) permits. The receiving streams, which include Town Branch and Piper Creek, will retain their underlying designated use of Warm Water Aquatic Life for purposes other than NPDES permits issued under the terms and conditions of this variance. All other water quality standards not specifically addressed by this variance should continue to apply for all Clean Water Act (CWA) purposes.

[1] US Environmental Protection Agency Region 7. 2010. Total Maximum Daily Load for Total Suspended Solids, Total Nitrogen, and Total Phosphorus: Piper Creek, Polk County, Missouri. Water, Wetlands, and Pesticides Division.

2. Applicable Discharger and Water Quality Standards

The only discharger to be permitted under the terms and conditions of the requested variance is the Bolivar WWTF. The water quality standards subject to this variance are the underlying standards used to develop WLAs in the Piper Creek TMDL. In the TMDL, EPA established WLAs for the Bolivar WWTF to address aquatic life use impairments related to organic sediment and other oxygen demanding substances. The TMDL identified the Bolivar WWTF as a point source contributor of oxygen demanding substances and assigned WLAs (Table 1) designed to achieve the state dissolved oxygen criterion of 5.0 milligrams per liter (mg/L) in the receiving streams. Specifically, the City is requesting a variance for $CBOD_5$, $NBOD_5$, TN, and TP[2].

Table 1. Piper Creek TMDL Wasteload Allocations.

Parameter	TMDL WLA	Variance Requested
$CBOD_5$, mg/L[1]	4.03	Yes
$NBOD_5$, mg/L[1]	1.17	Yes
Total Nitrogen, mg/L	0.289	Yes
Total Phosphorus, mg/L	0.007	Yes
Ammonia, mg/L[2]	1.4	No
TSS, mg/L	27	No

1 – According to Table 13 in the TMDL, these WLAs were calculated from a 5-day biochemical oxygen demand (BOD_5) WLA value of 5.2 mg/L. For the remainder of the report, the BOD_5 value will be used to assess alternatives and develop reduction targets.
2 – Set equal to the existing toxicity-based summer average monthly permit limit.

Since the TMDL was originally developed, MDNR has identified a number of underlying technical issues in the assumptions and information used to develop the suggested WLAs. In particular, the TMDL does not provide a strong link between the WLAs and Missouri's DO criterion or aquatic life use protections. MDNR is currently amending the TMDL and will likely issue revised WLAs in the near future. Depending on the results of that TMDL amendment, the City may need to reevaluate this variance and associated implementation schedule in the future.

[2] According to Table 13 in the TMDL, the CBOD5 and NBOD5 WLAs were calculated directly from a 5-day biochemical oxygen (BOD_5) WLA value of 5.2 mg/L. For the remainder of this report, BOD5 will be used to assess alternatives and develop reduction targets.

3. Wastewater Treatment Alternatives

The City evaluated a series of WWTF upgrade alternatives to better understand the potential modifications and costs necessary to meet the TMDL targets. The evaluation included a review of existing facility condition and needs, peak flow treatment alternatives, and potential nutrient removal upgrades. A summary of the WWTF review is included in the sections that follow. All costs presented below should be considered planning level estimates that must be refined as projects are selected and moved forward. Additional treatment process details and design schematics are available in the full WWTF evaluation report (**Attachment A**).

3.1 Base Improvements

The existing WWTF requires base improvements due to poor condition of existing equipment and to address undersized unit processes. Base improvements include construction of a new vortex grit removal unit, construction of a new oxidation ditch splitter structure, addition of a sludge digestion and storage tank, and yard pipe improvements. These improvements will renew the existing facility and help to optimize current treatment practices and operations. The estimated 20-Year present worth (PW) cost for these improvements is $2.9 million, in 2019 dollars.

3.2 Peak Flow Alternatives

The existing WWTF has an average day flow capacity of 2.55 MGD and a peak hydraulic capacity of 6.0 MGD. However, wet weather events cause sanitary sewer overflows (SSOs) in the collection system and bypasses at the WWTF (Figure 1). As part of the wet weather evaluation, the City reviewed recent overflow data and estimated that peak flows may reach 13.0 MGD in the system during a 2-year storm event.

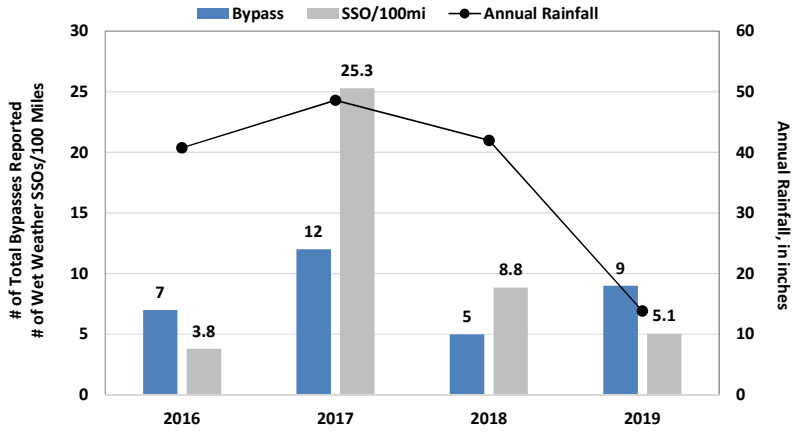

Figure 1. Wet Weather SSOs and Bypasses Reported between January 2016 and April 2019.

The City evaluated the following four wet weather management alternatives aimed at addressing the estimated 7.0 MGD excess flow in the collection system:

1. **Inflow and Infiltration (I/I) Reduction –** Over the last several years, the City has spent considerable effort inspecting, cleaning, and repairing their public wastewater collection

system (480,000 linear feet) to rehabilitate their system and reduce peak flows. However, further public and private I/I reduction efforts are needed to reduce peak flows in the system. For the purposes of this planning level analysis, the cost of this alternative is estimated to be $70 per linear foot based on the results from recent total system I/I reduction projects in the region. The estimated cost to address 30% of the system is $33.6 million, in 2019 dollars.

2. **Peak Flow Storage –** This alternative includes adding a peak flow pump station to divert excess wastewater into peak flow storage tank at the WWTF location. Once peak wet weather flow decreases to a level that can be properly processed by the plant, the stored excess wastewater would be reintroduced to the plant for treatment. The estimated 20-year PW cost for this alternative is $6.7 million, in 2019 dollars.

3. **System Expansion –** This alternative includes adding or expanding unit processes to increase treatment capacity of the WWTF. The estimated 20-year PW cost for this alternative is $18.8 million, in 2019 dollars.

4. **Tertiary Filters –** This alternative includes the addition of tertiary cloth filters to treat during peak flow events. During average daily use, these filters would act as a final polishing step prior to UV disinfection. During peak flow events, operations would be modified to allow excess flow to bypass the biological treatment process and be directed to the tertiary filters. After filtration, the excess peak flow would be blended downstream of the unit with typical treated water. The estimated 20-year PW cost for this alternative is $15.5 million, in 2019 dollars.

3.3 Nutrient Removal Alternatives

A significant aspect of the Piper Creek TMDL is the requirement for the WWTF to meet ecoregional TN and TP targets of 0.289 mg/L and 0.007 mg/L, respectively. According to information reviewed for the WWTF evaluation and alternatives analysis, the existing average effluent concentration for TN and TP is 18 mg/L and 2.5 mg/L, respectively. It is important to note that these existing effluent concentrations are long-term average values and vary significantly over the period of record; TN ranges from 2 mg/L - 35 mg/L while TP ranges from 0.1 mg/L to 7.2 mg/L. The low individual results may be influenced by periods of excess dilute flow in the system, and could increase as the City continues to make progress reducing I/I over time.

As part of the alternatives analysis, the City evaluated the following four progressively advanced nutrient removal upgrades.

1. **Chemical Phosphorus Removal –** This alternative includes the addition of alum upstream of the clarifiers. With this alternative, anticipated average TP effluent concentrations would be approximately 1 mg/L as an annual average; however, as additional alum is added to approach lower concentrations, consideration needs to be provided for increased solids production and handling. The estimated 20-year PW cost for this alternative is $2.4 million, in 2019 dollars.

2. **Biological Nutrient Removal –** This alternative includes improvements to intermittently aerate the existing oxidation ditches to facilitate favorable conditions for biological denitrification and total nitrogen removal. It also includes a chemical feed system to enable phosphorus reduction. This anticipated long-term average effluent concentration for TN and TP is 10 mg/L and 1 mg/L, respectively. The estimated 20-year PW cost for this alternative is $7.4 million, in 2019 dollars. This cost is in addition to the chemical phosphorus removal cost.

3. **Enhanced Nutrient Removal –** This alternative includes adding a denitrification filter and carbon source to the BNR improvements, as well as increasing chemical dosage to further reduce nutrients. The anticipated long-term average effluent concentration for TN and TP is 5 mg/L and 0.5 mg/L, respectively. The estimated 20-year PW cost for this alternative is $10.1 million, in 2019 dollars. This cost is in addition to the biological nutrient removal cost.

4. **Reverse Osmosis –** Reverse osmosis (RO) represents the current highest form of treatment that could be used to further reduce effluent nutrients beyond the levels that can be achieved by ENR; however, RO is not a proven technology for use in municipal wastewater treatment applications with respect to effluent nutrient discharge quality due to its limited body of research. In addition to the performance uncertainty, RO has significant energy requirements and produces a reject brine that must be treated through concentration and crystallization. These aspects considerably increase the life-cycle costs of this alternative. The anticipated long-term average effluent concentration for TN and TP is 3 mg/L and 0.1 mg/L, respectively. The estimated 20-year PW cost for this alternative is $202.7 million, in 2019 dollars. This cost is in addition to the enhanced nutrient removal cost.

3.4 Alternative Comparison

Anticipated effluent quality for each of the upgrade scenarios were compared to the TMDL WLAs (Table 2). None of the scenarios are capable of meeting all of the TMDL WLAs. As previously discussed, the TMDL WLAs for TN and TP are not achievable even with the most advanced treatment technologies. Therefore, water quality standards cannot be achieved and a variance would be required for any of the alternatives.

Table 2. Comparison of Anticipated Effluent Quality to TMDL WLAs.

Parameter	Anticipated Effluent Concentration (mg/L)[1]					
	TMDL WLA	Base/Wet Weather Improvements[2]	Chemical Phosphorus Removal	Biological Nutrient Removal	Enhanced Nutrient Removal	Reverse Osmosis
BOD_5, mg/L	5.2	25	25	10	5	3
TN, mg/L	0.289	18	18	10	5	3
TP, mg/L	0.007	2.5	1	1	0.5	0.1

1 - Nutrient concentrations are achievable as an annual average.
2 – Assumed equal to existing projected maximum monthly average concentration (91.7% tile) for BOD5; assumed equal to existing measured long-term average concentration for TN and TP.

4. Financial Capabilities Assessment

Per Factor 6 of 40 CFR 131.10(g), variances from water quality standards may be granted if the necessary pollution controls beyond technology-based standards cause "substantial and widespread economic and social" impacts. The analyses below demonstrate that significant nutrient controls are not economically feasible and would cause substantial and widespread economic and social impacts in the City at this time.

4.1 Substantial Impact Analysis

EPA[3] suggests that two economic tests be used to evaluate the likelihood that substantial impacts will occur as the result of implementing a particular wastewater treatment alternative. The first test, called the municipal preliminary screener (MPS), evaluates whether or not residents can afford a pollution control alternative by comparing the expected annual pollution control cost to the community median household income (MHI).

If the MPS indicates substantial impacts are likely, the analysis proceeds to the second test. The Secondary Test relies on several indicators to assess the economic health of the community as a whole. Results from the MPS and secondary test are then jointly evaluated in the Substantial Impacts Matrix to determine whether the alternative is likely to have substantial economic impacts on the community.

4.1.1 Municipal Preliminary Screener

Average annual pollution control costs were determined by estimating anticipated residential sewer rates and resulting bills needed to fund each of the alternatives identified in Section 3. The existing residential sewer rates in the City include a base rate of $28.25 per month (includes first 2,000 gallons used) plus a volumetric rate of $5.00 per additional 1,000 gallons used (Table 3). These rates are equivalent to a $43.25 (1.2% MHI) per month sewer bill assuming 5,000 gallons per month usage.

It is important to note that the 2019 rate is approximately an 86% increase over 2018, which included a $15 base rate and a $2.75 usage rate. The City made these increases based on the findings of a recent rate study[4] which estimated that the City's sewer fund would run an annual deficit of approximately $600,000 if the previous rates were left in place. At the higher 2019 rate, the City will be able to fund existing expenses and debt and begin building a reserve fund for future improvements.

[3] EPA (Environmental Protection Agency). 1995. Interim Economic Guidance for Water Quality Standards. EPA-823-B-95-002. Office of Water, EPA, Washington, DC.

[4] Missouri Rural Water Association. 2018. City of Bolivar, MO Water and Wastewater Rate Study. Prepared by Liz Grove, August 2018.

Table 3. Estimated Total Pollution Control Costs for Identified Alternatives.

Alternative	Capital Cost	Additional Annual O&M	Base Monthly Rate (Includes 2,000 gal./month)	Monthly Volumetric Rate (/1,000 gal.)	Avg. Monthly Residential Bill (5,000 gal./month)[3]	Avg. Bill as % of MHI[3]
Existing WWTF	---	---	$28.25	$5.00	$43.25	1.3%
Base Improvements	$2,270,720	$44,900	$28.25	$6.54	$47.87	1.4%
Wet Weather Improvements[1]						
Storage[4]	$8,695,250	$67,300	$28.25	$10.28	$59.08	1.7%
Expansion	$18,832,180	$211,900	$28.25	$16.82	$78.72	2.3%
Filter/Blending	$15,338,150	$221,700	$28.25	$14.93	$73.04	2.1%
Nutrient Removal[2]						
Chem. Phosphorus Removal	$9,386,520	$191,200	$28.25	$11.41	$62.48	1.8%
Biological Nutrient Removal	$12,800,050	$243,900	$28.25	$13.64	$70.34	2.1%
Enhanced Nutrient Removal	$17,916,930	$444,500	$28.25	$17.71	$81.39	2.4%
Reverse Osmosis	$110,290,210	$8,182,400	$28.25	$115.89	$375.92	11.1%

1 - All wet weather improvement alternatives include base improvements. The "total system" public and private I/I removal alternative discussed in Section 3.2 (30% reduction, $33.6 million) is not included in this table, as the significant cost makes implementing this alternative impracticable.
2 - All nutrient removal costs include wet weather storage and base improvement costs.
3 - MHI = $40,786.
4 – If public sector I/I removal and collection system maintenance activities implemented by the City reduce wet weather issues in the system to manageable levels, the storage alternative will be revised or eliminated.

To fund the alternative treatment scenarios, volumetric rates would need to be increased significantly (Table 3). Based on the analysis, resulting average monthly bills for the alternatives identified would range from $48 to $376. Relative to the MHI of $40,790, the MPS ranges from 1.4% to 11.1%. EPA suggests that MPS values in excess of 2% will result in substantial impacts, and greater than 1% has the potential for substantial impacts. Therefore, all of the alternatives evaluated have the potential to cause substantial impacts in the community; two wet weather alternatives and three nutrient removal alternatives exceed 2% of MHI and would likely cause substantial impacts.

4.1.2 Secondary Test

Per EPA guidance, if the MPS has the potential for substantial impacts, the analysis proceeds to the secondary test. The secondary test relies on the following indicators to assess the economic health of the community as a whole using a standardized scoring system (Table 4).

- **Bond Rating** – The City's current bond rating is A+. Therefore, the secondary indicator score for this metric is 3.

- **Overall Net Debt as a Percent of Full Market Value of Taxable Property** - Overall net debt is a community's debt that is repaid by property taxes. It excludes debt repaid by user fees. Overall net debt in the City is $13.29 million. However, full market value of property is not available because the City does not collect property taxes. Therefore, this indicator is not applicable.

- **Unemployment Rate** – The unemployment rate is the percent of a community's labor force that is unemployed. The 2013-2017 ACS shows that Bolivar had an

unemployment rate of 4.0% as compared to the statewide average of 5.8% and a nationwide average of 6.6%. As of August 2019, the statewide and nationwide unemployment rates have improved to 3.2% and 3.7%, respectively (U.S. Bureau of Labor and Statistics). A contemporaneous unemployment rate is not currently available for the City, but it likely improved as well. Therefore, the assumed secondary indicator score for this metric is 2.

- **Median Household Income** - EPA has historically accepted the median household income (MHI) to be a good socioeconomic indicator. According to the 2013-2017 ACS profile, the MHI for Bolivar was $39,990. Adjusted for inflation, the equivalent 2019 MHI is $40,786. For comparison, the adjusted state average is $52,568. Therefore, the secondary indicator score for this metric is 1.

- **Property Tax Revenues as a Percent of Full Market Value of Taxable Property** - This indicator measures the burden that property taxes currently have on residents and helps in evaluating the funding capacity to support new expenditures. Because the City does not collect property taxes, this indicator is not applicable.

- **Property Tax Collection Rate** - The property tax collection rate measures the efficiency of the tax collection system. Indirectly, it measures whether or not the current property taxes are burdensome. Because the City does not collect property taxes, this indicator is not applicable.

Based on results of EPA's secondary test, the City has an overall average score of 2. According to the secondary test matrix, this score suggest mid-range impacts (Table 4).

Table 4. Secondary Test Indicators and Assessment Results for the City of Bolivar.

Secondary Indicator	Benchmarks			Bolivar Value	Score
	Weak (1)	Mid-Range (2)	Strong (3)		
Bond Rating	Below BBB or Baa	BBB or Baa	Above BBB or Baa	A+	3
Overall Net Debt as % of Full Market Value of Taxable Property	Above 5%	2% - 5%	Below 2%	---	---
Unemployment Rate[1]	Above National Average	National Average 3.6%	Below National Average	4.0%	2
Median Household Income[2]	Below State Median	State Median $52,568	Above State Median	$40,786	1
Property Tax Revenues as a Percent of Full Market Value of Taxable Property	Above 4%	2% - 4%	Below 2%	---	---
Property Tax Collection Rate	< 94%	94% - 98%	> 98%	---	---
a. Weak is a score of 1 point b. Mid-Range is a score of 2 points c. Strong is a score of 3 points				**SUM**	**6**
				AVERAGE	**2**

[1] If the community's employment rate is equal to the national average unemployment rate, plus or minus 1%, then the community's unemployment rate is assessed as being equal to the national rate.
[2] If the community's median household income is equal to the state median, plus or minus 10%, then the community's median household income is assessed as being equal to the state's median household income.
[3] Based on the unemployment rate in 2017.

Results of the MPS and Secondary Test should be jointly evaluated to determine whether or not the project will have significant financial impacts on the community. EPA recommends evaluating the results with a Substantial Impacts Matrix (Figure 5). In this matrix, the MPS for each treatment alternative is paired with the cumulative assessment score and plotted to estimate impacts. If a community's combined score falls in the upper right corner of the matrix (cells marked with an "X"), substantial financial impacts are expected to occur as a result of the pollution control project. Scores that fall in the lower left of the matrix (cells marked with "✓") indicate that the community is not expected to suffer substantial financial impacts. Scores falling in the categories marked with a "?" indicates that the impacts are unclear and may need to be evaluated in more detail.

Table 5. Substantial Impacts Matrix.

Secondary Score	Municipal Preliminary Screener		
	Less than 1%	1% to 2%	Greater than 2%
Less than 1.5	?	X	X
1.5 to 2.5	✓	?	X
Greater than 2.5	✓	✓	?

Source: U.S. EPA (1995)
X = impact is likely to be substantial
? = impact is unclear
✓ = impact is not likely to be substantial

According to the results of the MPS and Secondary Test evaluations for the City, two of the wet weather alternatives (expansion and blending) and three of the advanced nutrient removal alternatives (BNR, ENR, and RO) are likely to cause substantial affordability impacts for customers. Results for the remaining alternatives are unclear and require further evaluation. (Table 6).

Table 6. Results of the Substantial Impacts Assessment.

Alternative	Avg. Monthly Residential Bill (5,000 gal./month)	Avg. Bill as % of MHI	Affordability Impact
Existing WWTF	$43.25	1.3%	Unclear
Base Improvements	$47.87	1.4%	Unclear
Wet Weather Improvements[1]			
Storage[3]	$59.08	1.7%	Unclear
Expansion	$78.72	2.3%	Likely
Filter/Blending	$73.04	2.1%	Likely
Nutrient Removal[2]			
Chem. Phosphorus Removal	$62.48	1.8%	Unclear
Biological Nutrient Removal	$70.34	2.1%	Likely
Enhanced Nutrient Removal	$81.39	2.4%	Likely
Reverse Osmosis	$375.92	11.1%	Likely

1 - All wet weather improvement alternatives include base improvements.
2 - All nutrient removal costs include wet weather storage and base improvement costs.
3 - If public sector I/I removal and collection system maintenance activities implemented by the City reduce wet weather issues in the system to manageable levels, the storage alternative will be revised or eliminated.

4.2. Widespread Impact Analysis

Where financial tests demonstrate that impacts will be substantial or unclear, EPA requires that additional analyses be performed to demonstrate that the impacts will also be widespread across the community. EPA has no explicit criteria for evaluating widespread impacts, but suggests considering changes in socioeconomic indicators. A summary of potential changes are outlined below:

- The City's sewer rates are already higher than most similar sized communities. According to the Missouri Public Utility Alliance 2019 sewer rate survey data, the City's existing sewer rates are already higher than most similar sized communities (Figure 2). Significant rate increases would exacerbate this condition and could reduce the potential for future population and industrial growth in the City.

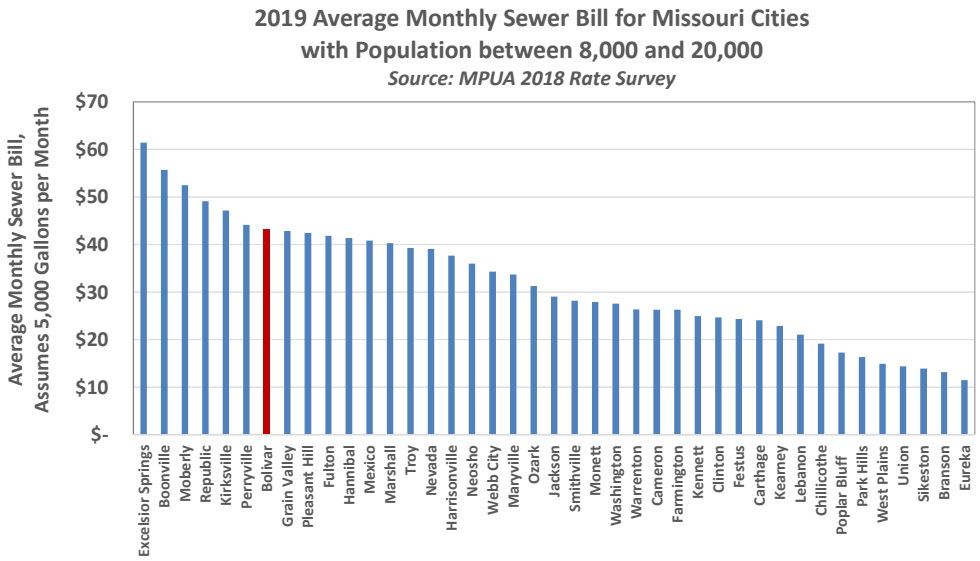

Figure 2. Comparison of Existing Bolivar Monthly Sewer Bills to Other Missouri Cities with Populations between 8,000 and 20,000.

- The City already has a lower MHI relative to the rest of the state. The relatively low MHI suggests that the financial burden would be significant for a large portion of the City. It is unclear how the MHI would change with progressively expensive levels of treatment, but it could decrease if high sewer rates impacted local employers and employment opportunities.

- Although the City's unemployment rate is low (4.0%) compared to the state (5.8%), the poverty rate for individuals (16.7%) is higher (14.6%). Given the fact that the City recently increased sewer rates by 86% in one year, additional significant increases will likely have impact these low income individuals.

- Businesses and industries in the City could be at a disadvantage if the sewer rates rise to an amount they cannot afford or is uncompetitive compared to other areas. As a result, businesses and industries could be required to reduce staff, reduce growth, or close their facilities due to high sewer rates.

- High sewer rates could negatively impact property values in the City.

- The project will increase the community's debt and preclude or delay necessary investments in future City needs such as education, transportation, drinking water, police services, and emergency services.

Based on these factors, it is clear that alternatives that exceed 2% of the City's MHI are not affordable at this time. Therefore, the City elects to pursue implementation of the base improvements, wet weather storage, and chemical phosphorus removal alternatives. However, the cost of these alternatives (1.8% of MHI) could cause significant and widespread impacts if they are not implemented in a phased manner. This phasing will allow the City to moderately raise sewer rates over time and collect additional information needed to fully inform the wet weather storage project before it is constructed. The proposed implementation schedule in the following section will allow the City to more adequately renew their existing facility, address high-priority wet weather concerns, and remove phosphorus to begin making progress towards meeting the TMDL.

5. Variance Recommendations

Based on the evaluations presented above, the City is pursuing implementation of the base improvements, wet weather storage (unless public sector I/I removal efforts eliminate the need for storage), and chemical phosphorus removal alternatives. The cost of these alternatives is projected to result in user rates that reach 1.8% of the City's MHI. This is about a 44% increase over existing user rates, which themselves were increased by 86% within the last year. Progressively higher levels of nutrient removal are not affordable at this time.

The proposed highest attainable condition (HAC), term of the variance, and implementation schedule are described in the sections that follow.

5.1. Highest Attainable Condition

A variance is a "time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the [water quality standards (WQS)] variance" (40 CFR § 131.10(o)). For discharger-specific WQS variances, the highest attainable condition (HAC) is specified as a quantifiable expression in one of the following three ways (40 CFR § 131.14(b)(1)(ii)(A)(1-3)):

1. The highest attainable interim criterion; or
2. The interim effluent condition that reflects the greatest pollutant reduction achievable; or
3. If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.

For purposes of this variance request, the HAC is defined here by effluent conditions associated with chemical phosphorus removal (Table 7). This alternative represents the greatest phosphorus reduction achievable at this time due to issues of affordability. Therefore, option 2 applies to TP. Because the selected alternative will not reduce BOD_5 or TN below existing levels, the existing condition represents the HAC for those parameters. Therefore, option 3 applies to these parameters and a pollutant minimization program (PMP) must be developed.

Table 7. Highest Attainable Effluent Condition for the Bolivar WWTF Chemical Phosphorus Removal Alternative.

Pollutant Parameter	TMDL WLA, mg/L	HAC, mg/L
BOD_5	5.2	25
Total Nitrogen	0.289	18
Total Phosphorus	0.007	1

Note: Nutrient concentrations are achievable as an annual average. The HAC will need to be reevaluated following implementation and optimization of the chemical phosphorus removal alternative.

The PMP is defined at 40 CFR 131.3(p) as "a structured set of activities to improve processes and pollutant controls that will prevent and reduce pollutant loadings." The City is committed to implementing a number of improvements at its WWTF and in its collection system that will result

in improved water quality. In particular, addressing wet weather concerns in the collection system and at the WWTF will reduce SSOs, bypasses, and improve overall water quality and wastewater treatment efficiency. These activities will serve to improve water quality across the City. These schedule for implementing these activities constitutes a PMP and is described in Section 5.2 below.

5.2. Term of Variance

According to 40 CFR 131.14(b)(iv), the term of the water quality standards variance must only be as long as necessary to achieve the HAC. For this variance, the schedule is targeted at meeting the TP HAC value (Table 7). However, prior to implementing chemical phosphorus removal, the City must address significant maintenance, repair, and wet weather management needs at the current WWTF. Therefore, the City is proposing a 22-year variance term (2041) and implementation schedule to implement the three upgrades and achieve the TP HAC. This term will allow the City to address maintenance and repair needs, more closely evaluate funding options for each stage of upgrade, collect additional data and develop a greater system understanding to more fully inform the intended wet weather storage project, and moderately raise rates over time to minimize affordability impacts.

The proposed variance term and schedule (Table 8) are as follows:

- The City currently spends an average of $150,000 per year rehabilitating the collection system through lining projects. The City anticipates implementing capital projects to reduce I/I, replace sewer lines, and encourage regionalization. The City intends to continue these practices, including more aggressive I/I reduction on an ongoing basis and may increase expenditures to address issues more expeditiously throughout the term of the variance.

- It is important to note that the initial wet weather storage alternative was developed based on an assessment of estimated SSO volumes over a relatively short period of time. During the first seven years of the variance (2020 – 2027), it will be critical for the City to conduct monitoring to confirm the flow assumptions and storage needs prior to implementing the storage alternative. If data from the flow monitoring studies indicate that a different wet weather solution is appropriate, the variance projects, schedule, and endpoints will be reevaluated and other wet weather management strategies such as continuing or accelerating I/I reduction will be considered for implementation.

- Construct base improvements in 2025.

- Following the construction of base improvements in 2025, an additional two years (2026-2027) is needed to optimize operations at the facility. Optimization will likely include a period of structured influent and process monitoring, followed by development of an operations manual.

- Four years (2028-2032) are needed to complete planning and funding evaluations for the wet weather storage basin. If new data indicate that a different wet weather solution (such as more aggressive I/I reduction) is appropriate, the variance projects, schedule, and endpoints may need to be reevaluated.

- Construct wet weather storage (or continue I/I reduction activities if wet weather issues have been reduced to manageable levels) in 2032.

- Two years (2033 – 2034) is needed to revise the optimization plan and optimize the facility.

- Four years (2034 – 2037) are needed to complete planning and funding evaluations for the chemical phosphorus removal facilities.

- Construct chemical phosphorus removal facilities in 2038.

- Two years (2039 – 2040) is needed to revise the optimization plan and operations manual, if necessary. An additional year (2041) is needed for the stream to acclimate to the new effluent quality.

- Two years (2042 - 2043) is needed for MDNR to reassess use attainment in the stream in response to the upgrades.

- One year (2044) is needed to evaluate the TMDL wasteload allocations and the Greatest Pollutant Reduction Achievable (GPRA). If the GPRA differs from the HAC in Table 7, the HAC will be redefined to match the GPRA.

This estimated term of variance may need to be modified in the future as funding needs or opportunities change, new information that impacts project selection or scheduling becomes available, or as TMDL or other regulatory requirements evolve. Since the proposed term of variance exceeds five years, the City is committed to reevaluating the HAC and the financial needs for the variance every five years (in accordance with 40 CFR 131.14(b)(v)) from the effective date of the variance or during the permit renewal process, whichever comes first.

Table 8. Implementation Schedule and Pollutant Minimization Program.

Phase	Years	Activity
1 (Base Improvements, Flow Monitoring, Collection System Asset Management Program)	Ongoing	Collection system maintenance and rehabilitation.
	2020 - 2027	Conduct system flow monitoring.
	2025	**Construct Base Improvements**
	2026 - 2027	Develop monitoring and operations plan, optimize facility
2 - Wet Weather Storage	2028	Planning and Funding Evaluation for Storage Basin
	2032	**Construct Storage Basin (only if I/I reduction activities have not reduced wet weather issues to manageable levels)**
	2033-2034	Revise optimization plan and operations manual
3 - Chemical Phosphorus Removal	2034-2037	Planning and Funding Evaluation for Chem P Removal
	2038	**Construct Chemical Phosphorus Removal**
	2039 - 2040	Revise optimization plan and operations manual.
	2042 - 2043	MDNR Stream Reassessment to determine if use is attained.
	2044	Evaluate TMDL WLA and GPRA

5.3. Stream Assessment

After the chemical phosphorus removal improvements are constructed and optimized, the City requests that the department perform a water quality study to determine whether applicable water quality standards have been re-attained in Town Branch and Piper Creek. Optimization of the phosphorus removal improvements are estimated to be completed in 2040. Once optimized, the stream should be allowed to acclimate to the new effluent quality until approximately 2042. Stream assessment activities should commence following this time for a period of 18 months to evaluate the stream response over a variety of seasonal conditions. If the stream attains the beneficial uses and is re-categorized as fully supporting aquatic life per Missouri's 305(b) assessment report, no further upgrades will be necessary as the facility is meeting the assumptions and requirements of the TMDL. However, if Town Branch and Piper Creek have not retained its beneficial uses, the City is committed to reassessing future treatment options.

6. Endangered and Threatened Species Review

State regulations at 10 CSR 20-7.031(12) prohibit variances that would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of such species' critical habitat. Therefore, a Missouri Department of Conservation Natural Heritage Review was obtained for the Salem WWTF (Appendix B). Based on the results of that review (Level 1), there are no endangered or threatened species that will be impacted by the project.

7. Summary

The City is requesting a variance from the underlying water quality standards used to develop the WLAs for the Bolivar WWTF included within the Piper Creek TMDL. The specific pollutants subject to this variance request include $CBOD_5$, $NBOD_5$, TN, and TP. The WWTF was identified as a point source contributor of these pollutants, which have been attributed to the impairment of Aquatic Life Use support in due to low dissolved oxygen levels. The underlying designated use and associated criterion remain applicable for all other CWA purposes.

Pursuant to requirements at 40 CFR § 131.14(b)(1), the City has identified effluent quality associated with chemical phosphorus removal as the highest attainable condition at this time. The primary factor precluding attainment of the underlying water quality standards used to develop the TMDL WLAs is specified at 40 CFR § 131.10(g)(6), which is "controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact." This is demonstrated by the fact nutrient removal technologies including BNR, ENR and RO do not meet the meet the Municipal Primary Screener and the Secondary Tests outlined in EPA guidance.

Implementation of this variance request will not result in any lowering of existing water quality. To the contrary, this variance request allows the City to prioritize and implement environmental improvement projects in a cost-effective manner. In addition to chemical phosphorus removal, the City plans to implement upgrades to address immediate renewal needs and wet weather management issues at the WWTF, which are anticipated to improvement treatment plant performance and overall water quality. Additionally, the City is continuing its program of sanitary sewer improvements, which will reduce the number and volume of sanitary sewer overflows and bypasses. Pursuing TMDL-based WLAs at this time would only serve to jeopardize funding for these critical environmental improvement projects and result in overall lower water quality.

Given existing environmental and regulatory obligations, current economic conditions, and technological limitations, the City is requesting variance limits. A summary of variance requirements and how they are addressed is provided for in Table 9 below.

Table 9. Summary of Variance Requirements.

Variance Requirement	Bolivar Variance
Pollutant(s) of water quality parameter(s) to which the WQS variance applies (40 CFR 131.14(b)(1)(i))	The variance applies to the underlying water quality standards used to develop the WLAs for the Bolivar WWTF included within the Piper TMDL. The specific pollutants subject to this variance request include BOD_5, TN, and TP.
Discharger(s) or permittee(s) subject to the WQS variance (40 CFR 131.14(b)(1)(i))	Bolivar Municipal WWTF (MSOP MO-0022373)
Will not result in any lowering of currently attained ambient water quality, unless the variance will be used for restorative activities (40 CFR 131.14(b)(1)(ii))	Implementation of this variance request will not result in any lowering of existing water quality. To the contrary, implementation of this variance will allow for upgrades that will result in improved effluent quality.
A highest attainable condition specified as a quantifiable expression in one of the following ways (40 CFR 131.14(b)(1)(ii)(A)(1-3)): • a highest attainable interim criterion; or, • an interim effluent condition that reflects the greatest pollutant reduction achievable; or, • if not additional feasible control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.	The HAC is defined here by the interim effluent condition that reflects the greatest pollutant reduction achievable with pollutant control technologies associated with chemical phosphorus removal. Expressed as long-term average, proposed HACs are as follows: • BOD_5 = 25 mg/L • TN = 18 mg/L • TP = 1 mg/L
A demonstration that attaining the underlying designated use is not feasible throughout the term of the WQS variance because of at least one of the factors listed in §131.10(g) or because of the restoration-related factor listed in §131.14(b)(2)(i)(A)(2) (40 CFR 131.14(b)(2)(i)(A))	Per Factor 6 of 40 CFR 131.10(g), treatment technologies more stringent that the proposed upgrades will result in "substantial and widespread economic and social" impacts. This is demonstrated by the fact nutrient removal technologies including BNR, ENR and LOT do not meet the meet the Municipal Primary Screener and the Secondary Tests outlined in EPA's Interim Economic Guidance for Water Quality Standards workbook.

Appendices

Appendix A

Bolivar Wastewater Treatment Facility Evaluation

Engineering Report

Bolivar Wastewater Treatment Facility Evaluation

City of Bolivar, Missouri

August 23, 2019

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1 Description of Need

1.1 Background

The City of Bolivar, Missouri (City) is located in Polk County and has a population of approximately 11,038. The City maintains a collection system consisting of gravity sanitary sewer lines, pump stations, and forcemains. The City operates and maintains the Bolivar Wastewater Treatment Facility (WWTF or Facility), a 2.55 million gallon per day (MGD) activated sludge wastewater treatment facility.

The City's current National Pollution Discharge Elimination System (NPDES) permit expired in 2013. In July 2019, the Missouri Department of Natural Resources (MDNR) shared a new draft permit with the City which includes an adaptive management approach to address requirements of the Town Branch/Piper Creek total maximum daily load (TMDL) study. The study was completed in 2010 to address excessive sedimentation and low dissolved oxygen in Town Branch and Piper Creek. The TMDL includes stringent wasteload allocations for nutrients and oxygen-demanding pollutants.

Specifically, the permit requires that lower biochemical oxygen demand (BOD), total suspended solids (TSS), total phosphorus (TP), and total nitrogen (TN) levels be adopted over time in an attempt to meet the water quality requirements identified in the receiving stream. In addition, a copper limit will likely be phased into the future permit. More information on the potential permit limits the TMDL requirements is included in Section 2.4.

This Engineering Report addresses improvements required to rehabilitate and/or replace aging facilities at the WWTF and to address more stringent future effluent limits needed to address the TMDL over time.

1.2 Purpose

The purposes of this Engineering Report are as follows:

- Evaluate cost-effective improvement options to inform future permitting activities and regulatory alternatives to the TMDL.
- Provide estimates of construction and operation and maintenance (O&M) costs, including 20-year net present worth (NPW) analysis for the alternatives evaluated.
- Provide recommendations on the financing of the recommended improvements.
- Evaluate impacts on user charges.
- Provide a conceptual plan moving forward and to evaluate the impact of proposed improvements on the water quality of Town Branch River, and to address future nutrient limits, if required.

2 Projected Flows, Loadings, and Effluent Requirements

2.1 Demographic and Economic Data

General economic and demographic information for the City of Bolivar was obtained from the US Census Bureau and is tabulated below:

- The population estimate for July 2018 was 11,038.
- Approximately 61 percent of the population is 18 to 65 years old, with about 17 percent over the age of 65.
- The average number of people per household is 2.23.
- The median household income (MHI) (2003 – 2017) (2017$) is $39,900.
- The adjusted MHI for the State of Missouri is (2017$) $53,578.

2.2 Flow Projections

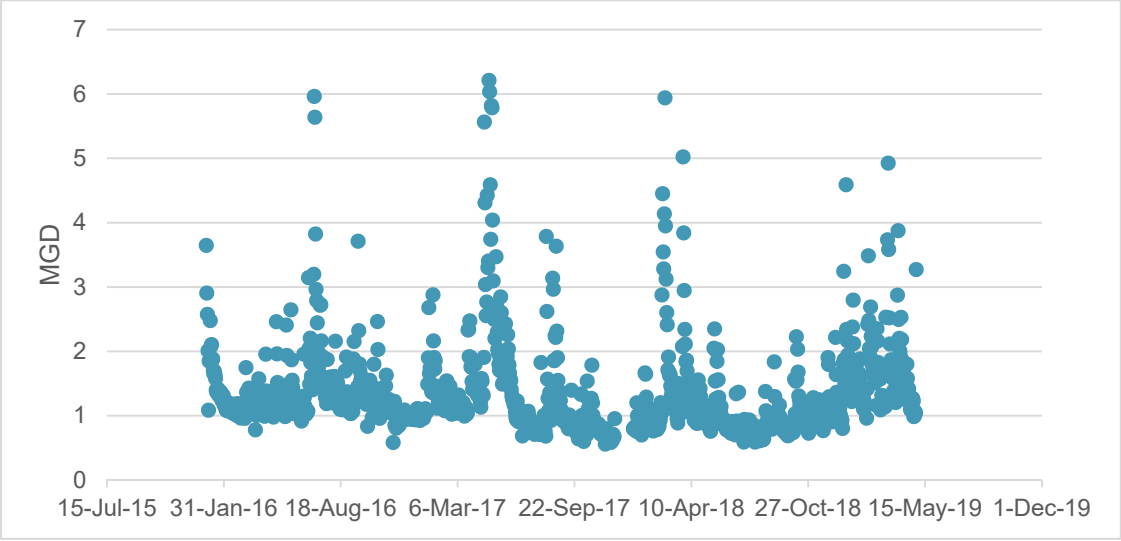
2.2.1 Influent/Effluent Flow

The existing WWTF has a permitted average day flow (ADF) capacity of 2.55 MGD and a peak hydraulic capacity of 6.0 MGD. The flow is comprised of domestic and commercial flows from various facilities within the service area.

The WWTF meters flow at the effluent of the ultraviolet light (UV) disinfection unit, prior to discharge into the receiving stream. The City does not currently monitor the influent flow.

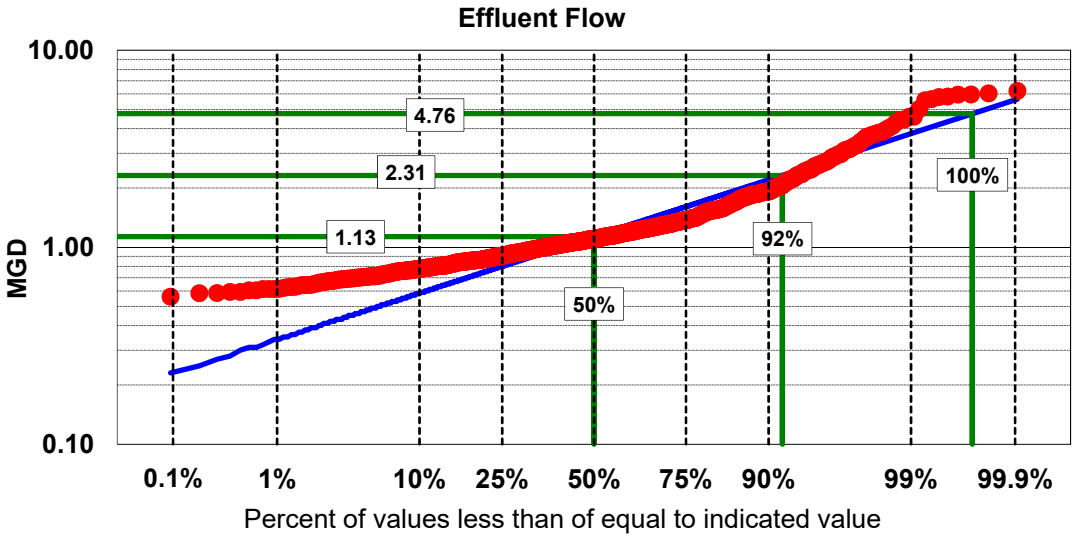
Effluent flow data, from January 2016 through April 2019, was provided by the City via daily monitoring reports (DMR). Refer to Figure 2-1 for effluent flow data.

Figure 2-1 – Bolivar WWTF - Effluent Flow Data (January 2016 – April 2019)



A statistical analysis was performed on the DMR data and it was determined that the effluent data generally follows a log-normal distribution. A percentile calculation was used in determining mean (50%), maximum month (92.7%), and maximum day values (99.7%). Figure 2-2 shows the graphical analysis of the statistics.

Figure 2-2 – Bolivar WWTF - Probability Analysis of Effluent Flow Data (LogNormal)



It can be seen that as flow approaches 6.0 MGD, data points begin to flatten out rather than continue at a consistent upward slope. The best explanation for this is that plant capacity is approximately 6.0 MGD, therefore, the flat area demonstrates that flow is exceeding the capacity that the Facility can treat. When the plant experiences flows that approach or exceed 6.0 MGD, typically they are accompanied to overflow events which are discussed more fully in Section 2.2.2.

In conjunction with the probability analysis presented in Figure 2-2 an arithmetic analysis was also performed on the effluent data. Table 2-1 summarizes the data from both the arithmetic and lognormal analysis of the effluent flow data.

Table 2-1 – Bolivar WWTF - Effluent Flow Analysis (Arithmetic and LogNormal)

Arithmetic	Minimum	0.6	MGD
	Average	1.3	MGD
	Maximum	6.2	MGD
	50.0 % Percentile	1.1	MGD
	91.7 % Percentile	2.0	MGD
	99.7 % Percentile	5.9	MGD
LogNormal	50.0 % Percentile	1.1	MGD
	91.7 % Percentile	2.3	MGD
	99.7 % Percentile	4.7	MGD

Based upon engineer's experience, collaborative discussion with the City's wastewater operations staff (i.e., discussion on actual influent flow observed on a regular basis), and the data from Table 2-1, Table 2-2 was developed and provides the design flow criteria at the WWTF.

Table 2-2 – Bolivar WWTF - Effluent Flow Parameters (January 2016 through April 2019)

Flow Condition (Effluent Flows)	DMR Flow (MGD)
Design Flow(1)	2.5
Average Daily Flow(2)	1.1
Maximum Month Flow(3)	2.2
Peak Daily Flow(4)	6.0

Notes:
(1) Design Flow is based upon the permitted capacity of the plant
(2) Average daily flow is based upon the arithmetic average daily flows from DMR data from January 2016 through April 2019
(3) Maximum month flow is the average of the arithmetic data and the lognormal data for max month (91.7 percentile).
(4) After discussion with plant operators in context with the data presented in Table 2-1, a peak daily flow of 6.0 MGD was determined as the peak design flow. Additionally, it can be seen in Figure 2-2 the plant can only treat flow up to 6.0 MGD before the trend flattens out. The trend flattening out indicates that flow capacity has been reach and there is flow loss at some other point in the system (e.g., sanitary overflow event).

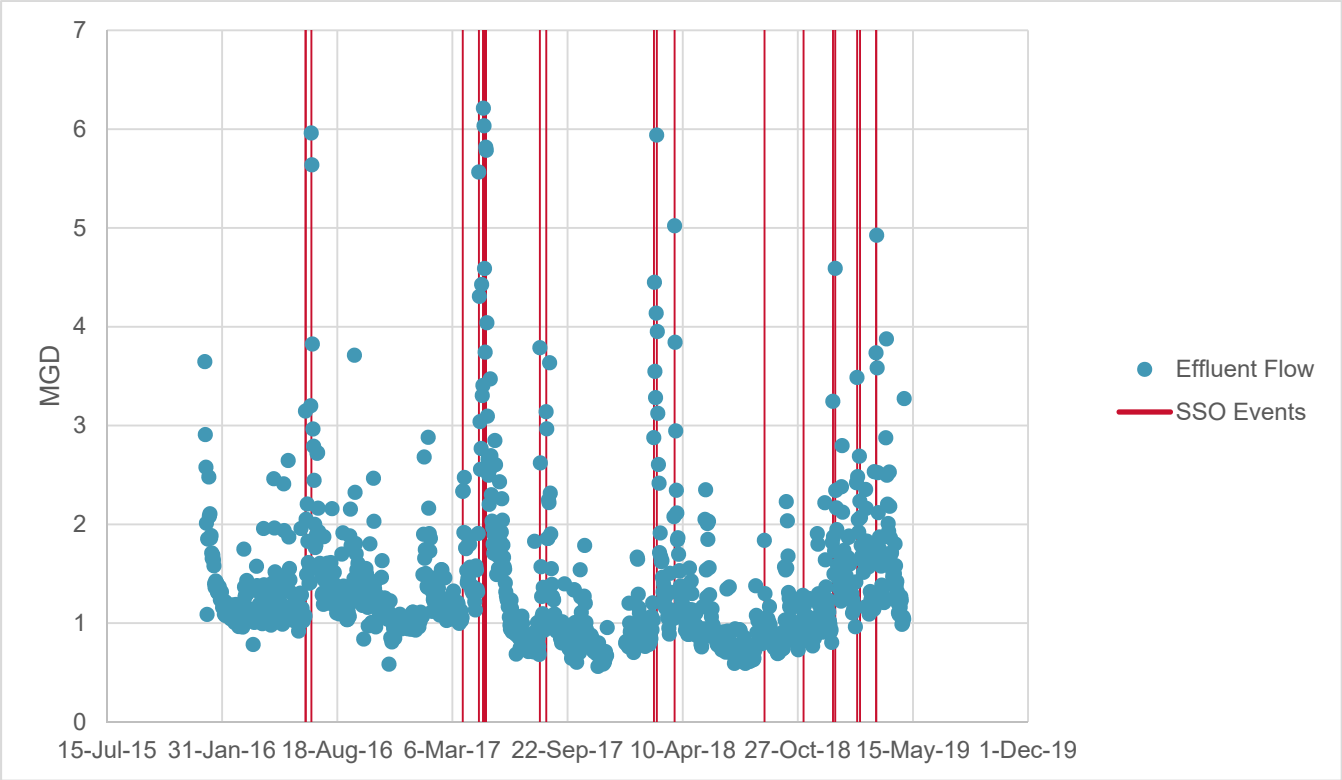
The flow data presented in Table 2-2 was utilized for unit sizing of the WWTF improvement alternatives discussed in Section 4.

2.2.2 SSO Flow

One issue the City has been facing with annual regularity is the occurrence of Sanitary Sewer Overflow (SSO) events within their collection system. Because of these issues, a holistic analysis of flow to the plant would have to encompass total system flow rather than just influent/effluent plant flow.

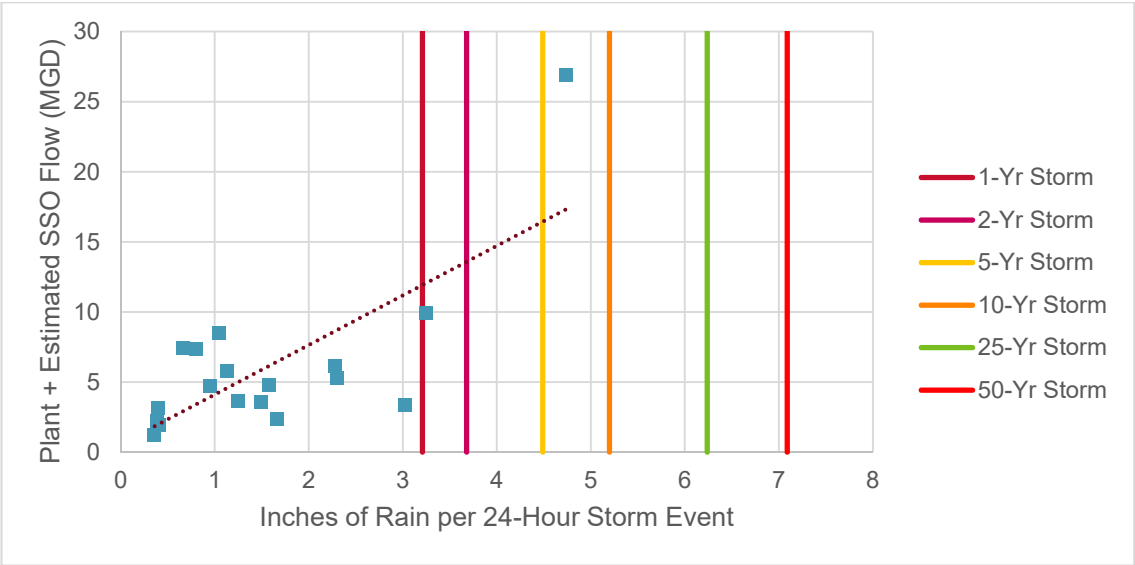
Between January 2016 and December 2018, the City recorded thirty SSO events at various locations within the collection system. By correlating the occurrence of these SSO events to when the plant experience peak flow (6.0 MGD), it can be concluded that the City's sanitary system is collecting and conveying more wastewater than can be treated by the plant during peak wet weather events (i.e., heavy rainfall events). When the treatment plant is unable to process the wastewater at a rate equal to or greater than the influent flow, the collection system becomes backed up and overflows at surrounding manholes (i.e., SSO events occur). Figure 2-3 shows SSO events in relation to effluent plant flow.

Figure 2-3 – Bolivar WWTF - Effluent Flow Vs. SSO Events



In order to estimate the anticipated plant flow that may occur during wet weather peak flow events, Figure 2-4 was developed utilizing plant flow, SSO discharge volumes, and local rainfall data. Refer to Appendix B for data supporting Figure 2-4. For the purposes of establishing design criteria for the alternative analysis in Section 4.2, wet weather peak flow is based upon a 2-year storm event. As such, peak flow within the collection system was estimated to be 13.0 MGD. Considering the plant can currently treat approximately 6.0 MGD, it can be concluded that the plant is currently undersized by 7.0 MGD. The wet weather peak flow alternatives presented in Section 4.2 address the 7.0 MGD of excess wet weather flow.

Figure 2-4 - Bolivar WWTF - Anticipated Plant Flow



It should be noted that there is one data point in Figure 2-4 that is significantly higher than the majority of the data points (i.e., 27 MGD at a 4.75-Yr storm event). It was determined that this data point could potentially be an outlier due to the uncharacteristically high flow rate compared to the other data points; however, when this data point is removed from the data set, the trend line flattens out to such a degree that it does not seem to accurately represent the entire data set. One explanation as to why the trend line may be too flat is because the estimated SSO flows are not based upon flow monitoring instrumentations and could therefore be slightly underestimated or inconsistent. For the sake of establishing a conservative flow estimate for a given storm event, the high data point was left in the data set.

2.3 Loading Projections

The City provided influent loading data via DMRs from January 2016 to April 2019. Over this time period, the City monitored influent BOD and TSS and Effluent BOD, TSS, Ammonia, Total Nitrogen (TN), and Total Phosphorus (TP). Table 2-3 shows average wastewater values based upon DMR data.

In order to determine design loading values, the DMR data was analyzed through HDR's probability analysis tool. The tool plots graphs of a normal probability distribution and a log probability distribution for each set of loading data. The log probability distribution is linear for a normally distributed data set, allowing projections to be made. Refer Table 2-4 for design loadings based upon the probability tool analysis.

Table 2-3 - Bolivar WWTF - Wastewater Characteristics

Description	Units	Average Characteristics Values
Influent BOD	mg/L	243
Influent TSS	mg/L	298
Effluent BOD	mg/L	6
Effluent TSS	mg/L	5
Effluent Ammonia	mg/L	1
Effluent TN	mg/L	18
Effluent TP	mg/L	2.5

Because influent data was not available for ammonia and TN, TKN was assumed based upon influent values from similar plants and projects. Influent TP values were assumed to be 3% of the influent BOD concentration. Additional graphs for loading data can be found in Appendix C. Table 2-4 shows the 2012 loading conditions.

Table 2-4 - Bolivar WWTF - Raw Water Design Criteria

Description	Units	Assumed Loading
Influent BOD	mg/L	250
Influent TSS	mg/L	300
Influent TP	mg/L	7.5
Influent TKN	mg/L	40

2.4 Town Branch TMDL Targets

The Town Branch TMDL set pollutant targets for the City's WWTF to address aquatic life use impairments due to excessive sedimentation and low DO. While DO itself is not considered a pollutant, the TMDL identifies the Bolivar WWTF as the primary point source contributor of oxygen demanding substances and nutrients, including BOD_5, TSS, TN, and TP. The BOD and total ammonia nitrogen targets were developed with a model designed to attain the minimum dissolved oxygen criterion of 5 mg/L. However, the TSS, TN and TP targets were set based on ecoregional conditions, which do not necessarily ensure compliance with MDNR's DO criterion. The final TMDL targets are stringent and cannot be achievable with current treatment technologies.

Figure 2-5 – Town Branch TMDL Targets for the Bolivar WWTF

Description	Units	Assumed Loading
CBOD5	mg/L	4
TSS	mg/L	27
Total Ammonia Nitrogen	mg/L	1.4
Total Nitrogen	mg/L	0.29
Total Phosphorus	mg/L	0.007

3 Existing Facilities

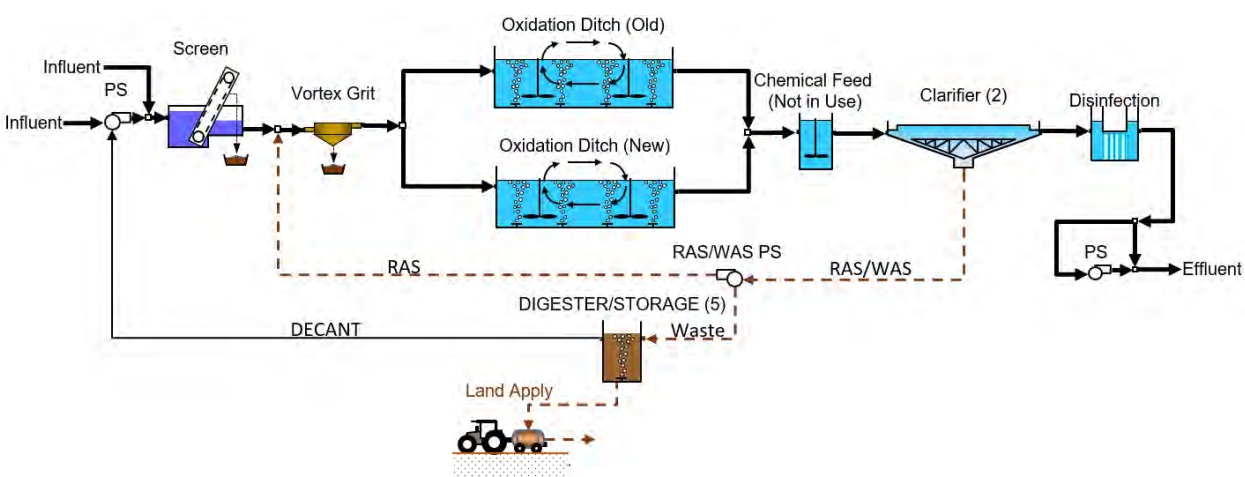
3.1 Wastewater Treatment Plant Location

The Bolivar WWTF lies in the Northeast portion of the City of Bolivar, Missouri, located North of E Broadway Street. The legal description is NE ¼, SW ¼, Section 6, Township 33N and Range 22W. Effluent discharges into the receiving stream, Town Branch River, from Outfall #001 to the Northeast of the Facility.

3.2 Existing Wastewater Treatment Plant Unit Processes

Appendix A includes the existing facility site layout. Refer Figure 3-1 for the process flow diagram of the existing Facility.

Figure 3-1 - Bolivar WWTF - Existing Process Flow



The following is a general description of the existing facilities at the site:

3.2.1 Influent Pump Station

The influent pump station lifts the influent flow to an elevation that allows it to flow by gravity through the unit processes at the treatment plant. The pump station consists of three pumps set to operate with two firm and one on standby. The pump station has a current firm capacity of 2.67 MGD. However, one plant influent sewer wastewater pipe

bypasses the influent pump station and discharges directly into a manhole prior to the headworks of the Facility (influent pump station effluent and flow from the influent sewer pipe join within this manhole); therefore, the influent pump station does not require a firm peak flow capacity of 6.0 MGD. Figure 3-2 shows the wetwell of the influent pump station.

Figure 3-2 - Bolivar WWTF - Influent Pump Station Wetwell

3.2.2 Influent Bar Screen

The influent mechanical bar screen is a 6.5 MGD Huber RakeMax. The screen was installed in 2015 and is in good working condition. The building housing the bar screen is constructed of masonry block is in good condition. Figure 3-3 shows the mechanical bar screen.

Figure 3-3 - Bolivar WWTF - Mechanical Bar Screen

3.2.3 Grit Removal

The grit removal system is downstream of the mechanical bar screen. Flow is directed out the effluent of the mechanical bar screen, through a parshall flume, and into the 4.0 MGD pista grit removal system. The unit is operational but undersized and beyond its useful life. Figure 3-4 shows the grit removal unit.

Figure 3-4 - Bolivar WWTF - Grit Removal

3.2.4 Oxidation Ditch Splitter Structure

Following grit removal, flow passes into a flow splitter structure that directs water into one of two oxidation ditches. The splitter structure is concrete construction and consists of two fixed weirs. This structure provides plant operators very little flow control and results in

unbalanced flow distribution among the two oxidation ditches. Figure 3-5 shows the oxidation ditch splitter structure.

Figure 3-5 - Bolivar WWTF - Oxidation Ditch Splitter Structure

3.2.5 Oxidation Ditches

The WWTF has two oxidation ditches (New Oxidation Ditch and Old Oxidation Ditch) which operate in parallel. The New Oxidation Ditch is aerated via three brush rotors, while the Old Oxidation Ditch is aerated via six brush rotors. The New Oxidation Ditch and Old Oxidation Ditch are operated at approximately 4,300 mg/L and 3,700 mg/L mixed liquor suspended solids (MLSS), respectively. RAS is introduced into the ditches at a discharge location prior to grit removal (refer to Figure 3-1). One explanation as to why the MLSS concentrations within the ditches are not equivalent is because mixing intensity is likely different because of the varying equipment within each ditch (i.e., different brush rotors). Table 3-1 summarizes the volume of the two oxidation ditches.

Table 3-1 - Bolivar WWTF - Oxidation Ditches Summary

Oxidation Ditch	Avg MLSS, mg/L	Geometry	Side Water Depth, ft	Length, ft	Width, ft	Volume, ft^3	Volume, gal	Percentage of Total Volume
New	4,300	Straight Walls	12	277	53	166,710	1,246,990	49%
Old	3,700	Sloped Walls	5	388	122	175,670	1,314,010	51%
Total						**342,380**	**2,561,000**	**100%**

The volume of the oxidation ditches does not significantly limit the capacity of the plant. During design average flow conditions (2.55 MGD and 425 mg/L of BOD), the oxidation ditches can treat 9,038 lbs BOD/day. At a flow rate of 2.55 MGD, the oxidation ditch

system has a 24.1 hour hydraulic retention time (HRT) and sludge retention time (SRT) of 14.8 days. Figure 3-6 and Figure 3-7 shows the New and the Old Oxidation Ditches, respectively.

Figure 3-6 - Bolivar WWTF - Old Oxidation Ditch

Figure 3-7 - Bolivar WWTF - New Oxidation Ditch

3.2.6 Final Clarifiers

The oxidation ditches discharge into their respective effluent structures. Subsequently, the effluent streams join together within the yard piping between the ditches and the clarifier. A splitter box located in between Clarifiers 1 and 2 equally distributes flow between the two units.

The two clarifiers are 75-foot diameter with double-sided V-notch weirs that are configured as a square in the center of the units. Sludge is removed using a return activated sludge/waste activated sludge (RAS/WAS) pipe that convey sludge to a pump station located North of the clarifiers. Clarifiers 1 and 2 are in moderate condition and functioning as designed. The clarifiers have adequate capacity as shown in Table 3-2. Plant operation can be optimized by operating the ditches at a more consistent MLSS of 3,500 mg/L. Figure 3-8 shows a single final clarifier.

Table 3-2 - Bolivar WWTF - Final Clarifiers

No. of Clarifiers	Diameter, ft	Sidewater Depth, ft	Total Volume, MG	Weir Loading Rate, gpd/ft [1]	Hydraulic Loading Rate gpd/ft^2 [1]	Solids Loading Rate lbs/d/ft^2 [1]
2	75	13	0.85	14,423	679	32
MDNR Limit				15,000	1,000	35

[1] Loadings were calculated with MLSS at 3,500 mg/L, design flow at 2.55 MGD, RAS at (1.5 x 2.55 MGD), and peak flow at 6.0 MGD.

Figure 3-8 - Bolivar WWTF - Final Clarifier

3.2.7 Return/Waste Activated Sludge Pump Station

The RAS pump station is located in a structure north of the final clarifiers. The pump station contains RAS pumps which convey sludge to discharge prior to the grit chamber. The structure also contains WAS pumps that convey sludge to aerobic digester storage tanks located south of the clarifiers. The pump station houses three pumps (two duty, one standby) that each have a capacity of 1,500 gpm. Pumps distribute RAS/WAS to their final destination by utilizing a series of valves located within the pump station. The pump station structure is in good condition, the pumps have adequate capacity, and piping is in good condition. Figure 3-9 shows the interior of the RAS/WAS pump station (note: when the photo was taken, one pump was down for maintenance).

Figure 3-9 - Bolivar WWTF - RAS/WAS Pump Station

3.2.8 UV Disinfection

Prior to discharge into the receiving stream, treated water is disinfected utilizing a Trojan 3000Plus UV disinfection unit. This 6.5 MGD unit process was designed and installed in 2012, is in good condition, and functioning as designed. Figure 3-10 shows the UV disinfection structure.

Figure 3-10 - Bolivar WWTF - UV Disinfection

3.2.9 Waste Activated Sludge Digesters/Storage

WAS is stabilized with the use of five existing aerobic digesters. Four of the aerobic digesters are 60-feet in diameter with a 12-foot side water depth (excluding two feet of freeboard) and one aerobic digester is 50-feet in diameter with a 10-foot side water depth (excluding two feet of freeboard). The available aerobic digester storage volume is approximately 1.1 MG. Each digester is outfitted with a 50 hp floating aerator.

Sludge digestion and storage is dependent upon flow rate and loading. Currently, at average daily flow conditions, the plant has approximately 140-days of storage volume (assuming 1.1 MGD and 2.5% solids). WAS is typically land-applied when available. Operations staff have stated that sludge storage volume can become an issue during winter conditions when land application is not available.

3.2.10 Effluent Pump Station

The effluent pump station conveys effluent flow to the receiving stream when conditions do not allow for gravity feed (e.g., flood conditions). The pump station consists of three pumps set to operate with two firm and one on standby with a firm capacity of 7.5 MGD. Each pump has a capacity of 2,620 gpm.

3.2.11 Unit Process Summary

Table 3-3 outlines the various unit processes and capacities at the WWTF.

Table 3-3 - Bolivar WWTF - Unit Process Summary

Unit Process	Capacity
Influent PS	2.67 MGD (Firm - 2 Duty/1 Standby)
Bar Screen	6.5 MGD
Grit Removal	4.0 MGD
Oxidation Ditches	HRT (at 2.55 MGD) - 24.1 hr
	SRT (at 2.55 MGD @ 3,500 mg/L) - 14.8 days
	OLR (at 2.55 MGD @ 250 mg/L BOD - 15.52 lb BOD/day/1000 ft^3
Final Clarifiers	SOR (at 6.0 MGD) - 679 gal/day/ft^2
	SLR (at 6.0 MGD + (2.55 MGD x 1.5) RAS @ 3,500 mg/L MLSS) - 32 lb/ft^2
	WLR (at 6.0 MGD) - 14,423 gpd/ft
Return Waste PS	4.36 MGD (Firm - 2 Duty/1 Standby)
UV Disinfection	6.5 MGD
Sludge Digestion and Storage	139 Days @ 2.5% solids @ 1.1 MGD
	60 Days @ 2.5% solids @ 2.55 MGD
Effluent PS	7.5 MGD (Firm - 2 Duty/1 Standby)

4 Wastewater Treatment Facility Improvement Alternatives

The improvement alternatives analyzed can be categorized into three main categories: base improvements to the existing facility, improvements to address peak flow events (refer to Section 2.2.2), and improvements to address nutrient removal.

Nine alternatives (base improvements plus eight alternatives) were evaluated. The four alternatives evaluated for nutrient improvements were developed for progressively more stringent levels of wastewater treatment. The nine treatment scenarios are as follows:

- Base Improvements to the Existing Facility
- Wet Weather Peak Flow Alternatives
    - Alternative I – I/I Reduction in Collection System
    - Alternative II – Peak Flow Storage
    - Alternative III – System Expansion
    - Alternative IV – Tertiary Filters
- Nutrient Improvements
    - Alternative V – Chemical Nutrient Removal
    - Alternative VI – Biological Nutrient Removal
    - Alternative VII – Enhanced Nutrient Removal
    - Alternative VIII – Limits of Technology

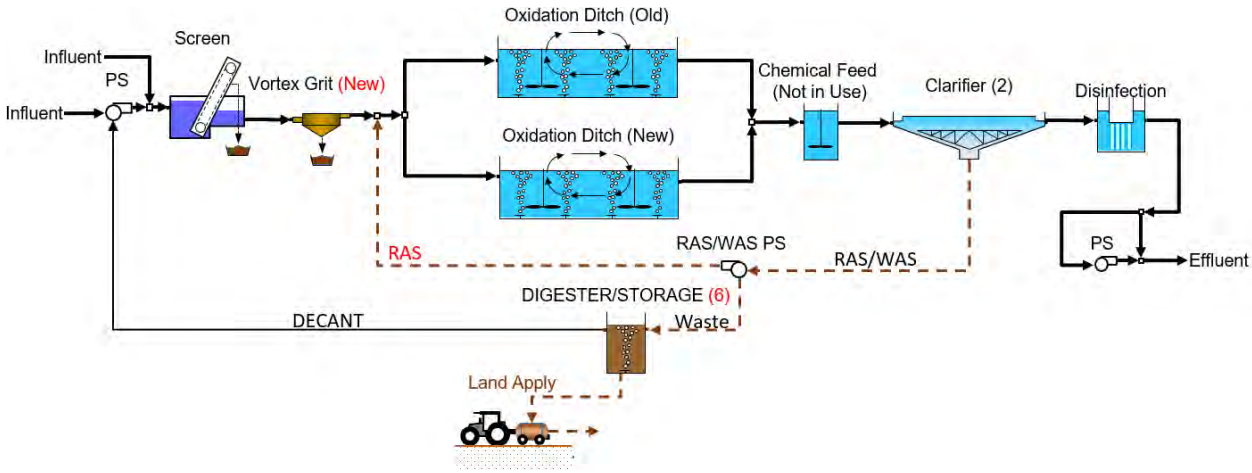
The following section provides details of each scenario evaluated.

4.1 Base Improvements to the Existing Facility

The existing WWTF requires base improvements due to poor condition of existing equipment and to address undersized unit processes. These base improvements are required to continue operating at current operating conditions. The base improvements were established based upon the findings in Section 3.

Base improvements include construction of a new vortex grit removal unit, construction of a new oxidation ditch splitter structure, addition of a sludge digestion and storage tank, and yard pipe improvements. The proposed improvements will renew the existing facility and properly size various unit processes to better handle current load and flow conditions. Further, these improvements will result in the optimization of current treatment practices and operations at the Facility. Figure 4-1 depicts the process flow diagram for the base case improvements.

Figure 4-1 – Bolivar WWTF - Process Flow – Base Improvements



Base Improvement inpacts to the existing facility include the following:

- New grit removal unit;
- New sludge digestion and storgae tank; and
- Yard piping improvements.

4.2 Wet Weather Peak Flow Alternatives

The alternatives presented in Section 4.2.1 through 4.2.4 address the peak flow issues discussed in Section 2.2.2.

4.2.1 Alternative I - I/I Reduction in Collection System

The SSO events that occur within the City's sanitary collection system can be attributed in part to excessive inflow and infiltration (I/I). Inflow within a system is defined as water (typically stormwater) entering the sewer system via elicit service lines (e.g., improperly connected downspouts or sump pumps) and are typically from residential or commercial entities. Infiltration is defined as water that enters into the sanitary system via cracks in pipes or loose joints. I/I is difficult to eliminate within a system because the issues tend to be widespread, difficult to identify, and complex in nature (i.e., who is responsible for the repair – homeowner or City).

The purpose of I/I reduction is to rehabilitate the sanitary collection system to a degree that will result in reduced flow to the WWTF. This would include removing elicit connections and rehabilitating/repairing piping and manholes. Rehabilitation would include but not be limited to the following: replacing pipes and manholes, replacing joints, and lining pipes and manholes.

The City of Bolivar has a system that consists of approximately 480,000 linear feet of piping; consequently this option would be a large undertaking by the City with no assurance of complete success. I/I reduction projects have been implemented in locations within this region with varying degrees of success. Based upon the experience at other

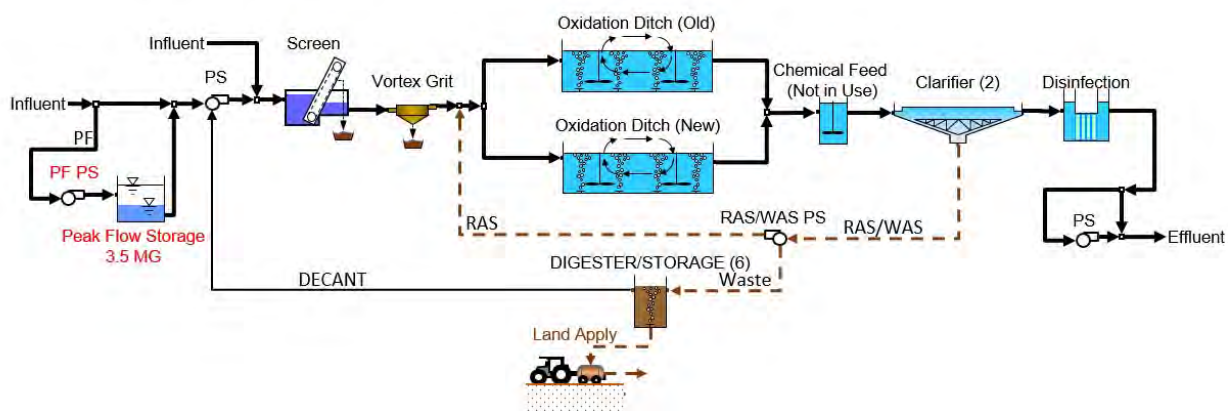
project locations, it would be borderline unreasonable to achieve a 30% reduction in I/I flow even with extreme rehabilitation. A cost of $70 per linear foot can be assumed for total system rehab (this cost includes rehab of both public and private service lines and connections).

It should be noted that the I/I reduction alternative is separate from typical annual maintenance. The City should continue their efforts in renewing and repairing the existing system as this is essential to ensure proper system functionality.

4.2.2 Alternative II - Peak Flow Storage

In order to better equip the Facility to handle peak flow wet weather events, this alternative was developed to direct excess flow (i.e., flows above 6.0 MGD) to a peak flow pump station that will subsequently divert the wastewater into peak flow storage. Once peak wet weather flow decreases to a level that can be properly processed by the plant, the stored excess wastewater will be reintroduced to the plant for treatment. This Alternative II involves the addition of a new peak flow pump station and a 3.5 million gallon pre-stressed concrete storage tank. Figure 4-2 shows the process flow for Alternative II.

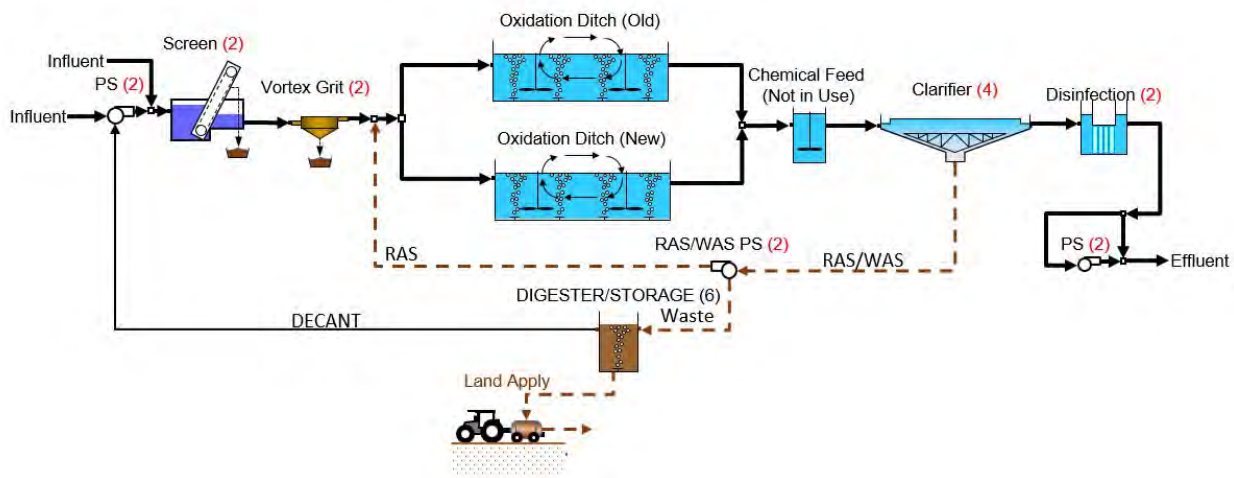
Figure 4-2 - Bolivar WWTF - Process Flow - Alternative II - Peak Flow Storage



4.2.3 Alternative III – System Expansion

For the purposes of giving the Facility the ability to handle wet weather peak flow events, this alternative was developed to expand the capacity of every unit process. This will require the addition/expansion of the following unit processes: influent pump station, mechanical bar screens, clarifiers, RAS/WAS pump station, UV disinfection, and effluent pump station. This approach will renew many of the existing unit processes at the Facility and effectively double peak flow capacity. Figure 4-3 depicts the process flow diagram for Alternative III.

Figure 4-3 - Bolivar WWTF - Process Flow - Alternative III - System Expansion



4.2.4 Alternative IV – Tertiary Filters

Alternative IV involves the addition of tertiary cloth filters that will be utilized to handle peak flow events. During average daily use, these filters would act as a final polishing step prior to UV disinfection. However, during peak flow events, operations of the Facility would be modified and excess flow will bypass the treatment process and be directed to the tertiary filters. After filtration, the excess peak flow would be blended downstream of the unit with typical treated water. Figure 4-4 depicts the process flow diagram for average daily flow conditions while Figure 4-5 depicts the process flow diagram for peak flow conditions. This alternative includes the following improvements: influent pump station, mechanical bar screen, grit removal, tertiary filters, UV disinfection, and effluent pump station.

Figure 4-4 - Bolivar WWTF - Process Flow - Alternative IV - Tertiary Filters (ADF)

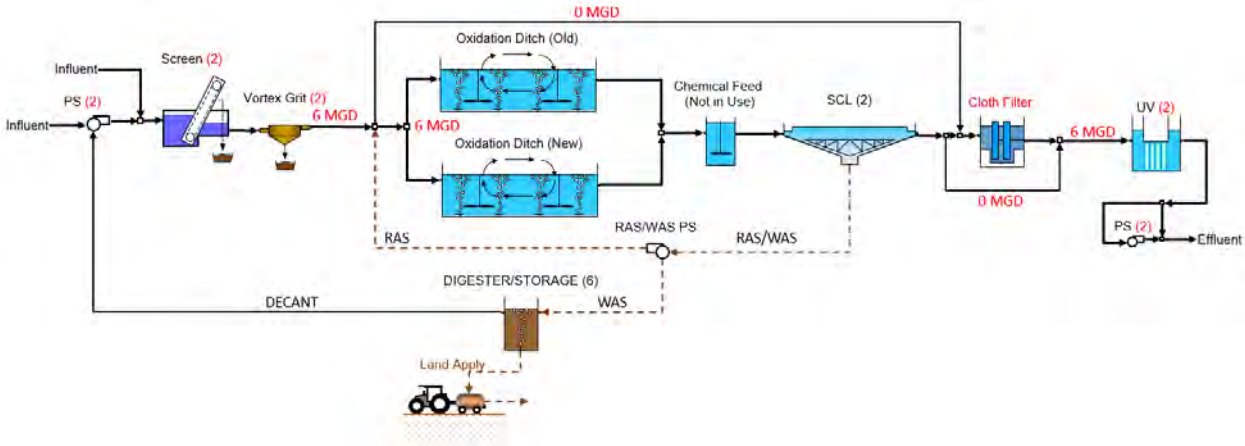
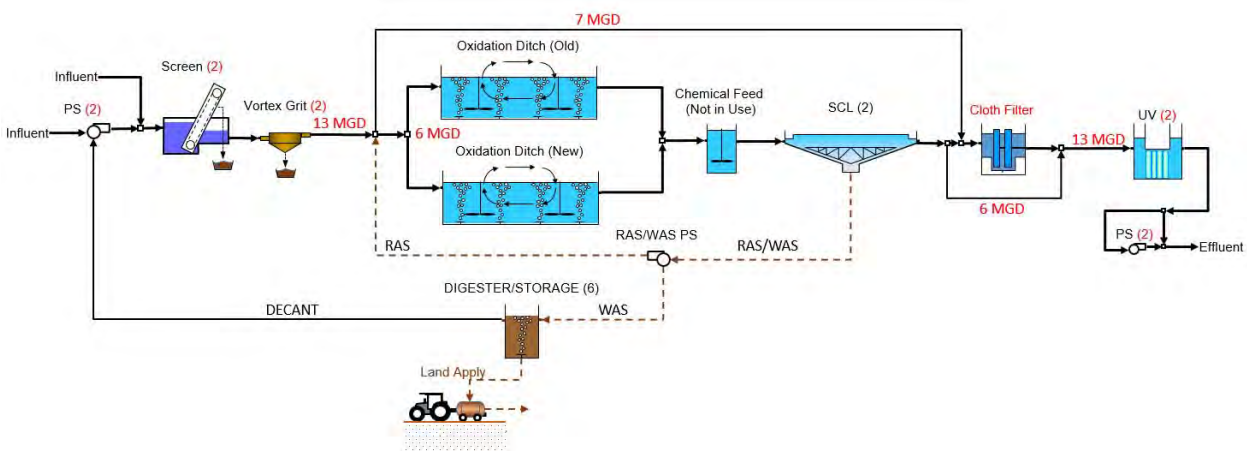


Figure 4-5 - Bolivar WWTF - Process Flow - Alternative IV - Tertiary Filters (Peak Flow)

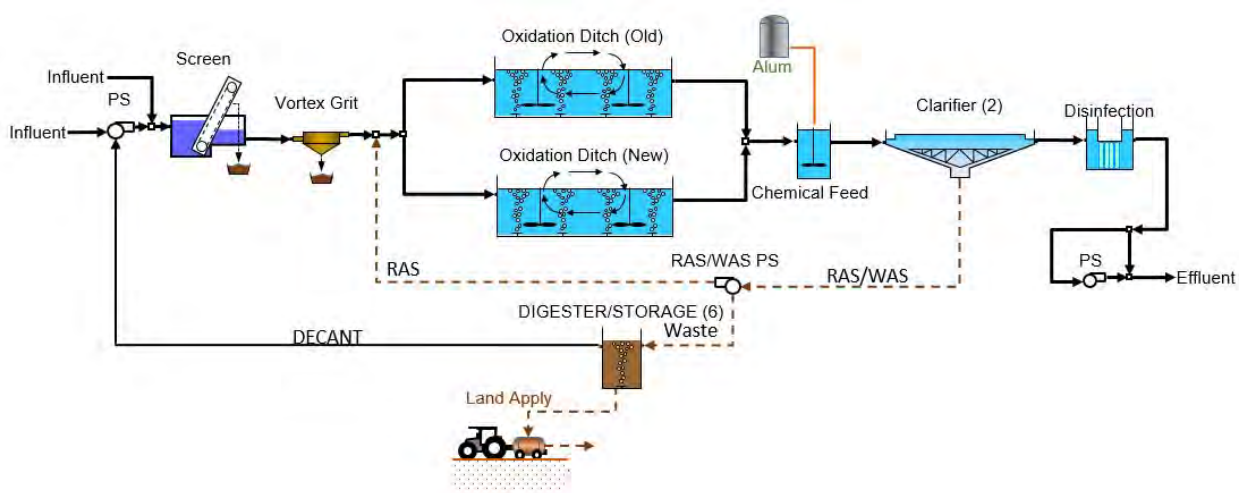


4.3 Nutrient Improvements

4.3.1 Alternative V – Chemical Nutrient Removal

For the purposes of achieving some nutrient removal for the base improvements, this alternative was developed and involves the addition of alum upstream of the clarifiers for the purposes of chemically nutrient removal (CNR) (i.e., removal of phosphorus). This will require an additional 560 square foot structure to house a chemical feed skid and storage tank. With this alternative, anticipated average TP effluent concentrations would be approximately 1 mg/L as an annual average; however, as additional alum is added to approach lower concentrations, consideration needs to be provided for increased solids production and handling. Figure 4-6 depicts the process flow diagram of Alternative V.

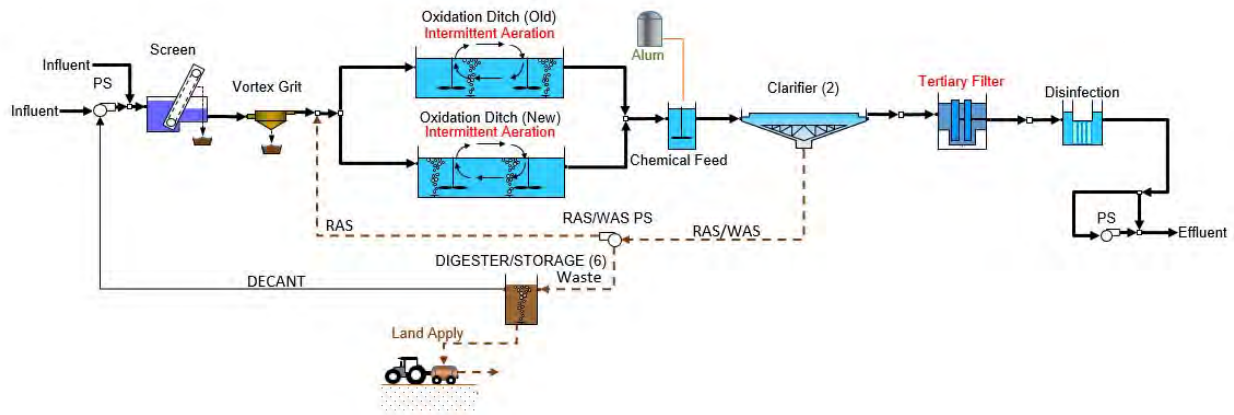
Figure 4-6 – Bolivar WWTF - Process Flow – Alternative V – CNR



4.3.2 Alternative VI – Biological Nutrient Removal

In addition to the improvements outlined in the base case, both aerobic and anoxic treatment conditions could be employed to achieve biological nutrient removal (BNR). The anticipated long-term average effluent concentrations for Alternative VI is a TN of 10 mg/L, a TP of 1 mg/L, and a CBOD5 and TSS of 10 mg/L each. The BNR treatment would be achieved utilizing intermittent aeration of the existing oxidation ditches. This cycle between aerobic and anoxic environments would facilitate favorable conditions for biological denitrification and total nitrogen removal. Alternative VI would also include a chemical feed system using alum to enable phosphorus reduction. Figure **4-7** specifically depicts the process flow diagram relevant to Alternative VI.

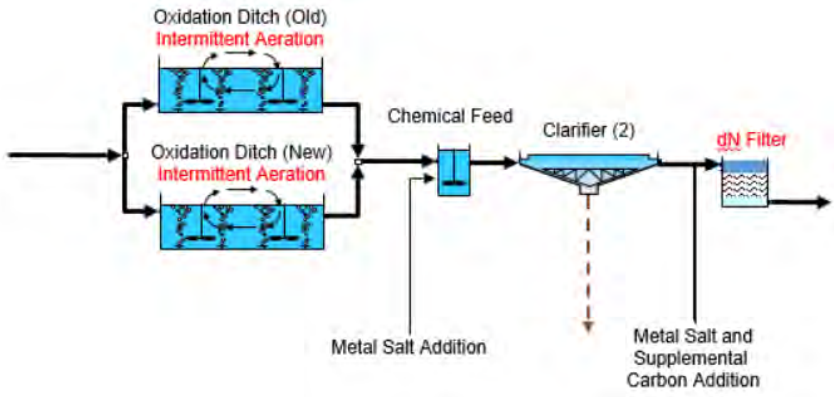
Figure 4-7 **– Bolivar WWTF - Process Flow – Alternative VI - BNR**



4.3.3 Alternative VII – Enhanced Nutrient Removal

In addition to the improvements outlined Alternative VI, filtration would be added to achieve enhanced nutrient removal (ENR). The anticipated long-term average effluent concentrations for Alternative VII is a TN of 5 mg/L, a TP of 0.5 mg/L, and a CBOD5 and TSS of 5 mg/L each. The ENR treatment would be achieved with a dentrification filter with the addition of a carbon source to promote further dentrification reducing the amount of total nitrogen from 10 mg/L, achievable in Alternative VI, to 5 mg/L in Alternative VII. Alternative VII would include additional chemical alum feed to enable further phosphorus reduction. Figure 4-8 depicts the process flow diagram of Alternative VII.

Figure 4-8 - Bolivar WWTF - Process Flow - Alternative VII - ENR



4.3.4 Alternative VIII – Limits of Technology

Reverse osmosis (RO) represents the current highest form of treatment that could be used to further reduce effluent total nitrogen (TN) and total phosphorus (TP) beyond the levels that can be achieved by ENR; however, RO is not a proven technology for use in municipal wastewater treatment applications with respect to effluent nutrient discharge quality due to its limited body of research.

According to WERF (2010), the current limit of technology (LOT) for TN removal ranges between 3 mg/L and 4 mg/L for municipal wastewater treatment. The level of TN removal that any proven technology can achieve depends on the effluent rDON, or refractory dissolved organic nitrogen, concentration. The level of effluent rDON for a typical municipal WWTF effluent can range from 1 to 2 mg/L, but higher concentrations are not uncommon and can be due to certain types of industrial contributions or may be generated as a byproduct of the treatment process. To yield an effluent TN near the TMDL WLA of 0.9 mg/l, effluent total inorganic nitrogen (TIN) concentrations of less than 0.8 mg/l would be required and the effluent rDON would have to be almost completely removed. According to WERF (2011), RO may have the potential to reduce rDON, and is known to remove nitrate and ammonia; however, depending on the membrane type, effluent rDON concentration reductions ranging from 50% and 90% are more likely. Therefore, it is unlikely effluent rDON concentrations could be reduced to a level required to meet the TMDL TN WLA. Also, such a low effluent TIN would require secondary and tertiary nitrogen removal processes with carbon addition capable of reducing TSS concentrations to less than 2 mg/l. Such a treatment train would require high levels of automation, highly skilled operations staff, and full redundancy throughout the liquid treatment process.

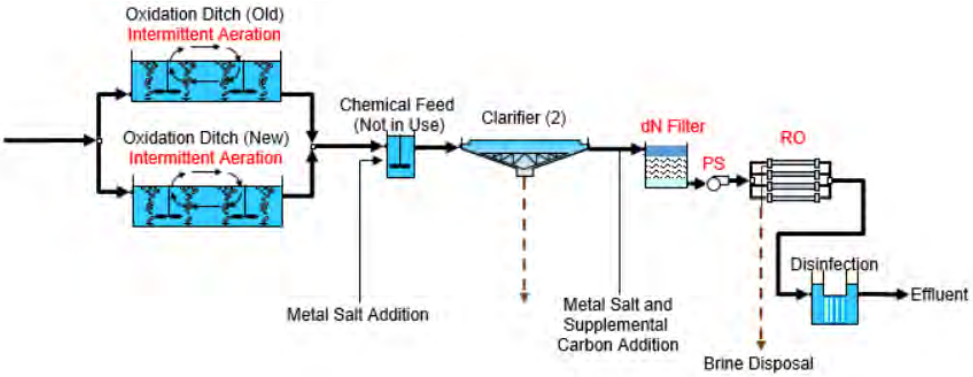
Similarly, the TMDL TP WLA of 0.007 mg/L also represents an unachievable limit given the current LOT. According to WERF, the current LOT for TP is in the range of approximately 0.1 mg/L (Clark et al. 2016). Currently, two of the most advanced phosphorus removal plants in the country include the Rock Creek and Durham facilities located in Oregon. They were designed to meet one of the most restrictive TMDL-based phosphorus limits (0.1 mg/L) outside of Missouri. These facilities have successfully achieved effluent TP concentrations near 0.07 mg/L by employing chemical clarification

and media filtration. However, even using such advanced technologies, it is unlikely average effluent TP could be reduced to level necessary to meet the TMDL WLA, which is approximately an order of magnitude lower than what is achieved at these treatment facilities.

In addition to RO having very high operations and maintenance (O&M) cost, RO produces a deionized permeate that is toxic to aquatic life. Diverting flow around the RO process and recombining it with the RO effluent should address concerns with toxic deionized permeate discharges. An additional treatment step would be required to condition the permeate by adding back salts and minerals to the plant effluent prior to discharge. Treatment of 100% of the plant flow would result in high capital and O&M expenditures, while still not likely attaining the effluent TN concentration required by the TMDL.

In addition to these concerns, RO also produces a reject brine that required some form of disposal. Typical methods used for disposal of brine from an RO process consist of injection wells; however, the use of this disposal method is currently not allowed in the state of Missouri. Other methods of disposal such as evaporation ponds are not applicable for this climatic area. Therefore, brine concentration and crystallization would most likely be the required disposal method if using an RO process. The significant energy requirements associated with further concentration of the brine and subsequent heating for evaporation would result in a considerably higher capital and annual O&M cost as compared to injection wells. In addition, this residuals management process would produce much higher levels of greenhouse gas (GHG) emissions due to energy consumption. Figure 4-9 depicts the process flow diagram of Alternative VIII.

Figure 4-9 - Bolivar WWTF - Process Flow – Alternative VII - LOT



5 Anticipated Capital, Operations/Maintenance Costs

5.1 Anticipated Capital Cost

Table 5-1 shows the anticipated capital costs for the proposed base improvements and alternatives.

Table 5-1 - Bolivar WWTF - Anticipated Capital Costs

FACILITIES	BASE IMPROVEMENTS	Alternative I 30% I/I Removal	Alternative II Peak Flow Storage	Alternative III [1] System Expansion	Alternative IV [1] Cloth Filters	Alternative V - CNR Chemical Addition	Alternative VI - BNR [2] Intermittent Aeration	Alternative VII - ENR Denitrification Filters	Alternative VIII - LOT Reverse Osmosis
Peak Flow Pump Station	-	-	$1,363,000	$1,437,000	$1,437,000	-	-	-	-
Peak Flow Storage Tank	-	-	$2,510,000	-	-	-	-	-	-
Effluent Pump Station	-	-	-	$1,138,000	$1,138,000	-	-	-	-
RAS/WAS Pump Station	-	-	-	$1,202,000	-	-	-	-	-
Headworks	$525,000	-	-	$1,685,000	$1,685,000	-	-	-	-
Final Clarifiers	-	-	-	$2,120,000	-	-	-	-	-
Sludge Digester/Storage	$523,000	-	-	-	-	-	-	-	-
UV Disinfection	-	-	-	$738,000	$738,000	-	-	-	-
Filter Building	-	-	-	-	$601,703	-	$601,703	$601,703	$601,703
Tertiary Filtration (Cloth Media)	-	-	-	-	$965,000	-	$965,000	-	-
Oxidation Ditch(s) Modification	-	-	-	-	-	-	$571,865	-	-
Chemical Feed and Building – Alum	-	-	-	-	-	$416,730	$416,730	-	-
Chemical Feed and Building - Carbon	-	-	-	-	-	-	-	$258,680	$258,680
Tertiary Filtration (dN)	-	-	-	-	-	-	-	$2,147,000	$2,147,000
Reverse Osmosis	-	-	-	-	-	-	-	-	$52,676,000
Site Piping (20%)	$209,600	-	-	$1,664,000	$1,312,941	-	-	-	-
Subtotal	**$1,257,600**	**-**	**$3,873,000**	**$9,984,000**	**$7,877,640**	**$416,730**	**$2,555,300**	**$3,007,380**	**$55,683,380**
Overhead (10%)	$125,760	-	$387,300	$998,400	$787,764	$41,673	$255,530	$300,738	$5,568,338
Profit (5%)	$62,880	-	$193,650	$499,200	$393,882	$20,837	$127,765	$150,369	$2,784,169
Bonds and Insurance (3%)	$37,728	-	$116,190	$299,520	$236,329	$12,502	$76,659	$90,221	$1,670,501
Contingency (25%)	$377,280	-	$968,250	$2,496,000	$1,969,410	$104,183	$638,825	$751,845	$13,920,845
Subtotal	**$1,861,248**	**-**	**$5,538,390**	**$14,277,120**	**$11,265,025**	**$595,924**	**$3,654,079**	**$4,300,553**	**$79,627,233**
ELA (16%)	$409,475	-	$886,142	$2,284,339	$1,802,404	$95,348	$584,653	$688,089	$12,740,357
Total	**$2,270,720**	**$33,600,000**	**$6,424,530**	**$16,561,460**	**$13,067,430**	**$691,270**	**$4,238,730**	**$4,988,640**	**$92,367,590**

[1] Alternative III and Alternative IV assumes the headwork portion from the base improvements have been constructed.

[2] Alternative VI - BNR is designed to utilize the existing ditches but employ intermittent aeration in order to achieve anoxic and aerobic conditions. This scenario will include the addition of mixers to the ditches.

5.2 Anticipated Operations and Maintenance Costs

Table 5-2 presents that anticipated annual operations and maintenance costs associated with the base improvements and each alternative. Refer to Appendix D for detailed analysis of each individual alternative.

Table 5-2 - Bolivar WWTF - O&M Costs

Annual Costs	Additional Annual O&M Costs							
	Base Improvements	Alternative II PF Storage	Alternative III System Expansion	Alternative IV Tertiary Filter	Alternative V CNR	Alternative VI BNR	Alternative VII ENR	Alternative VIII LOT
Estimated Annual Replacement Costs	$21,313	$21,731	$141,793	$150,726	$10,873	$97,874	$112,279	$4,604,722
Estimated Annual Chemical Costs	$0	$0	$0	$0	$112,930	$112,930	$264,859	$264,859
Estimated Annual Labor Costs	$0	$0	$0	$0	$0	$0	$0	$200,000
Estimated Annual Electricity Usage Costs	$23,577	$612	$25,111	$26,058	$0	$18,564	$0	$3,045,488
Estimated Annual O&M	$44,900	$22,400	$167,000	$176,800	$123,900	$229,400	$377,200	$8,115,100

5.3 Net Present Worth

Table 5-3 presents the net present worth (NPW) of each alternative relative to capital costs and annual O&M.

Table 5-3 - Bolivar WWTF - Net Present Worth

Description	Base Improvements	Alternative II Peak Flow Storage	Alternative III System Expansion	Alternative IV Tertiary Filter	Alternative V CNR	Alternative VI BNR	Alternative VII ENR	Alternative VIII LOT
Present Worth of Capital Costs	$2,270,720	$6,424,530	$16,561,460	$13,067,430	$691,270	$4,238,730	$4,988,640	$92,367,590
Present Worth of Annual O&M(1)	$620,000	$310,000	$2,270,000	$2,410,000	$1,690,000	$3,120,000	$5,130,000	$110,290,000
Subtotal NPW	**$2,890,720**	**$6,734,530**	**$18,831,460**	**$15,477,430**	**$2,381,270**	**$7,358,730**	**$10,118,640**	**$202,657,590**

(1)Assumes a discount rate of 4% over a 20-year planning period.

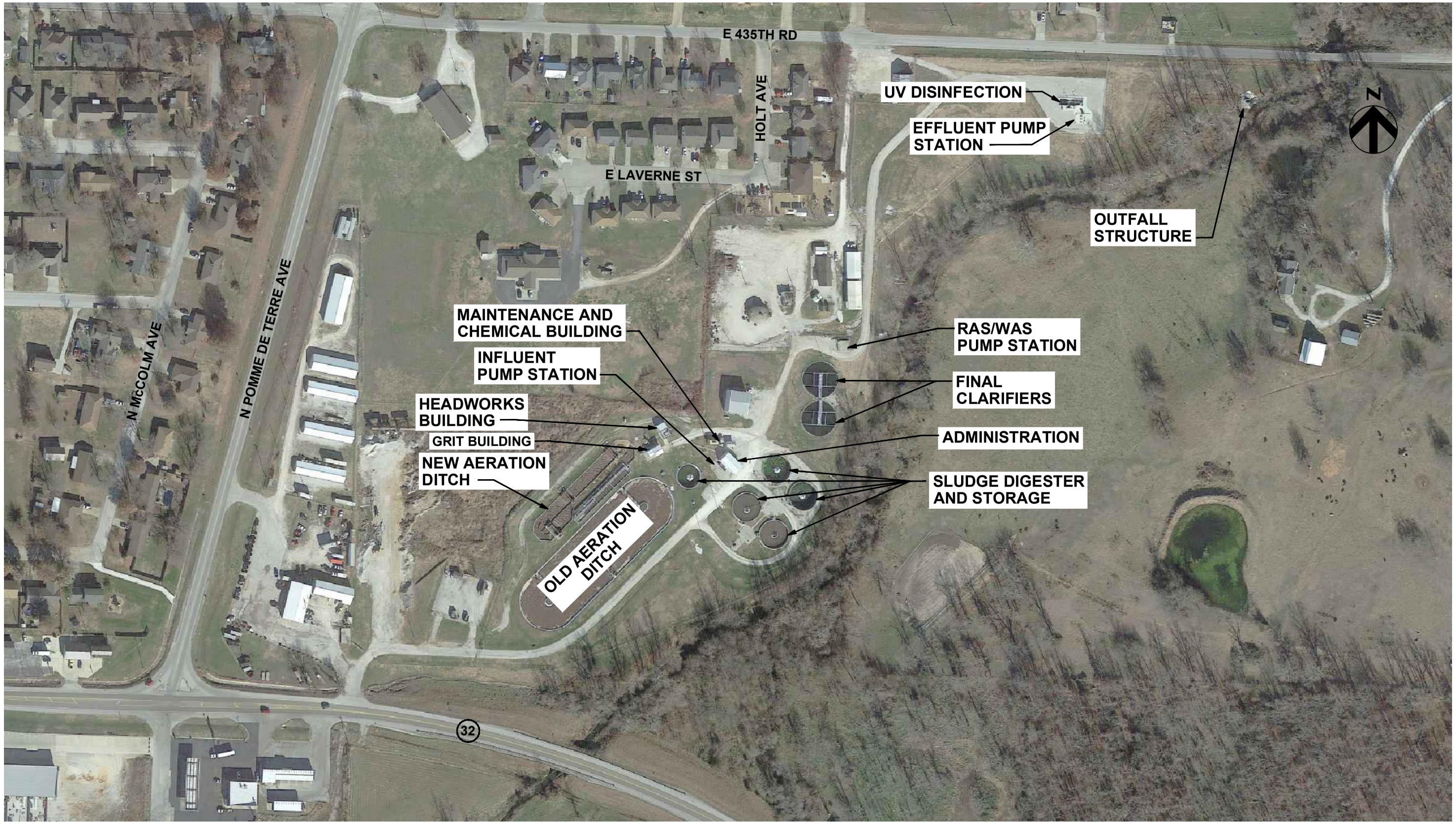
Because many of the alternatives build upon each other, Table 5-4 presents a holistic view of the total project net present worth.

Table 5-4 - Bolivar WWTF - Total Project Net Present Worth

Description	Base Improvements	Alternative II PF Storage	Alternative III System Expansion	Alternative IV Tertiary Filter	Alternative V(1) CNR	Alternative VI(1) BNR	Alternative VII (1) ENR	Alternative VIII(1) LOT
Base Improvements	$2,890,720	$2,890,720	$2,890,720	$2,890,720	$2,890,720	$2,890,720	$2,890,720	$2,890,720
Wet Weather Improvement	-	$6,734,530	$18,831,460	$15,477,430	$6,734,530	$6,734,530	$6,734,530	$6,734,530
CNR	-	-	-	-	$2,381,270	-	-	-
BNR	-	-	-	-	-	$7,358,730	$7,358,730	$7,358,730
ENR	-	-	-	-	-	-	$10,118,640	$10,118,640
LOT	-	-	-	-	-	-	-	$202,657,590
Estimated Net Present Worth	**$2,890,720**	**$9,625,250**	**$21,722,180**	**$18,368,150**	**$12,006,520**	**$16,983,980**	**$27,102,620**	**$229,760,210**

(1)Assumes peak flow storage is chosen as the wet weather improvement project.

Appendix A – Facility Site Plan



HDR

City of Bolivar MISSOURI Where Liberty Flows

CITY OF BOLIVAR, MISSOURI
Bolivar WWTF Alternatives Analysis
Facility Site Plan

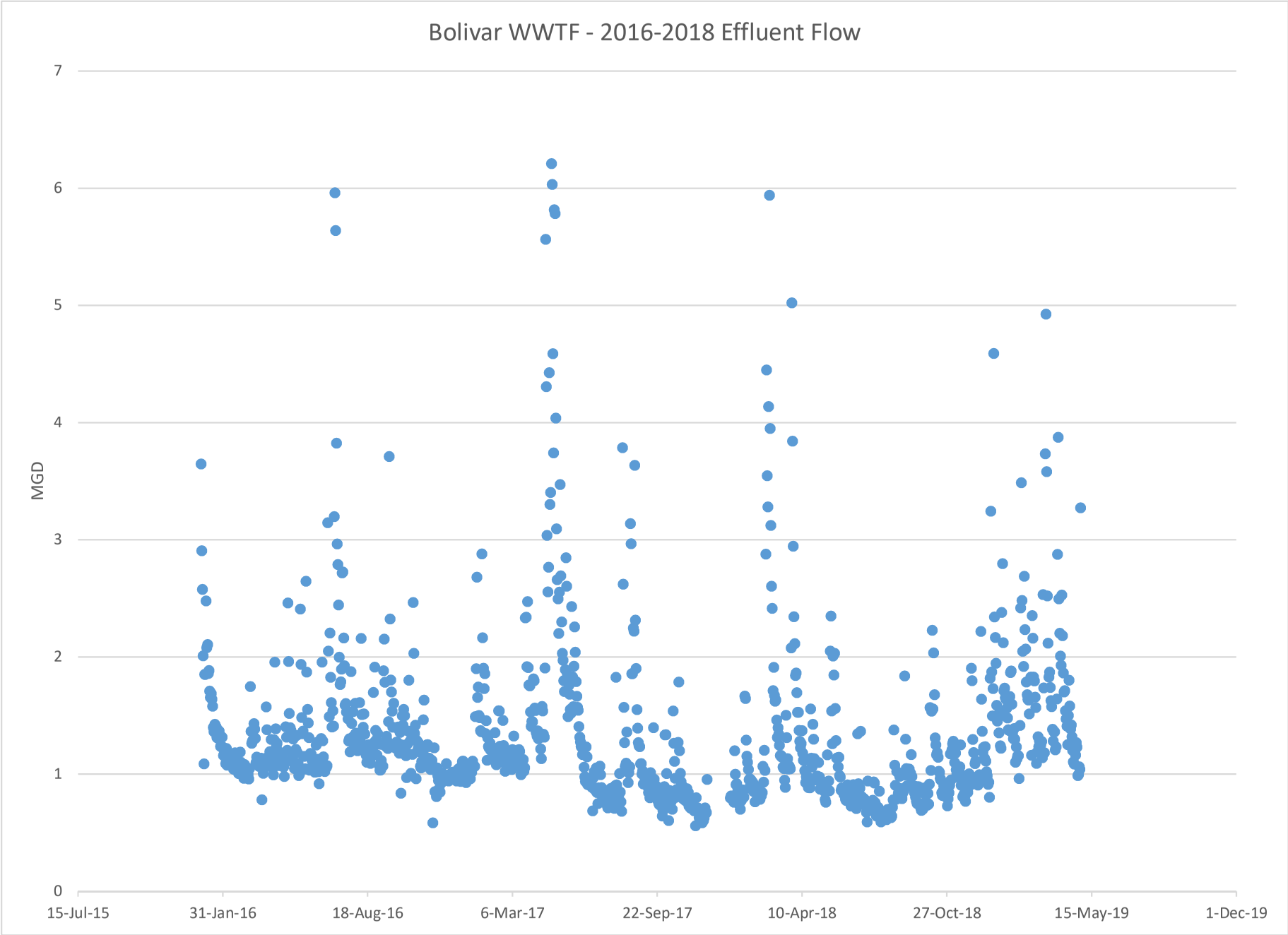
DATE 07-2019

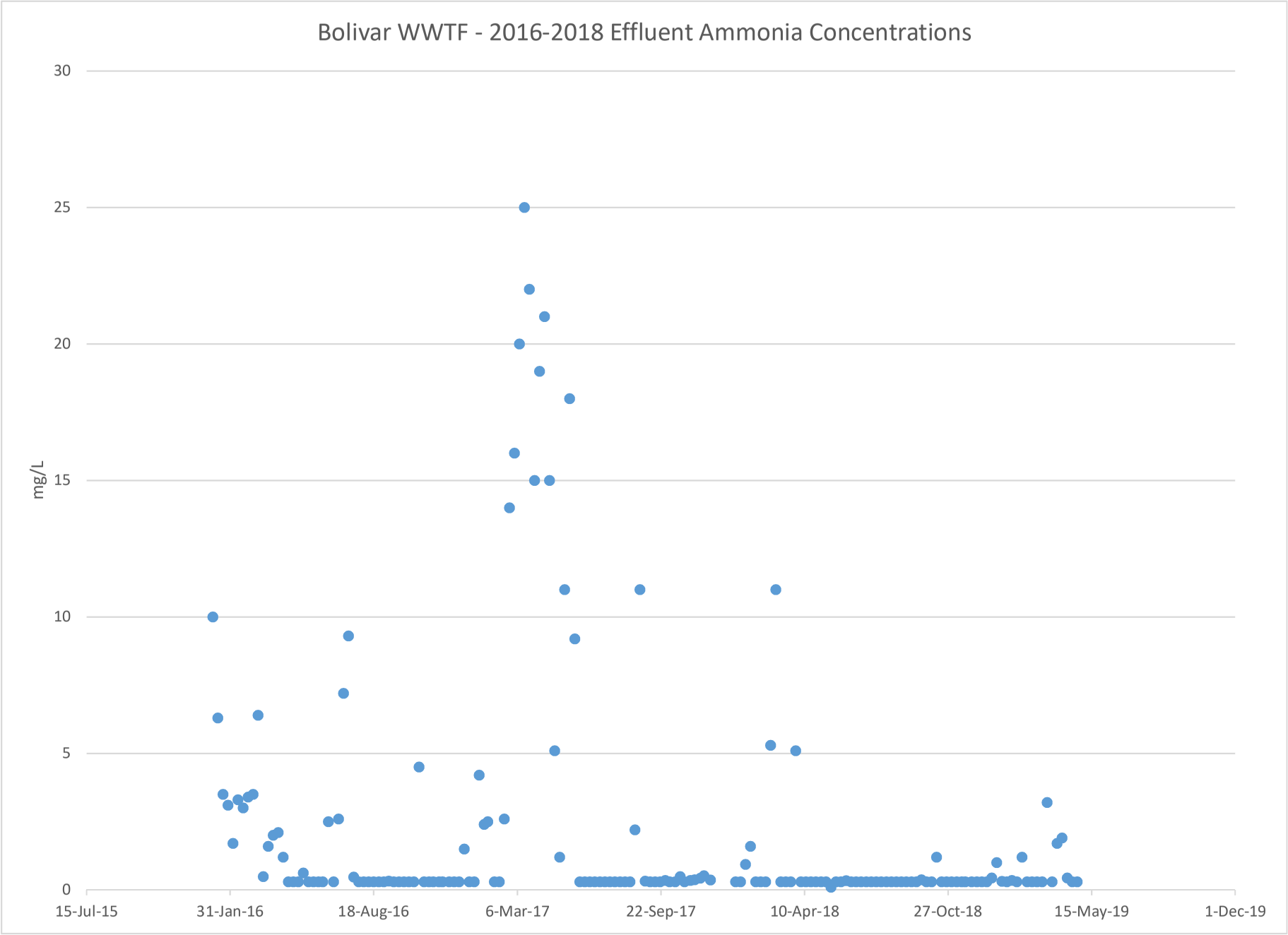
FIGURE 1

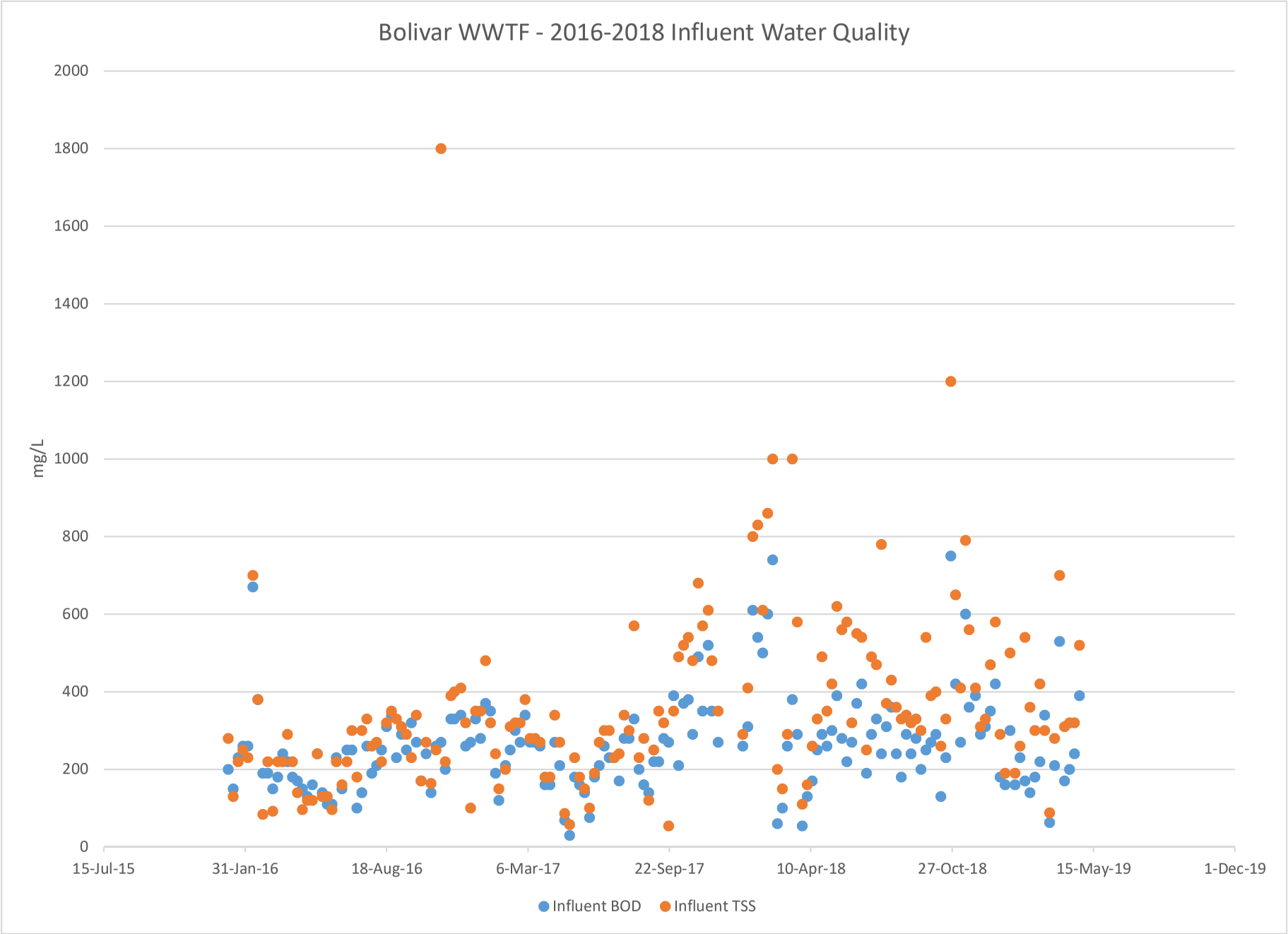
Appendix B – Sanitary Sewer Overflow and Rainfall Data

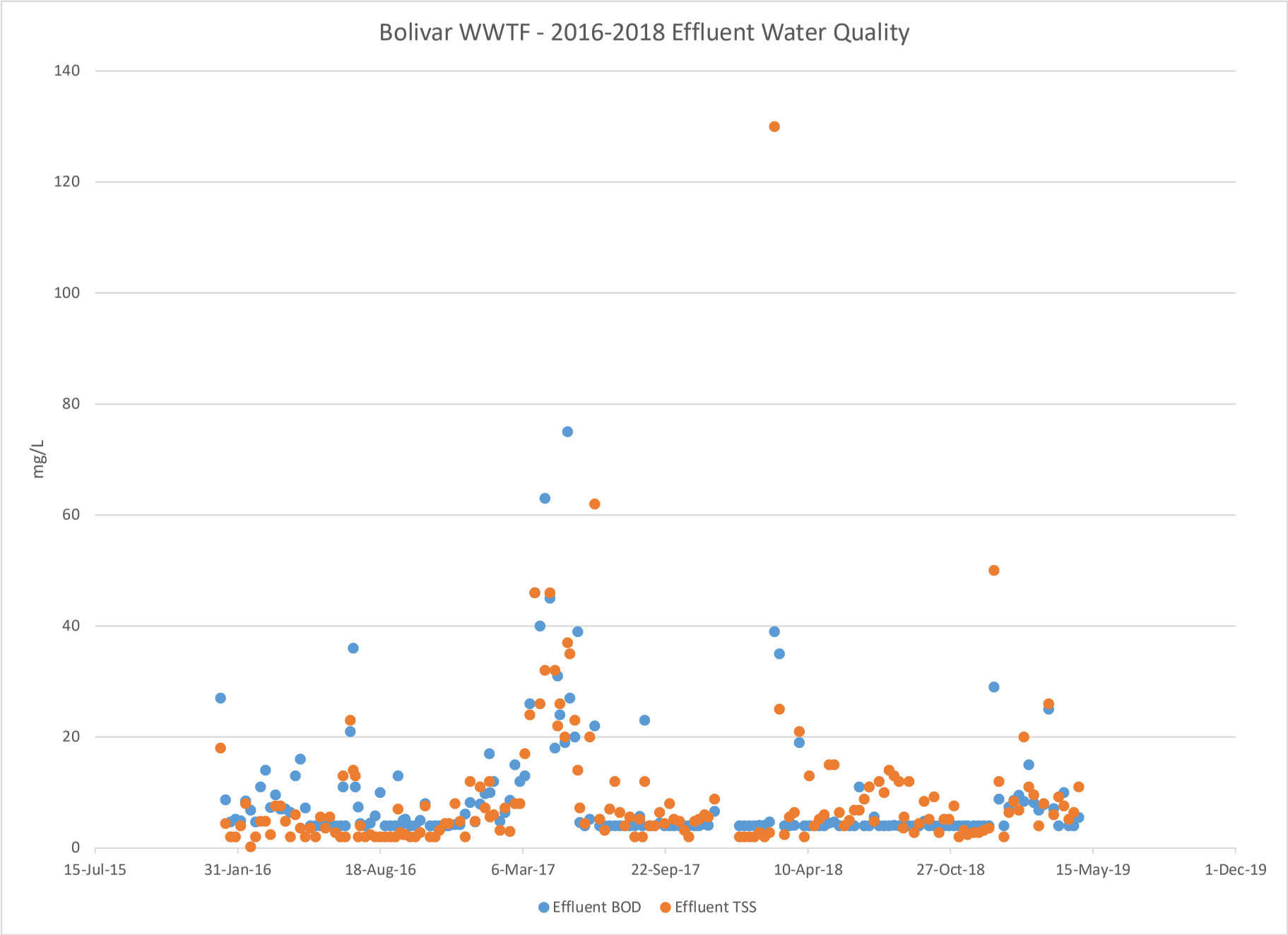
Date Begin	Date End	Location	Event Type	Bypass # of Days (1)	Discharge from SSO, MG	Approximate Discharge	Plant Flow, MGD	Total Discharge, MGD	DMR Rainfall, in/day
6/24/2016	6/25/2016	J4-MH-120	SSO	0.42	0.05	0.12	3.15	3.38	3.02
6/24/2016	6/25/2016	J4-MH-120	SSO	0.42	0.05	0.12			
7/4/2016	7/4/2016	J4-MH-120	SSO	0.62	2.48	3.98	5.96	9.94	3.25
3/24/2017	3/25/2017	J4-MH-120	SSO	0.40	0.02	0.05	2.33	2.38	1.66
4/21/2017	4/22/2017	J4-MH-120	SSO	1.13	3.30	2.91	5.56	8.48	1.05
4/29/2017	5/1/2017	J4-MH-120	SSO	2.30	0.91	0.40	6.21	7.46	0.66
4/29/2017	4/30/2017	G7-MH-020	SSO	1.00	0.09	0.09			
4/29/2017	4/30/2017	F5-MH-040	SSO	1.00	0.14	0.14			
4/29/2017	4/30/2017	F5-MH-010	SSO	1.00	0.12	0.12			
4/29/2017	4/30/2017	F5-MH-005	SSO	1.00	0.12	0.12			
4/29/2017	5/1/2017	J4-MH-090	SSO	1.83	0.44	0.24			
4/29/2017	4/30/2017	G5-MH-175	SSO	1.00	0.15	0.15			
5/3/2017	5/4/2017	J4-MH-120	SSO	1.48	0.62	0.42	5.82	7.34	0.80
5/3/2017	5/4/2017	J4-MH-095	SSO	1.04	0.15	0.14			
5/3/2017	5/4/2017	J4-MH-090	SSO	1.04	0.23	0.22			
5/3/2017	5/3/2017	F5-MH-175	SSO	0.63	0.00	0.01			
5/3/2017	5/3/2017	F5-MH-040	SSO	0.65	0.09	0.13			
5/3/2017	5/3/2017	F5-MH-095	SSO	0.50	0.03	0.07			
5/3/2017	5/3/2017	F5-MH-010	SSO	0.25	0.04	0.14			
5/3/2017	5/3/2017	F5-MH-005	SSO	0.23	0.03	0.11			
5/3/2017	5/3/2017	E6-MH-340	SSO	0.23	0.07	0.29			
8/5/2017	8/6/2017	J4-MH-120	SSO	1.05	24.30	23.10	3.79	26.88	4.74
8/16/2017	8/16/2017	1801 E. Broadway	SSO	0.04	0.00	0.03	3.14	3.17	0.40
2/19/2018	2/20/2018	J4-MH-120	SSO	0.29	0.10	0.34	4.45	4.79	1.58
2/24/2018	2/25/2018	J4-MH-120	SSO	1.00	0.23	0.23	5.94	6.17	2.28
3/27/2018	3/27/2018	J4-MH-120	SSO	0.44	0.34	0.78	5.02	5.80	1.13
8/30/2018	8/30/2018	J4-MH-120	SSO	0.23	0.03	0.13	1.84	1.97	0.41
11/6/2018	11/6/2018	313 N. Oakland	SSO	0.04	0.00	0.02	1.19	1.22	0.36
12/27/2018	12/27/2018	J4-MH-120	SSO	0.15	0.05	0.36	3.24	3.60	1.49
12/31/2018	12/31/2018	J4-MH-120	SSO	0.37	0.04	0.11	4.59	4.70	0.95
2/7/2019	2/8/2019	J4-MH-120	SSO	1.15	0.21	0.18	3.49	3.67	1.25
2/12/2019	2/12/2019	D6-MH-025	SSO	0.04	0.00	0.02	2.23	2.26	0.39
3/12/2019	3/13/2019	J4-MH-120	SSO	1.00	0.14	0.14	4.93	5.29	2.30
3/12/2019	3/13/2019	MH Oxidation Ditch	SSO	1.00	0.22	0.22			

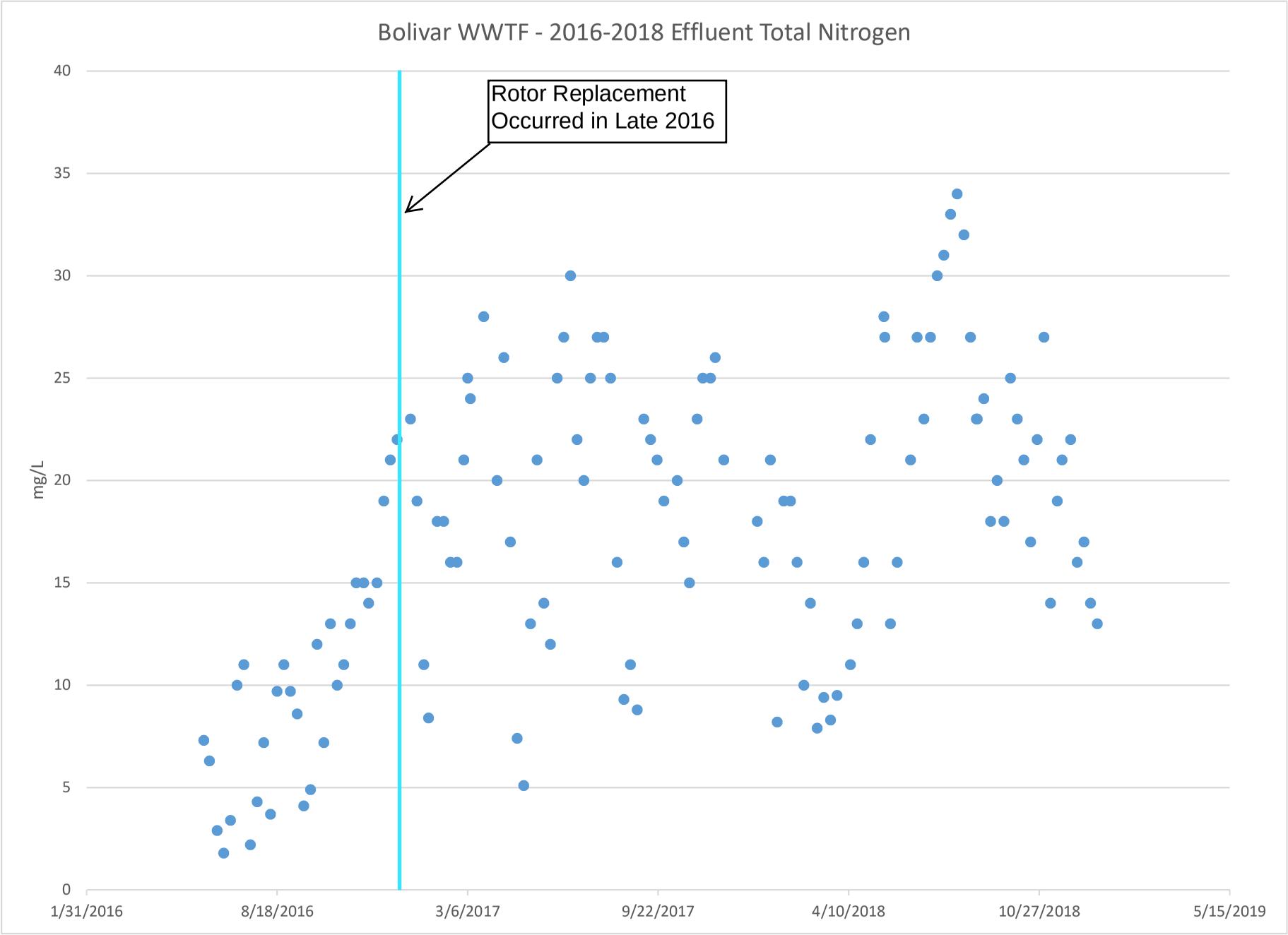
Appendix C – Loading Graphs

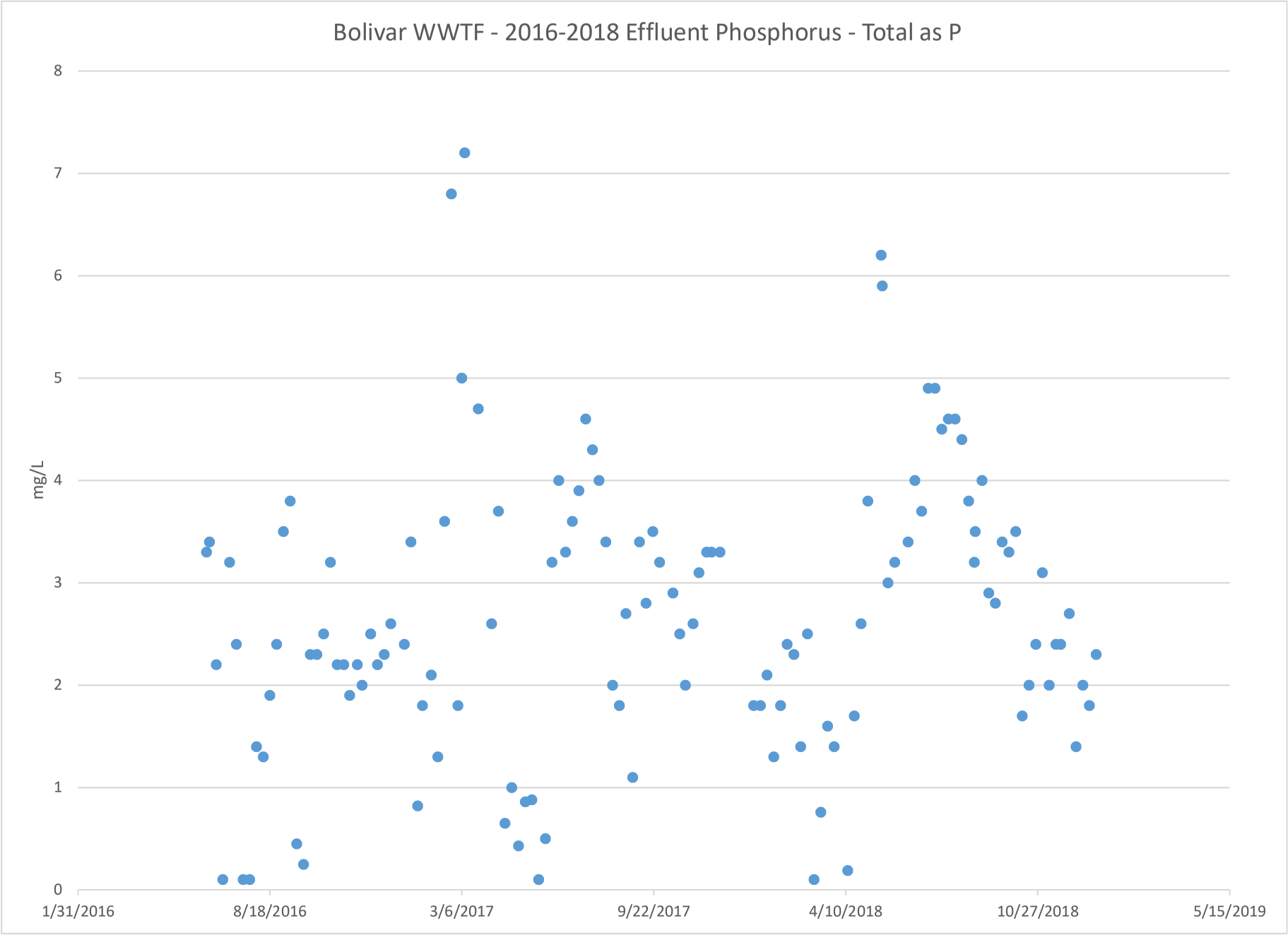

Bolivar WWTF - 2016-2018 Effluent Flow
MGD
7
6
5
4
3
2
1
0
15-Jul-15
31-Jan-16
18-Aug-16
6-Mar-17
22-Sep-17
10-Apr-18
27-Oct-18
15-May-19
1-Dec-19

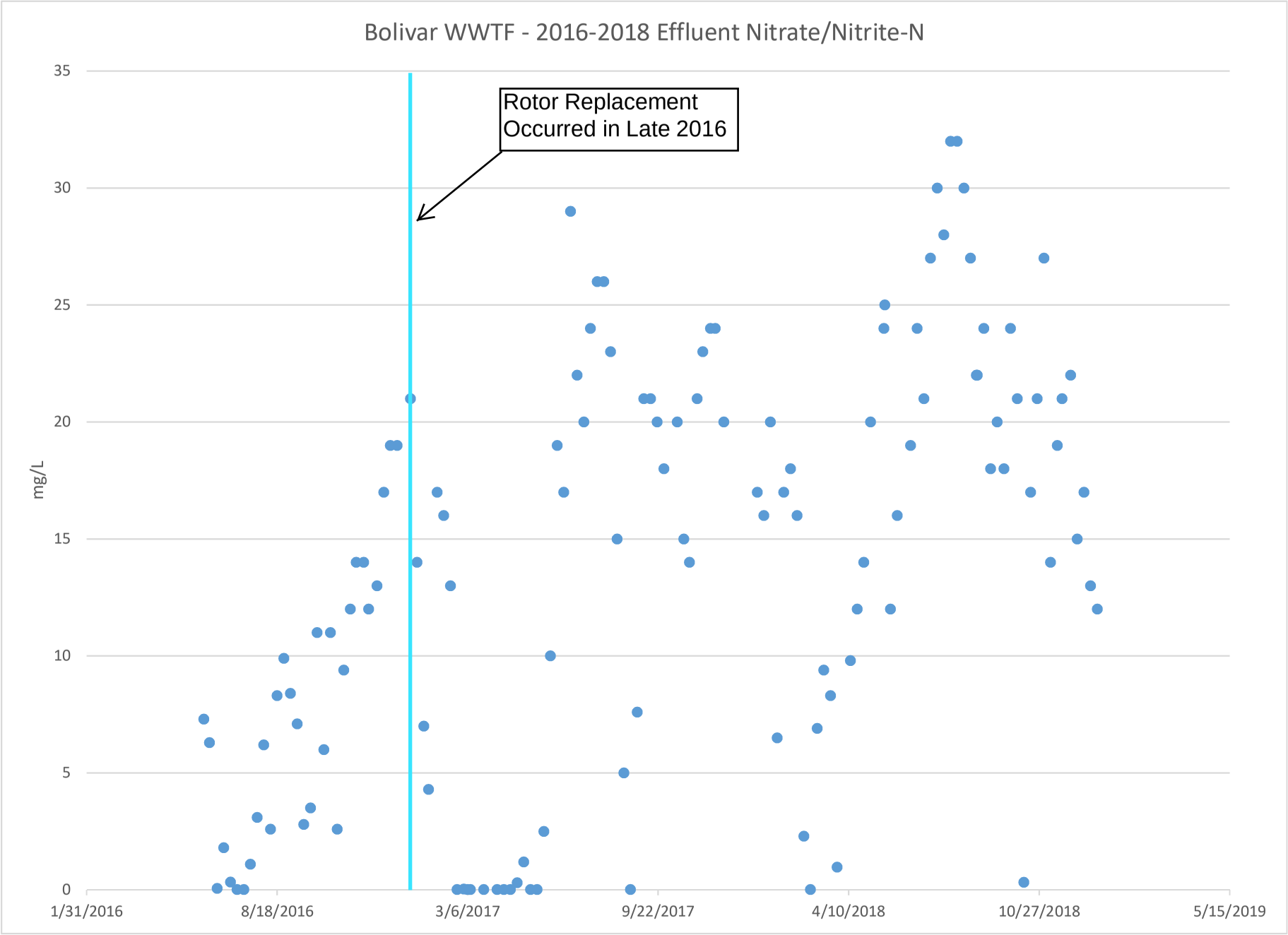

Bolivar WWTF - 2016-2018 Effluent Ammonia Concentrations
mg/L
30
25
20
15
10
5
0
15-Jul-15
31-Jan-16
18-Aug-16
6-Mar-17
22-Sep-17
10-Apr-18
27-Oct-18
15-May-19
1-Dec-19

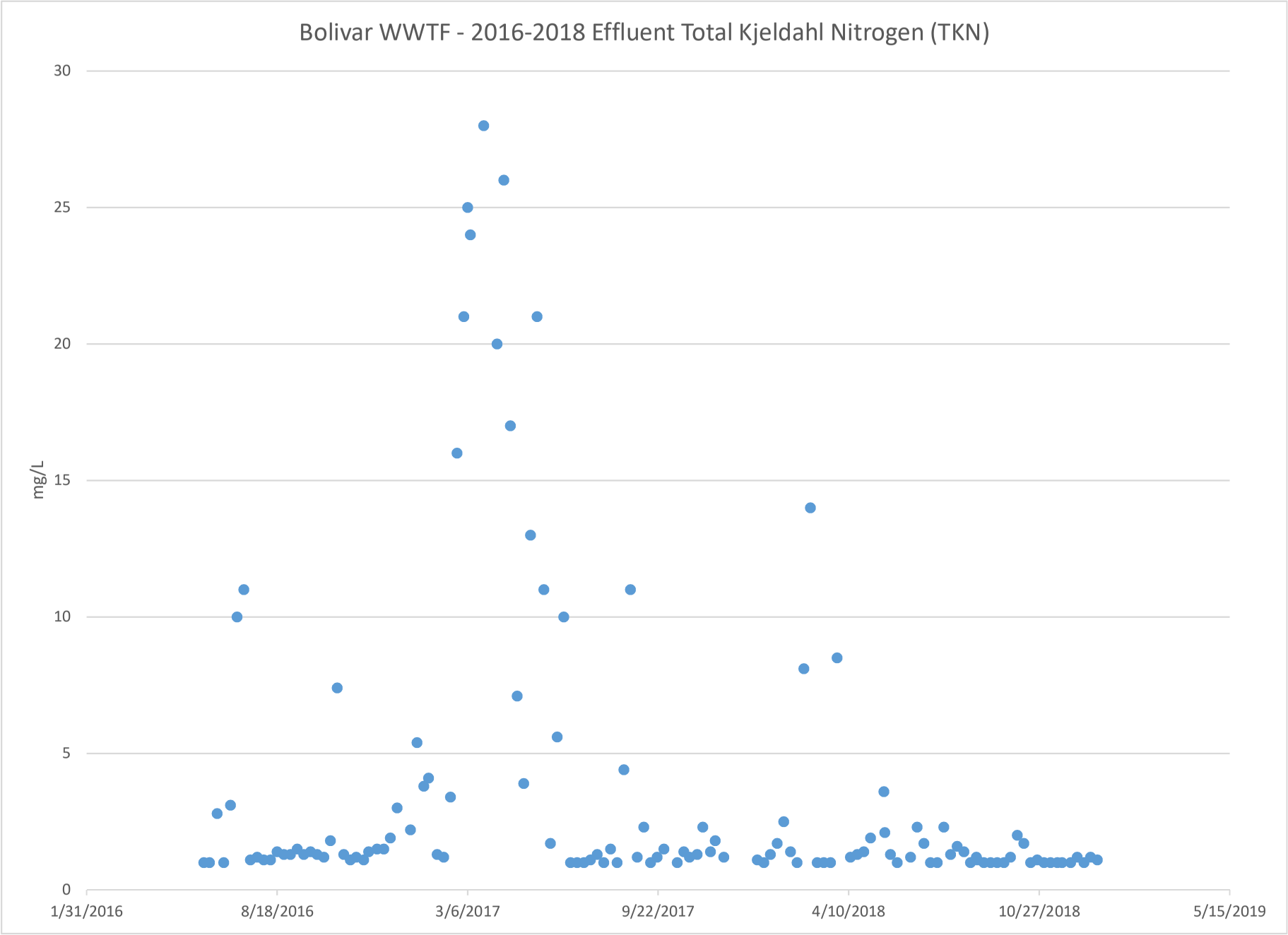

Bolivar WWTF - 2016-2018 Influent Water Quality
mg/L
2000
1800
1600
1400
1200
1000
800
600
400
200
0
15-Jul-15
31-Jan-16
18-Aug-16
6-Mar-17
22-Sep-17
10-Apr-18
27-Oct-18
15-May-19
1-Dec-19
Influent BOD
Influent TSS


Bolivar WWTF - 2016-2018 Effluent Water Quality
mg/L
140
120
100
80
60
40
20
0
15-Jul-15
31-Jan-16
18-Aug-16
6-Mar-17
22-Sep-17
10-Apr-18
27-Oct-18
15-May-19
1-Dec-19
Effluent BOD
Effluent TSS


Bolivar WWTF - 2016-2018 Effluent Total Nitrogen
Rotor Replacement Occurred in Late 2016
mg/L
40
35
30
25
20
15
10
5
0
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019


Bolivar WWTF - 2016-2018 Effluent Phosphorus - Total as P
mg/L
0
1
2
3
4
5
6
7
8
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019


Bolivar WWTF - 2016-2018 Effluent Nitrate/Nitrite-N
Rotor Replacement Occurred in Late 2016
mg/L
35
30
25
20
15
10
5
0
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019


Bolivar WWTF - 2016-2018 Effluent Total Kjeldahl Nitrogen (TKN)
mg/L
30
25
20
15
10
5
0
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019

Appendix D – Anticipated Operations and Maintenance Cost Estimates

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
BASE IMPROVEMENTS

Estimated Repair and Replacement Cost

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR 15%	10 YR 25%	15 YR 15%	20 YR 100%	Estimated Equipment Capital Cost
Pista Grit Chamber Internals	$11,000	$19,000	$11,000	$75,500	$75,500
Grit Pump	$2,000	$4,000	$2,000	$15,000	$15,000
Grit Washer	$9,000	$15,000	$9,000	$60,000	$60,000
Digester Mixer	$15,000	$25,000	$15,000	$100,000	$100,000
Totals	$37,000	$63,000	$37,000	$250,500	$250,500

Future Maintenance Costs
(Adjusted w/ Inflation)

	Present Value	5 YR 1.16	10 YR 1.34	15 YR 1.56	20 YR 1.81
5 Year Equipment Cycle	$37,000	$42,893			
10 Year Equipment Cycle	$63,000		$84,667		
15 Year Equipment Cycle	$37,000			$57,645	
20 Year Equipment Cycle	$250,500				$452,431
Totals	$387,500	$42,893	$84,667	$57,645	$452,431

Repair and Replacement Account Deposit
(Includes Interest)

	5 YR	10 YR	15 YR	20 YR
	$42,893	$84,667	$57,645	$452,431

	Annual Factor	Annual Deposit	Future Replacement Funds			
SFF - 5 yrs	0.1774	$7,609.09	$42,893	$42,893	$42,893	$42,893
SFF - 10 yrs	0.0759	$3,169.28		$41,774	$17,866	$17,866
SFF - 15 yrs	0.0430	($133.78)			($3,114)	($754)
SFF - 20 yrs	0.0272	$10,667.94				$392,426
Totals			$42,893	$84,667	$57,645	$452,431

Estimated Annual Repair and Replacement Cost **Deposit** **$21,313**

Chemical Costs @ ADF

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Chemical Costs				**$0**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Labor Costs				**$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Chamber Drive Motor	2	1	2	1,570	24	13,752
Grit Slurry Pump	10	1	10	7,849	1.5	4,298
Grit Washer	3	1	3	2,355	1	860
Digester Mixers	50	1	50.0	39,247	24	343,807
					kW-hrs/year =	362,716
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$23,577**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$44,889**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE II - PEAK FLOW STORAGE

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Peak Flow Pumps	$38,000	$64,000	$38,000	$255,000	$255,000
Totals	$38,000	$64,000	$38,000	$255,000	$255,000

Future Maintenance Costs
(Adjusted w/ Inflation)

	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$38,000	$44,052			
10 Year Equipment Cycle	$64,000		$86,011		
15 Year Equipment Cycle	$38,000			$59,203	
20 Year Equipment Cycle	$255,000				$460,558
Totals	$395,000	$44,052	$86,011	$59,203	$460,558

Repair and Replacement Account Deposit
(Includes Interest)

	5 YR	10 YR	15 YR	20 YR
	$44,052	$86,011	$59,203	$460,558

	Annual Factor	Annual Deposit	Future Replacement Cost			
SFF - 5 yrs	0.1774	$7,814.74	$44,052	$44,052	$44,052	$44,052
SFF - 10 yrs	0.0759	$3,183.29		$41,958	$17,944	$17,944
SFF - 15 yrs	0.0430	($120.04)			($2,794)	($677)
SFF - 20 yrs	0.0272	$10,853.11				$399,238
Totals			$44,052	$86,011	$59,203	$460,558

Estimated Annual Repair and Replacement Cost **Deposit** **$21,731**

Chemical Costs @ ADF

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Chemical Costs				**$0**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Labor Costs				**$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Peak Flow Pumps [1]	25	2	50	39,247	0.66	9,419
					kW-hrs/year =	9,419
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$612**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$22,343**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE III - SYSTEM EXPANSION

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Peak Flow Pumps (2 Duty/1 Standby)	$38,000	$64,000	$38,000	$255,000	$255,000
Effluent Pumps (2 Duty/1 Standby)	$38,000	$64,000	$38,000	$255,000	$255,000
RAS/WAS Pumps (2 Duty/1 Standby)	$27,000	$45,000	$27,000	$180,000	$180,000
Pista Grit Chamber Internals	$11,000	$19,000	$11,000	$75,500	$75,500
Grit Pump	$2,000	$4,000	$2,000	$15,000	$15,000
Grit Washer	$9,000	$15,000	$9,000	$60,000	$60,000
Mechanical Bar Screen	$27,000	$45,000	$27,000	$180,000	$180,000
Clarifier Equipment (2 Clarifiers)	$73,000	$122,000	$73,000	$488,000	$488,000
UV Disinfection	$23,000	$39,000	$23,000	$156,000	$156,000
Totals	$248,000	$417,000	$248,000	$1,664,500	$1,664,500

Future Maintenance Costs
(Adjusted w/ Inflation)

	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$248,000	$287,500			
10 Year Equipment Cycle	$417,000		$560,413		
15 Year Equipment Cycle	$248,000			$386,376	
20 Year Equipment Cycle	$1,664,500				$3,006,272
Totals	$2,577,500	$287,500	$560,413	$386,376	$3,006,272

Repair and Replacement Account Deposit
(Includes Interest)

	5 YR	10 YR	15 YR	20 YR
	$287,500	$560,413	$386,376	$3,006,272

	Annual Factor	Annual Deposit	Future Replacement Cost			
SFF - 5 yrs	0.1774	$51,001.46	$287,500	$287,500	$287,500	$287,500
SFF - 10 yrs	0.0759	$20,705.36		$272,913	$116,718	$116,718
SFF - 15 yrs	0.0430	($766.55)			($17,842)	($4,321)
SFF - 20 yrs	0.0272	$70,853.16				$2,606,375
Totals			$287,500	$560,413	$386,376	$3,006,272

Estimated Annual Repair and Replacement Cost **Deposit** **$141,793**

Chemical Costs @ ADF

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Chemical Costs				**$0**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Labor Costs				**$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Peak Flow Pumps [1]	25	2	50	39,247	0.66	9,419
RAS/WAS Pumps	25	2	50	39,247	24	343,807
Mechanical Bar Screen	3.5	1	3.5	2,747	4	4,011
Clarifier Equipment	1	2	2	1,570	24	13,752
UV Disinfection						15,330
					kW-hrs/year =	386,320
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$25,111**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$166,904**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE IV - TERTIARY FILTER

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Peak Flow Pumps	$38,000	$64,000	$38,000	$255,000	$255,000
Effluent Pumps	$38,000	$64,000	$38,000	$255,000	$255,000
Pista Grit Chamber Internals	$11,000	$19,000	$11,000	$75,500	$75,500
Grit Pump	$2,000	$4,000	$2,000	$15,000	$15,000
Grit Washer	$9,000	$15,000	$9,000	$60,000	$60,000
Mechanical Bar Screen	$27,000	$45,000	$27,000	$180,000	$180,000
UV Disinfection	$23,000	$39,000	$23,000	$156,000	$156,000
Tertiary Filters	$116,000	$193,000	$116,000	$772,200	$772,200
Totals	$264,000	$443,000	$264,000	$1,768,700	$1,768,700

Future Maintenance Costs
(Adjusted w/ Inflation)

	Present Value	5 YR 1.16	10 YR 1.34	15 YR 1.56	20 YR 1.81
5 Year Equipment Cycle	$264,000	$306,048			
10 Year Equipment Cycle	$443,000		$595,355		
15 Year Equipment Cycle	$264,000			$411,303	
20 Year Equipment Cycle	$1,768,700				$3,194,469
Totals	$2,739,700	$306,048	$595,355	$411,303	$3,194,469

Repair and Replacement Account Deposit
(Includes Interest)

5 YR	10 YR	15 YR	20 YR
$306,048	$595,355	$411,303	$3,194,469

	Annual Factor	Annual Deposit	Future	Replacement	Cost	
SFF - 5 yrs	0.1774	$54,291.88	$306,048	$306,048	$306,048	$306,048
SFF - 10 yrs	0.0759	$21,949.10		$289,307	$123,729	$123,729
SFF - 15 yrs	0.0430	($793.70)			($18,474)	($4,474)
SFF - 20 yrs	0.0272	$75,278.54				$2,769,166
Totals			$306,048	$595,355	$411,303	$3,194,469

Estimated Annual Repair and Replacement Cost **Deposit** **$150,726**

Chemical Costs @ ADF

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Chemical Costs				**$0**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Labor Costs				**$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Peak Flow Pumps [1]	25	2	50	39,247	0.66	9,419
Mechancial Bar Screen	3.5	1	3.5	2,747	4	4,011
Chamber Drive Motor	2	1	2	1,570	24	13,752
Grit Slurry Pump	10	1	10	7,849	1.5	4,298
Grit Washer	3	1	3	2,355	1	860
RAS/WAS Pumps	25	2	50	39,247	24	343,807
UV Disinfection						15,330
Effluent Pumps	25	2	50	39,247	0.66	9,419
					kW-hrs/year =	400,896
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$26,058**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$176,784**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE V - CNR

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Chemical Tanks	$11,000	$18,000	$11,000	$71,400	$71,400
Chemical Feed System	$8,000	$14,000	$8,000	$56,250	$56,250
Totals	$19,000	$32,000	$19,000	$127,650	$127,650

Future Maintenance Costs

(Adjusted w/ Inflation)	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$19,000	$22,026			
10 Year Equipment Cycle	$32,000		$43,005		
15 Year Equipment Cycle	$19,000			$29,601	
20 Year Equipment Cycle	$127,650				$230,550
Totals	$197,650	$22,026	$43,005	$29,601	$230,550

Repair and Replacement Account Deposit

(Includes Interest)	5 YR	10 YR	15 YR	20 YR
	$22,026	$43,005	$29,601	$230,550

	Annual Factor	Annual Deposit	Future	Replacement	Cost	
SFF - 5 yrs	0.1774	$3,907.37	$22,026	$22,026	$22,026	$22,026
SFF - 10 yrs	0.0759	$1,591.64		$20,979	$8,972	$8,972
SFF - 15 yrs	0.0430	($60.02)			($1,397)	($338)
SFF - 20 yrs	0.0272	$5,433.92				$199,890
Totals			$22,026	$43,005	$29,601	$230,550

Estimated Annual Repair and Replacement Cost **Deposit** **$10,873**

Chemical Costs @ ADF

Component		Units Per Day	Units Per Year	Cost Per Unit	Cost
TP Removal - Alum [1]	Gal	267	97,354	$1.16	$112,930
Estimated Annual Chemical Costs					**$112,930**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Estimated Annual Labor Costs				**$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
			0	0		0.00
			0	0		0.00
					Total kW-hrs/year =	0
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$0**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$123,803**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE VI - BNR

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Old Ditch Mixers (4 Mixers)	$17,000	$29,000	$17,000	$116,000	$116,000
New Ditch (4 Mixers)	$20,000	$33,000	$20,000	$132,000	$132,000
Chemical Tanks	$11,000	$18,000	$11,000	$71,400	$71,400
Chemical Feed System	$8,000	$14,000	$8,000	$56,250	$56,250
Tertiary Filters	$116,000	$193,000	$116,000	$772,200	$772,200
Totals	$172,000	$287,000	$172,000	$1,147,850	$1,147,850

Future Maintenance Costs

(Adjusted w/ Inflation)	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$172,000	$199,395			
10 Year Equipment Cycle	$287,000		$385,704		
15 Year Equipment Cycle	$172,000			$267,970	
20 Year Equipment Cycle	$1,147,850				$2,073,145
Totals	$1,778,850	$199,395	$385,704	$267,970	$2,073,145

Repair and Replacement Account Deposit

(Includes Interest)	5 YR	10 YR	15 YR	20 YR
	$199,395	$385,704	$267,970	$2,073,145

	Annual Factor	Annual Deposit	Future	Replacement	Cost	
SFF - 5 yrs	0.1774	$35,371.98	$199,395	$199,395	$199,395	$199,395
SFF - 10 yrs	0.0759	$14,134.87		$186,309	$79,680	$79,680
SFF - 15 yrs	0.0430	($477.07)			($11,104)	($2,689)
SFF - 20 yrs	0.0272	$48,844.11				$1,796,759
Totals			$199,395	$385,704	$267,970	$2,073,145

Estimated Annual Repair and Replacement Cost **Deposit** **$97,874**

Chemical Costs @ ADF

Component		Units Per Day	Units Per Year	Cost Per Unit	Cost
TP Removal - Alum [1]	Gal	267	97,354	$1.16	$112,930

Estimated Annual Chemical Costs **$112,930**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost

Estimated Annual Labor Costs **$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Mixers (Old Ditch)	8.44	4	33.76	25175	12	110265.74
Mixers (New Ditch)	13.42	4	53.68	40029	12	175327.76
					Total kW-hrs/year =	285593.5053
					$/kW-hrs =	$0.065

Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation) **$18,564**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$229,368**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE VII - ENR

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Denitrifying Filter	$186,000	$310,000	$186,000	$1,240,000	$1,240,000
MicroC® Tank	$3,000	$5,000	$3,000	$21,700	$21,700
MicroC® Feed Pump	$8,000	$14,000	$8,000	$56,250	$56,250
Totals	$197,000	$329,000	$197,000	$1,317,950	$1,317,950

Future Maintenance Costs
(Adjusted w/ Inflation)

	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$197,000	$228,377			
10 Year Equipment Cycle	$329,000		$442,148		
15 Year Equipment Cycle	$197,000			$306,920	
20 Year Equipment Cycle	$1,317,950				$2,380,364
Totals	$2,040,950	$228,377	$442,148	$306,920	$2,380,364

Repair and Replacement Account Deposit
(Includes Interest)

	5 YR	10 YR	15 YR	20 YR
	$228,377	$442,148	$306,920	$2,380,364

	Annual Factor	Annual Deposit	Future	Replacement	Cost	
SFF - 5 yrs	0.1774	$40,513.26	$228,377	$228,377	$228,377	$228,377
SFF - 10 yrs	0.0759	$16,218.41		$213,771	$91,425	$91,425
SFF - 15 yrs	0.0430	($553.45)			($12,882)	($3,120)
SFF - 20 yrs	0.0272	$56,100.29				$2,063,682
Totals			$228,377	$442,148	$306,920	$2,380,364

Estimated Annual Repair and Replacement Cost **Deposit** **$112,279**

Chemical Costs @ ADF

Component		Units Per Day	Units Per Year	Cost Per Unit	Cost
TP Removal - Alum [1]	Gal	565	206,146	$1.16	$239,130
MicroC® [2]	Gal	47	17,153	$1.50	$25,729

Estimated Annual Chemical Costs **$264,859**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost

Estimated Annual Labor Costs **$0**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
					kW-hrs/year =	0
					$/kW-hrs =	$0.065
Estimated Annual Electricity Usage Cost (Design Year, Not Adjusted for Inflation)						**$0**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$377,137**

CITY OF BOLIVAR MISSOURI
BOLIVAR WASTEWATER TREATMENT PLANT IMPROVEMENTS
OPERATIONS AND MAINTENANCE COST ESTIMATE
ALTERNATIVE VIII - LOT

Maintenance Costs

Inflation Rate (Assumed)	3%
Interest Rate (Assumed)	6%

Today's Replacement Costs

Item	5 YR	10 YR	15 YR	20 YR	Estimated Equipment Capital Cost
	15%	25%	15%	100%	
Denitrifying Filter	$186,000	$310,000	$186,000	$1,240,000	$1,240,000
MicroC® Tank	$3,000	$5,000	$3,000	$21,700	$21,700
MicroC® Pump	$8,000	$14,000	$8,000	$56,250	$56,250
RO System	$7,901,000	$13,169,000	$7,901,000	$52,676,000	$52,676,000
Totals	$8,098,000	$13,498,000	$8,098,000	$53,993,950	$53,993,950

Future Maintenance Costs

(Adjusted w/ Inflation)	Present Value	5 YR	10 YR	15 YR	20 YR
		1.16	1.34	1.56	1.81
5 Year Equipment Cycle	$8,098,000	$9,387,801			
10 Year Equipment Cycle	$13,498,000		$18,140,183		
15 Year Equipment Cycle	$8,098,000			$12,616,420	
20 Year Equipment Cycle	$53,993,950				$97,519,080
Totals	$83,687,950	$9,387,801	$18,140,183	$12,616,420	$97,519,080

Repair and Replacement Account Deposit

(Includes Interest)	5 YR	10 YR	15 YR	20 YR
	$9,387,801	$18,140,183	$12,616,420	$97,519,080

	Annual Factor	Annual Deposit	Future	Replacement	Cost	
SFF - 5 yrs	0.1774	$1,665,362.19	$9,387,801	$9,387,801	$9,387,801	$9,387,801
SFF - 10 yrs	0.0759	$664,025.34		$8,752,382	$3,743,173	$3,743,173
SFF - 15 yrs	0.0430	($22,106.66)			($514,554)	($124,617)
SFF - 20 yrs	0.0272	$2,297,440.93				$84,512,723
Totals			$9,387,801	$18,140,183	$12,616,420	$97,519,080

Estimated Annual Repair and Replacement Cost **Deposit** **$4,604,722**

Chemical Costs @ ADF

Component		Units Per Day	Units Per Year	Cost Per Unit	Cost
TP Removal - Alum [1]	Gal	579	206,146	$1.16	$239,130
MicroC® [2]	Gal	47	17,153	$1.50	$25,729
Estimated Annual Chemical Costs					**$264,859**

Labor Costs

Component	Units Per Day	Units Per Year	Cost Per Unit	Cost
Additional Labor [3]			$200,000	$200,000
Estimated Annual Labor Costs				**$200,000**

Estimated Electricity Usage Cost (@ ADF)

Component	HP	Quantity	Total HP	Watts	Hours/Day	kW-hrs/year
Annual Cost for RO (2009) [3]						$2,057,422.88
Escalation					4%	
Estimated Annual Utility and Maintenance Cost for RO (2019)						**$3,045,488**

ESTIMATED ANNUAL OPERATIONS AND MAINTENANCE COST **$8,115,069**

Appendix B

Heritage Review

Missouri Department of Conservation

Missouri Department of Conservation's Mission is to
protect and manage the forest, fish, and
wildlife resources of the state and to
facilitate and provide opportunities for all citizens to
use, enjoy and learn about these resources.

Natural Heritage Review Level One Report: No Known Records

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this website is to provide information to federal, state and local agencies, organizations, municipalities, corporations and consultants regarding sensitive fish, wildlife, plants, natural communities and habitats to assist in planning, designing and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Bolivar Variance Request #6403
Project Description: Variance application request
Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Effluent Discharge, Effluent discharge - renewal or modification of discharge to stream
Contact Person: david carani
Contact Information: david.carani@hdrinc.com or 5738239873

PRELIMINARY REPORT

Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, Reports include information about records near but not necessarily on the project site.

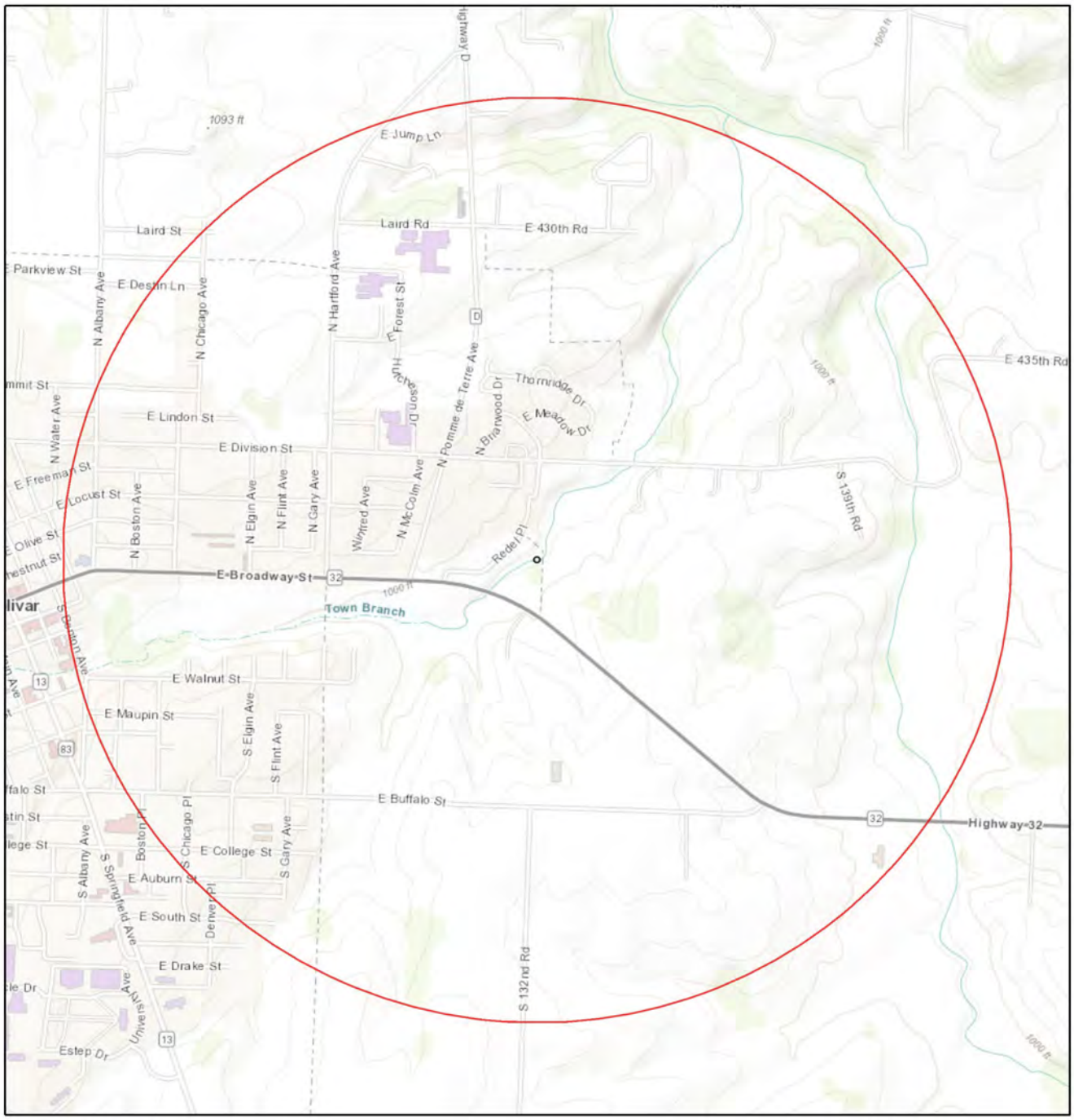
The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. The information within this report is not intended to replace Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit the USFWS Information for Planning and Conservation (IPaC) website at https://ecos.fws.gov/ipac/ for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.

Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or www.modot.mo.gov/ehp/index.htm for additional information on recommendations.

PRELIMINARY REPORT

Bolivar Variance Request



October 21, 2019

1:19,090

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

Project Boundary

Buffered Project Boundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Species or Communities of Conservation Concern within the Area:

There are no known records for Species or Natural Communities of Conservation Concern within the defined Project Area.

Other Special Search Results:

No results have been identified for this project location.

Project Type Recommendations:
Waste Transfer, Treatment, and Disposal - Liquid Effluent Discharge - New or Renewal of Permit: Clean Water Act permits issued by other agencies regulate both construction and operation of wastewater systems, and provide many important protections for fish and wildlife resources throughout the project area and at some distance downstream. Fish and wildlife almost always benefit when unnatural pollutants are removed from water, and concerns are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any "Clean Water Permit" conditions.
Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - Indiana bats *(Myotis sodalis*, federal- and state-listed endangered) and **Northern long-eared bats** (*Myotis septentrionalis,* federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April. **If any trees need to be removed for your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 ext. 100 for Ecological Services) for further coordination under the Endangered Species Act.**

PRELIMINARY REPORT

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See http://mdc.mo.gov//9633 for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (?140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit (http://www.nwk.usace.army.mil/Missions/RegulatoryBranch.aspx) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (http://dnr.mo.gov/env/wpp/401/index.html), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit http://dnr.mo.gov/env/wpp/permits/index.html for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below.

MDC Natural Heritage Review
Resource Science Division
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182
NaturalHeritageReview@mdc.mo.gov

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 1 0). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 1 0-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

Additional information on Missouri's sensitive species may be found at http://mdc.mo.gov/discover-nature/field-guide/endangered-species . Detailed information about the animals and some plants mentioned may be accessed at http://mdc4.mdc.mo.gov/applications/mofwis/mofwis_search1.aspx . If you would like printed copies of best management practices cited as internet URLs, please contact the Missouri Department of Conservation.

PRELIMINARY REPORT

Tab G3

Missouri Clean Water Commission Meeting
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
Jefferson City, MO 65101
January 9, 2020

City of Salem Variance Request CWC-V-2-20
Salem Wastewater Treatment Facility

Issue: The City of Salem submitted a variance application on October 10, 2019 requesting a water quality standards (WQS) variance for the Salem Wastewater Treatment Facility, Missouri State Operating Permit MO-0021768. The variance is from the from the underlying water quality standards utilized for the development of the Spring Creek Total Maximum Daily Load (TMDL) wasteload allocations for total nitrogen, total phosphorus, total suspended solids, and 5-day carbonaceous biochemical oxygen demand for the protection of aquatic life use. The Department seeks the Clean Water Commission's decision to grant or deny this variance.

Background: A WQS variance is a tool that may be used to improve water quality over time. Variances establish time-limited criteria that provide dischargers the time and flexibility to make incremental water quality improvements reflecting the best that can be achieved in that given time period. There are seven factors that can be used when considering a WQS variance. The City of Salem is requesting a variance based on the following factor: Controls more stringent than those required by sections 301(b) and 306 of the federal Clean Water Act would result in substantial and widespread economic and social impact.

The City of Salem has requested a 30-year term for this variance. During this term, permit limits that would typically be based on the underlying water quality standards utilized for the development of the Spring Creek TMDL wasteload allocations would be replaced with limits based on the "highest attainable condition" (HAC) of the facility. The City of Salem will also develop and implement a Pollutant Minimization Program (PMP), which is a structured set of activities to improve processes and pollution controls that will prevent and reduce pollutant loadings. The HAC and PMP will ensure that implementation of the variance will not result in the lowering of existing water quality. The Department presented the variance and supporting information to the Commission via memorandum dated October 30, 2019, along with a recommendation for approval at a future meeting following public notice.

The variance documents and supporting information were placed on 30 day public notice October 28, 2019. The Department received no comments.

The Department is recommending the Commission approve the variance. Once a WQS variance is approved, it must be incorporated into state regulation, which will include a second public notice period and CWC approval as a part of the rulemaking package.

Recommended Action: The Department recommends the Commission grant the Salem Water Quality Standards Variance as proposed.

Suggested Motion Language: The Department suggests the Commission motion to grant the City of Salem Variance CWC-V-2-20 as proposed.

List of Attachments: Final City of Salem Variance CWC-V-2-20

Missouri Department of Natural Resources
City of Salem Variance CWC-V-2-20
Salem Wastewater Treatment Facility

The Missouri Department of Natural Resources and the Missouri Clean Water Commission hereby adopts a Water Quality Standards (WQS) variance for Missouri State Operating Permit #MO-0021768 from the underlying water quality standards utilized for the development of the Spring Creek Total Maximum Daily Load (TMDL) wasteload allocations (WLAs) for total nitrogen, total phosphorus, Total Suspended Solids (TSS), and 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) for the protection of aquatic life use.

Salem Wastewater Treatment Facility (WWTF)

Permit Number: MO-0021768
County: Dent

Treatment Type: Activated sludge
Treatment Components: Bar screen, influent pump station, oxidation ditch, three secondary clarifiers, two sludge holding tanks, two sludge reed beds, ultraviolet disinfection, and sludge is land applied.
Design Flow: 741,000 gallons per day*
*The City of Salem is planning on increasing the design flow during WWTF improvements.

Spring Creek

12-digit Hydrologic Unit Code (HUC) and Name: 07140102-0103, Spring Creek
Water Body Identification (WBID) Number and Hydrologic Class: WBID 1870, Class P
Designated Uses: Protection of aquatic life – warm water habitat, human health protection, irrigation, livestock and wildlife protection, whole body contact recreation, and secondary contact recreation

Impairments: A TMDL was developed and approved in 2010 for organic sediment and low dissolved oxygen impairments in Spring Creek. The TMDL can be found here: https://dnr.mo.gov/env/wpp/tmdl/docs/1870-spring-ck-tmdl.pdf. The TMDL established the following WLAs for Salem WWTF:

Pollutant	Concentration Limits	WLA at Design Flow
Total Nitrogen	0.289 mg/L	1.79 lbs/day
Total Phosphorus	0.007 mg/L	0.04 lbs/day
TSS	5 mg/L	31 lbs/day
$CBOD_5$	3.3 mg/L	20.5 lbs/day

Factor Precluding Attainment

Factor: [40 CFR Section 131.10(g)(6)] Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact. The City of Salem evaluated five alternative treatment scenarios representing progressively more stringent levels of wastewater treatment.

Scenario I – Improvements to Existing WWTF
Scenario I Alt – Improvements to Existing WWTF with Chemical Phosphorus Removal
Scenario II – Biological Nutrient Removal
Scenario III – Enhanced Nutrient Removal
Scenario IV – Limits of Technology

Anticipated effluent quality for each of these treatment scenarios are as follows:

Pollutant	Average Effluent Concentrations (mg/L) for each Scenario					
	TMDL WLA	I	I Alt	II	III	IV
Total Nitrogen	0.289	15	15	10	5	3
Total Phosphorus	0.007	5	1-2	1	0.5	0.1
TSS	5	15	15	10	5	3
$CBOD_5$	3.3	15	15	10	5	3

The TMDL WLAs for total nitrogen and total phosphorus are not achievable even with the most advanced treatment technologies; therefore, water quality standards cannot be met, and a WQS variance is required for these pollutants at any scenario. Per Factor 6, variances may be granted if the necessary pollution controls beyond technology-based standards cause, "substantial and widespread economic and social impact." The City of Salem has conducted analyses to demonstrate that treatment scenarios beyond Scenario I are not economically feasible and would cause substantial and widespread economic and social impacts in the city with current funding sources. See Appendix C – City of Salem's Request for Variance from the Spring Creek Total Maximum Daily Load for supporting information.

Variance Requirements

This variance is the applicable WQS in effect for the purposes of developing Clean Water Act Section 301 National Pollutant Discharge Elimination System (NPDES) permit limits. This is a variance from the underlying water quality standards used to develop the WLAs for the Salem WWTF included within the Spring Creek TMDL for total nitrogen, total phosphorus, TSS, and $CBOD_5$. The underlying designated use and associated criterion remain applicable for all other Clean Water Act purposes, and all other uses and associated criteria not specified in this variance remain applicable for all Clean Water Act purposes.

Currently Attained Water Quality: Implementation of this WQS variance will not result in the lowering of existing water quality. A WQS variance must include requirements that represent the highest attainable condition (HAC) of the water body, which must be specified as a quantifiable expression. For this variance, the HAC is established pursuant to 40 CFR Section 131.14(b)(1)(ii)(A)(3): If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program. The Salem WWTF is required to implement interim effluent conditions reflecting the greatest pollutant reduction achievable, as well as a PMP.

Greatest Pollution Reduction Achievable (GPRA): This WQS variance must reflect the interim effluent condition that reflects the greatest pollutant reduction achievable during the term specified in the variance. Because the City of Salem plans to address WWTF improvements in a step-wise manner, there are multiple interim effluent conditions established in this variance:

Pollutant	Current Optimized Performance	Scenario I (2023)	Scenario I-Alt (2050)
Total Nitrogen	22 mg/L	15 mg/L	15 mg/L
Total Phosphorus	5 mg/L	5 mg/L	1 mg/L
TSS	15 mg/L	15 mg/L	15 mg/L
$CBOD_5$	15 mg/L	15 mg/L	15 mg/L

Pollutant Minimization Program (PMP): The Salem WWTF's PMP is a structured set of activities to improve processes and pollution controls that will prevent and reduce pollution loadings. The Missouri State Operating Permit #MO-0021768 will contain a requirement for the implementation of the PMP with annual reporting to the Department.

The City of Salem has included the following activities in their PMP (See Appendix B – Pollutant Minimization Program for the Salem WWTF for further details):

- Collection system rehabilitation
- Sewer extension to enable closure of lagoon located at Salem Memorial District Hospital
- Phased approach to Scenario I upgrades to keep it functioning properly
- Develop a Sampling and Monitoring Protocol
- Optimize operation of the new aerator/mixer combination unit

Additional pollutant reduction activities will be considered and included in the PMP as appropriate.

Variance Conditions

Public Participation: Initial public participation prior to the request for approval by the Missouri Clean Water Commission and U.S. Environmental Protection Agency will occur per 10 CSR 20-7.031(12). Also, this variance will be incorporated into 10 CSR 20-7.031 Table J and will be subject to additional public review during the next WQS triennial review, as well as subsequent triennial reviews conducted by the Department until this variance expires. Finally, Missouri State Operating Permit #MO-0021768, which will reflect the conditions and requirements of the variance, will be public noticed per 10 CSR 20-6.020.

Term of Variance: The term of the variance must only be as long as necessary to achieve the highest attainable condition. The City of Salem has requested the term of this variance be 30 years, which will allow time to upgrade the WWTF to Scenario I-Alt treatment technologies, optimize operations, and mitigate impacts to the city's financial capability. The term of the variance may need to be modified in the future as new information becomes available.

Reevaluation: The term of this variance exceeds five years; therefore, a reevaluation after five years is required per 40 CFR Section 131.14(b)(1)(v). The Department will reevaluate the highest attainable condition using all existing and readily available information every five years. Any adjustments will be incorporated into Missouri State Operating Permit #MO-0021768, which will follow the public participation process pursuant to 10 CSR 30-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.

If the Department does not complete a reevaluation of the variance no less frequently than every five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.

Other Considerations:
NPDES Permit Limits and Considerations. This variance will be used solely to establish effluent limits for total nitrogen, total phosphorus, TSS, and $CBOD_5$ and PMP requirements in Missouri State Operating Permit #MO-0021768. This variance will not be used for any other Clean Water Act purposes.

Protections for endangered or threatened species and their critical habitat. It is not anticipated that the granting of this variance will jeopardize threatened or endangered species or result in the destruction or adverse modification of such species' critical habitat. The Missouri Department of Conservation's Natural Heritage Review queries records for species and natural communities of conservation concern. Based on the Heritage Review for Salem WWTF, the following federally or state-listed threatened or endangered species or critical habitats were identified near the project site:

- Indiana bats (Myotis sodalist, federal and state-listed endangered)
- Northern longeared bats (Myotis septentrionalis, federal-listed threatened)

It is not anticipated that the granting of this variance request will jeopardize threatened or endangered species or modify such species' critical habitat. As described in the Heritage Review, concerns regarding the construction and operation of wastewater systems "are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any 'Clean Water Permit' conditions."

Appendices

Appendix A – Crosswalk Table between City of Salem Variance CWC-V-2-20 and 40 CFR Section 131.14 (Page 6)

Appendix B – Pollutant Minimization Program for the Salem WWTF (Page 12)

Appendix C – City of Salem's Request for Variance from the Spring Creek Total Maximum Daily Load (Page 13)

Appendix A – Crosswalk Table between City of Salem Variance CWC-V-2-20 and 40 CFR Section 131.14

40 CFR 131.14	City of Salem Variance CWC-V-2-20
131.14 Water quality standards variances. States may adopt WQS variances, as defined in § 131.3(o). Such a WQS variance is subject to the provisions of this section and public participation requirements at § 131.20(b). A WQS variance is a water quality standard subject to EPA review and approval or disapproval.	10 CSR 20-7.031 (12) Water Quality Standards Variances. A permittee or an applicant for a National Pollutant Discharge Elimination System (NPDES) or Missouri state operating permit may pursue a temporary variance pursuant to either section 644.061 or section 644.062, RSMo. A variance from water quality standards shall comply with 40 CFR 131.14.
(a) Applicability	
(1) A WQS variance may be adopted for a permittee(s) or water body/waterbody segment(s), but only applies to the permittee(s) or water body/waterbody segment(s) specified in the WQS variance.	This variance only applies to the Salem Wastewater Treatment Facility Missouri State Operating Permit #MO-0021768.
(2) Where a State adopts a WQS variance, the State must retain, in its standards, the underlying designated use and criterion addressed by the WQS variance, unless the State adopts and EPA approves a revision to the underlying designated use and criterion consistent with §§ 131.10 and 131.11. All other applicable standards not specifically addressed by the WQS variance remain applicable.	This variance request only varies the underlying WQS used for the development of Spring Creek TMDL wasteload allocations for total nitrogen, total phosphorus, TSS, and $CBOD_5$. All other WQS in 10 CSR 20-7.031 remain in-tact. The underlying aquatic life designated use and associated criterion will remain applicable for all other CWA purposes, and all other uses and associated criteria not specified in this WQS remain applicable for all CWA purposes.
(3) A WQS variance, once adopted by the State and approved by EPA, shall be the applicable standard for purposes of the Act under § 131.21(d) through (e), for the following limited purposes. An approved WQS variance applies for the purposes of developing NPDES permit limits and requirements under 301(b)(1)(C), where appropriate, consistent with paragraph (a)(1) of this section. States and other certifying entities may also use an approved WQS variance when issuing certifications under section 401 of the Act.	This WQS variance will be the applicable water quality standard in effect for the purposes of developing CWA Section 301(b)(1)(C) National Pollutant Discharge Elimination System (NPDES) permit limits. The only permit that will receive this variance is #MO-0021768 for the City of Salem's Wastewater Treatment Facility.

(4) A State may not adopt WQS variances if the designated use and criterion addressed by the WQS variance can be achieved by implementing technology-based effluent limits required under sections 301(b) and 306 of the Act.	Implementation of technology-based effluent limits will not allow Salem Wastewater Treatment Facility the ability to achieve effluent quality to meet underlying WQS utilized for the development of the Spring Creek TMDL WLAs for total nitrogen, total phosphorus, TSS, and $CBOD_5$.
(b) Requirements for Submission to EPA	
(1) A WQS variance must include:	
(i) Identification of the pollutant(s) or water quality parameter(s), and the water body/waterbody segment(s) to which the WQS variance applies. Discharger(s) - specific WQS variances must also identify the permittee(s) subject to the WQS variance.	The City of Salem requests a WQS variance from the underlying WQS utilized for the development of the Spring Creek TMDL WLAs for total nitrogen, total phosphorus, TSS, and CBOD5 for the protection of aquatic life use. The variance would apply to the City of Salem's WWTF #MO-0021768, which discharges to Spring Creek. Spring Creek is a class P stream with a water body identification number 1870. Spring Creek is located in the Spring Creek watershed, 12-digit Hydrologic Unit Code 07140102-0103.
(ii) The requirements that apply throughout the term of the WQS variance. The requirements shall represent the highest attainable condition of the water body or waterbody segment applicable throughout the term of the WQS variance based on the documentation required in (b)(2) of this section. The requirements shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(2) of this section. The State must specify the highest attainable condition of the water body or waterbody segment as a quantifiable expression that is one of the following: (A) For discharger(s)-specific WQS variances: (1) The highest attainable interim criterion; or (2) The interim effluent condition that reflects the greatest pollutant reduction achievable; or	Implementation of this WQS variance will not result in the lowering of existing water quality. Pursuant to 40 CFR Section 131.14, the Salem Wastewater Treatment Facility is required to implement the highest attainable conditions that will be established in Missouri State Operating Permit #MO-0021768. This WQS variance must reflect the interim effluent condition that reflects the greatest pollutant reduction achievable during the term specified in the variance. Because the City of Salem plans to address WWTF improvements in a step-wise manner, there are multiple interim effluent conditions established in this variance, which were calculated based on current performance of the facility and expected performance of future upgrades to treatment technology. The City of Salem must also implement their PMP detailed in Appendix B of this document. The Missouri State Operating Permit #MO-0021768 will contain a requirement for the implementation of a PMP with annual reporting to the Department.

(3) If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program. (B) For WQS variances applicable to a water body or waterbody segment: (1) The highest attainable interim use and interim criterion; or (2) If no additional feasible pollutant control technology can be identified, the interim use and interim criterion that reflect the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the State adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.	
(iii) A statement providing that the requirements of the WQS variance are either the highest attainable condition identified at the time of the adoption of the WQS variance, or the highest attainable condition later identified during any reevaluation consistent with paragraph (b)(1)(v) of this section, whichever is more stringent.	Because the City of Salem plans to address WWTF improvements in a step-wise manner, there are multiple interim effluent conditions established in this variance, which were calculated based on current performance of the facility and expected performance of future upgrades to treatment technology. These are the highest attainable conditions that the plant can achieve in the interim. Upon reevaluation no less than every five years, these values may be adjusted.
(iv) The term of the WQS variance, expressed as an interval of time from the date of EPA approval or a specific date. The term of the WQS variance must only be as long as necessary to achieve the highest attainable condition and consistent with the demonstration provided in paragraph (b)(2) of this section. The State may adopt a subsequent WQS variance consistent with this section.	The City of Salem has requested the term of this variance be 30 years. This will allow to upgrade the WWTF to Scenario I-Alt treatment technologies, optimize operations, and mitigate impacts to the city's financial capability for the highest attainable condition to be achieved.

(v) For a WQS variance with a term greater than five years, a specified frequency to reevaluate the highest attainable condition using all existing and readily available information and a provision specifying how the State intends to obtain public input on the reevaluation. Such reevaluations must occur no less frequently than every five years after EPA approval of the WQS variance and the results of such reevaluation must be submitted to EPA within 30 days of completion of the reevaluation.	The Department will reevaluate the highest attainable condition every five years. Any adjustments will be incorporated into Missouri State Operating Permit #MO-0021768, which will follow the public participation process pursuant to 10 CSR 20-6.020. The results of the reevaluation will be submitted to EPA within 30 days of completion of the reevaluation.
(vi) A provision that the WQS variance will no longer be the applicable water quality standard for purposes of the Act if the State does not conduct a reevaluation consistent with the frequency specified in the WQS variance or the results are not submitted to EPA as required by (b)(1)(v) of this section.	If the Department does not complete a reevaluation of the variance no less than every five years following EPA approval of the variance, or does not submit the results of the reevaluation to EPA within 30 days of the reevaluation, the variance will no longer be the applicable water quality standard until the Department completes and submits the reevaluation to EPA.
(2) The supporting documentation must include:	
(i) Documentation demonstrating the need for a WQS variance. (A) For a WQS variance to a use specified in section 101(a)(2) of the Act or a sub-category of such a use, the State must demonstrate that attaining the designated use and criterion is not feasible throughout the term of the WQS variance because: (1) One of the factors listed in § 131.10(g) is met, or (2) Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use and criterion while the actions are being implemented. (B) For a WQS variance to a non-101(a)(2) use, the State must submit documentation justifying how its consideration of the use and value of the water for those uses listed in §	The basis for this request is 40 CFR § 131.10(g)(6) Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact. The City of Salem evaluated five alternative treatment scenarios representing progressively more stringent levels of wastewater treatment. Per Factor 6, variances may be granted if the necessary pollution controls beyond technology-based standards cause, "substantial and widespread economic and social impact." The City of Salem has conducted analyses to demonstrate that treatment scenarios beyond Scenario I are not economically feasible and would cause substantial and widespread economic and social impacts in the city with current funding sources. See Appendix C – City of Salem's Request for Variance from the Spring Creek Total Maximum Daily Load for supporting information.

131.10(a) appropriately supports the WQS variance and term. A demonstration consistent with paragraph (b)(2)(i)(A) of this section may be used to satisfy this requirement.	
(ii) Documentation demonstrating that the term of the WQS variance is only as long as necessary to achieve the highest attainable condition. Such documentation must justify the term of the WQS variance by describing the pollutant control activities to achieve the highest attainable condition, including those activities identified through a Pollutant Minimization Program, which serve as milestones for the WQS variance.	The City of Salem must follow the PMP detailed in Appendix B of this document. The PMP establishes milestones over the term of this variance.
(iii) In addition to paragraphs (b)(2)(i) and (ii) of this section, for a WQS variance that applies to a water body or waterbody segment: (A) Identification and documentation of any cost-effective and reasonable best management practices for nonpoint source controls related to the pollutant(s) or water quality parameter(s) and water body or waterbody segment(s) specified in the WQS variance that could be implemented to make progress towards attaining the underlying designated use and criterion. A State must provide public notice and comment for any such documentation. (B) Any subsequent WQS variance for a water body or waterbody segment must include documentation of whether and to what extent best management practices for nonpoint source controls were implemented to address the pollutant(s) or water quality parameter(s) subject to the WQS variance and the water quality progress achieved.	This provision does not apply.
(c) Implementing WQS variances in NPDES permits.	

A WQS variance serves as the applicable water quality standard for implementing NPDES permitting requirements pursuant to § 122.44(d) of this chapter for the term of the WQS variance. Any limitations and requirements necessary to implement the WQS variance shall be included as enforceable conditions of the NPDES permit for the permittee(s) subject to the WQS variance.	This variance will be used solely to establish effluent limits for total nitrogen, total phosphorus, TSS, and $CBOD_5$ within Missouri State Operating Permit #MO-0021768. The variance will not be used for any other Clean Water Act or Missouri Clean Water Law Purposes.

Appendix B – Pollutant Minimization Program for the Salem WWTF

Per 40 CFR § 131.14 (b)(1)(ii), a Pollutant Minimization Program (PMP) is required for any water quality standards variance when no additional feasible control technology can be identified and the highest attainable effluent condition is adopted by the State as the water quality standard. The PMP is defined at 40 CFR Section 131.3(p) as "a structured set of activities to improve processes and pollutant controls that will prevent and reduce pollutant loadings." The City is already committed to implementing a number of improvements at its WWTF and in its collection system that will result in improved water quality. These activities, which constitute the PMP, are described below.

Since 2010, the City has spent approximately $1,500,000 on collection system rehabilitation programs. The City has budgeted an additional $550,000 for this effort during fiscal year 2020. Funding for rehabilitation will continue to vary year to year, but the City anticipates spending approximately $200,000 annually going forward (approximately the average since 2010).
The City has also budgeted $980,000 for the Highway 72 sewer extension project to eliminate the lagoon located at the Salem Memorial District Hospital. Completion of this project is scheduled by the end of 2019.

In addition to collection system improvements, the City will implement Scenario I in phases to address necessary upgrades to keep it functioning properly. Phase 1a (intermediate pump station and UV disinfection) was completed in 2018 and completion of Phase 1b is estimated in 2020. Phase 1b improvements (estimated completion in 2020) include construction of a new Headworks Facility and other facility improvements to improve capacity and treatment capability. Completion of Phase 2 improvements is estimated at the end of 2023. Phase 2 improvements will include a new peak flow disinfection basin, removal of the existing rotors, and installation of an additional Aire-O2 aerator/mixer combination unit.

Finally, the City will undertake steps to optimize treatment at its facility. Optimization steps are summarized below:

- A Sampling and Monitoring Protocol will be established for the collection of grab samples for dissolved oxygen within the basin and for total phosphorus, nitrogen, nitrate and ammonia within the effluent. The Protocol will require approximately 3 months to develop. Following development, the Protocol will include 1 year (minimum) of monitoring to ensure the summer and winter seasons are monitored adequately.
- Following 1 year of monitoring, the dissolved oxygen levels within the basin will be optimized through the operation of the rotors within the ditch to provide further nitrate and total nitrogen reduction. The dissolved oxygen optimization will require a 1 year period to account for season variation. No additional equipment will be necessary for this optimization.
- As part of Scenario I Phase 2, the City will optimize operation of the new Aire-O2 aerator/mixer combination unit. Optimization of the ditch using the new Aire-O2 unit will require 1 year of operation to provide further denitrification within the ditch through the summer and winter seasons. The combination unit can be cyclically operated to provide aeration (nitrification) and mixing (denitrification) in separate cycles. No additional equipment will be necessary for this optimization.

Request for Variance from the Spring Creek Total Maximum Daily Load

Salem WWTF Improvements

Salem Wastewater Treatment Plant

Salem, Missouri

October 3, 2019

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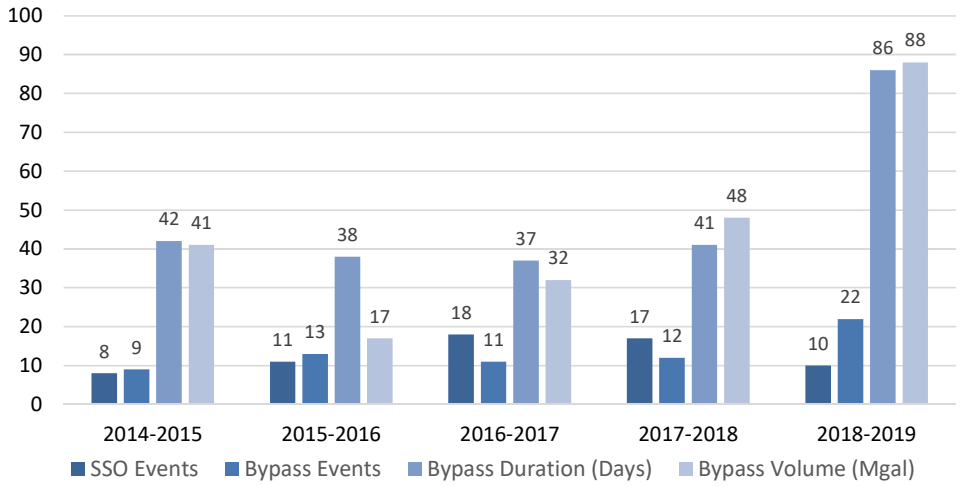
1.Introduction

The City of Salem, Missouri (City) is pursuing a discharge-specific variance from the underlying water quality standards used to develop wasteload allocations (WLA) for the Salem Municipal Wastewater Treatment Facility (WWTF) (MSOP MO-0021768) included within the Spring Creek Total Maximum Daily Load (TMDL) (MDNR 2010). The WLAs prescribed in the Spring Creek TMDL pose wastewater treatment challenges with currently available proven technologies. In addition to technical challenges, the Spring Creek TMDL presents financial issues that will result in widespread economic and social impacts and compromises the City's ability to address other infrastructure needs.

This variance request will only be used to establish effluent limits for 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) within the Salem Municipal WWTF National Pollutant Discharge Elimination System (NPDES) permit. Spring Creek will retain its underlying designated use of Warm Water Aquatic Life for purposes other than the NPDES permit issued under the terms and conditions of this variance. All other water quality standards not specifically addressed by this variance should continue to apply for all Clean Water Act (CWA) purposes.

2. Existing Challenges and Needs

The City's ability to address the TMDL WLAs is compromised by limited financial resources and existing commitments to other environmental obligations. Notably, the City is operating under a Voluntary Compliance Agreement (VCA) to address significant inflow and infiltration (I/I) issues that result in bypasses at the City's wastewater treatment facility. The City's collection system consists of approximately 35 miles of mostly vitrified clay pipe (VCP). Structural defects in the VCP and manholes allow I/I to enter the system that has contributed to sanitary sewer overflow (SSO) events and bypasses at the treatment facility (Figure 1).



Note: Year is defined as the period from July 1 through June 30

Figure 1. Salem Annual Bypass Summary

Since 2010, the City has spent approximately $1.5 million on collection system improvements and is budgeted to spend an additional $550,000 in fiscal year 2020 (Figure 2). This funding has been largely directed towards the City's cured in-place pipe (CIPP) program. However, ongoing sewer rehabilitation work is needed into the foreseeable future. Additionally, the City has budgeted approximately $980,000 to eliminate the lagoons at the Salem Memorial District Hospital as part of the Highway 72 sewer expansion.

The City is also committed to making critical and necessary improvements to its aging WWTF. It has been over 20 years since the Salem WWTF was last upgraded and the City is in the process of making several necessary and critical repairs to its facility. However, due to financial constraints, facility improvements are being implemented using a phased approach. Phase 1 improvements (explained in greater detail in Section 4) were largely funded by a certificate of participation, but there is currently no funding mechanism in place to complete the second phase of improvements (see Section 6.1). These existing commitments represent a significant burden for the City, which has already raised sewer rates by approximately 76% since 2015 (see Section 6.1).

In addition to existing commitments, it is anticipated that Missouri will likely adopt new ammonia criteria based on the latest federal recommendations within the next several years. The revised

ammonia criteria will result in significantly more stringent effluent limits, which will have an impact on facility operations and require major capital improvements. There are also a number of other future 304(a) criteria revisions at the federal level that could eventually impact treatment requirements at the Salem WWTF.

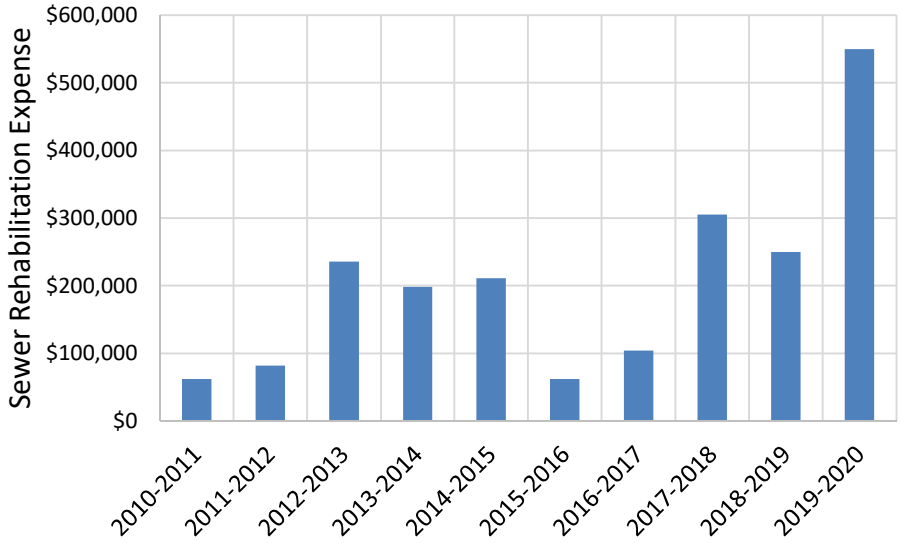


Figure 2. Annual Sewer Rehabilitation Expenses

The City is committed to making environmental improvements, but desires to do so in the most effective and efficient manner possible. Attempting to meet the TMDL WLAs at this time would jeopardize other critical environmental improvement projects and would result in widespread economic and social impacts. In particular, the City's collection system improvements to address wet weather discharges, elimination of the Salem Memorial District Hospital lagoon system, and critical WWTF rehabilitation improvements are considered higher water quality priorities with the City's financial constraints. Given the financial limitations of the City and the competing water quality drivers, it is important that the City prioritize and balance improvement opportunities with existing financial constraints and environmental benefits. The proposed improvements to the WWTF provided within this document strike this balance without significantly jeopardizing other water quality improvement projects.

3. Applicable Discharger and Water Quality Standards

The only discharger to be permitted under the terms and conditions of the requested variance is the Salem WWTF. The WWTF discharges effluent into Spring Creek. Spring Creek is a Class P stream with the waterbody identification number (WBID) of 1870. Spring Creek is located in the 12 digit hydrologic unit code (HUC) of 07140102-010003.

The water quality standards subject to this variance are the underlying standards used to develop the WLAs in the Spring Creek TMDL. MDNR established WLAs for the Salem WWTF in the Spring Creek TMDL in order to address aquatic life use impairments due to low dissolved oxygen (DO). While DO itself is not considered a pollutant, the TMDL identifies the Salem WWTF as the primary point source contributor of oxygen demanding substances and nutrients in Spring Creek, including $CBOD_5$, TSS, TN, and TP. Specifically, the City is requesting a variance from the underlying water quality standards utilized for the development of Spring Creek WLAs for $CBOD_5$, TSS, TN, and TP (Table 1).

Table 1. Spring Creek TMDL Wasteload Allocations.

Parameter	TMDL WLA
$CBOD_5$, mg/L	3.3
TSS, mg/L	5
Total Nitrogen, mg/L	0.289
Total Phosphorus, mg/L	0.007

Since the TMDL was originally developed, MDNR has identified a number of underlying technical issues in the assumptions and information used to develop the suggested WLAs. In particular, the TMDL does not provide a strong link between the WLAs and Missouri's DO criterion or aquatic life use protections. MDNR is currently amending the TMDL and will likely issue revised WLAs in the near future. Depending on the results of that TMDL amendment, the City may need to reevaluate this variance and associated implementation schedule in the future.

4. Wastewater Treatment Alternatives

Five alternative treatment scenarios representing progressively more stringent levels of wastewater treatment were evaluated. The five treatment scenarios are as follows:

- Scenario I – Improvements to Existing WWTF
- Scenario I Alt – Improvements to Existing WWTF with Chemical Phosphorus Removal
- Scenario II – Biological Nutrient Removal
- Scenario III – Enhanced Nutrient Removal
- Scenario IV – Limits of Technology

The following section provides details of each scenario evaluated.

4.1. Scenario I – Improvements to Existing WWTF

The WWTF requires extensive improvements to meet existing permit limits due to poor condition of existing equipment, the need to increase the average daily flow (1.1 MGD), and the need to eliminate the existing Bypass Outfall 002. Due to budgetary limitations, the proposed improvements to the existing WWTF will be completed in multiple phases as detailed below. Figure 3 depicts the process flow diagram of Scenario I.

- **Phase 1A – New Ultraviolet Disinfection Facility**
    - New intermediate pump station
    - New UV disinfection (Outfall 001)

- **Phase 1B – New Headworks Facility and Existing WWTF Improvements**
    - New Headworks Facility
    - Hydraulic improvements
    - Oxidation ditch cleanout and bridge modification

- **Phase 2 – New Peak Flow Disinfection Basin and Existing WWTF Improvements**
    - New chlorine and dechlorination contact basin for peak flows
    - New chemical storage building
    - Influent pump station improvements
    - Additional oxidation ditch modifications
    - Secondary clarifiers repair and drive replacement
    - Return activated sludge/waste activated sludge (RAS/WAS) improvements
    - Aerobic digester aerator modifications
    - Reed curing/drying pad relocation

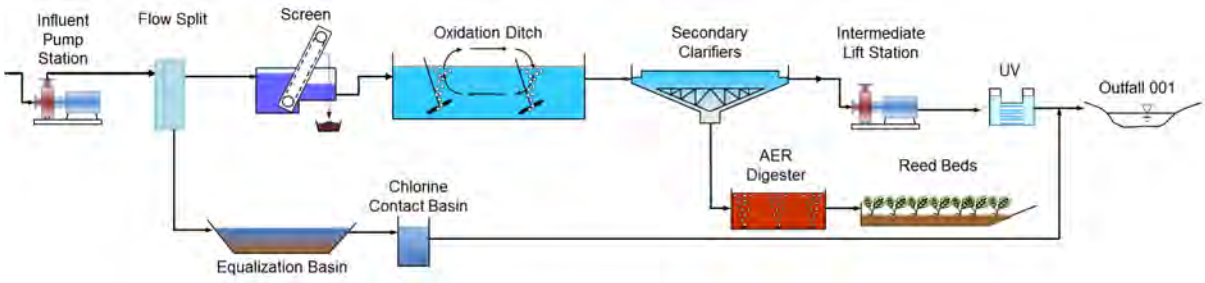


Figure 3. Scenario I Process Flow Diagram – Existing WWTF Improvements

Phase 1A – New Ultraviolet Disinfection Facility

Phase 1A involves the addition of a UV equipment to disinfect the plant effluent prior to discharge from Outfall 001. The UV equipment consists of low pressure, high intensity bulbs in a horizontal configuration. The existing plant hydraulics require the installation of an intermediate pump station upstream of the UV Disinfection Facility, which discharges plant flows in an open channel that then flow by gravity through the UV channel. The improvements also include a new electrical duct bank and utility relocations. Phase 1A Improvements were completed in 2018 in order to meet the schedule of compliance requiring the City to meet final effluent requirements for *E. coli.*

Phase 1B – New Headworks Facility and Existing WWTF Improvements

Phase 1B involves construction of a new Headworks Facility to screen influent flows prior to treatment within the oxidation ditch. The new Headworks Facility will include a perforated plate fine screen with a washer compactor. Improvements for Phase 1B also include the construction of a new secondary flow splitter and other hydraulic improvements.

Further, to improve capacity and treatment capability within the existing oxidation ditch the ditch will be taken offline temporarily to make bridge repairs, remove grit and other improvements. Following the basin cleanout, an Aire-O_2 aerator/mixer combination unit will be installed to provide redundancy for the existing rotors. However, without additional Phase 2 improvements the facility cannot be operated to provide denitrification.

Anticipated average effluent quality for the TMDL parameters that would result from Scenario 1 Phase 1B improvements are as follows:

- $CBOD_5$ and TSS – 15 mg/L
- TN – 22 mg/L
- TP – 5 mg/L

Phase 2 – New Peak Flow Disinfection Basin and Existing WWTF Improvements

Phase 2 involves construction of a chlorine contact basin downstream of the existing Peak Flow Storage Basin. Flows in excess of the mechanical plant peak flow (3.62 MGD) and equalization basin storage (900,000 gallons) will be chlorinated then dechlorinated prior to blending with Outfall 001 UV disinfected effluent. The chlorine disinfection will require construction of a new

chemical building to house two chemical feed skids and storage tanks for hypochlorite and bisulfite. The construction of the chlorine contact basin will require the relocation of the existing reed curing and drying pad.

Phase 2 will also include the removal of the existing rotors and installation of an additional Aire-O_2 aerator/mixer combination unit. The combination units can be cyclically operated to provide aeration (nitrification) and mixing (denitrification) in separate cycles.

Improvements for Phase 2 also include replacement of pumps and valves in the existing Influent Pump Station; painting and metal repair of existing clarifiers and replacement of existing drives; replacement of pumps and valves in the existing RAS/WAS pump station; and repair to existing aerobic digester aerator assembly.

Anticipated average effluent quality for the TMDL parameters that would result from Scenario 1 Phase 2 improvements are as follows (see Appendix A for additional details):

- $CBOD_5$ and TSS – 15 mg/L
- TN – 15 mg/L
- TP – 5 mg/L

4.2. Scenario I Alternative – Improvements with Chemical Phosphorus Removal

For the purposes of achieving some nutrient removal in Scenario I, chemical phosphorus removal was considered in addition to existing planned improvements. This alternative involves the addition of alum upstream of the secondary clarifiers for the purposes of chemically removing phosphorus. This will require an additional 300 square foot structure to house a chemical feed skid and storage tank. With this alternative, anticipated average TP effluent concentrations would be approximately 1-2 mg/L as an annual average. However, as additional alum is added to approach lower concentrations, consideration needs to be provided for increased solids production and handling. Figure 4 depicts the process flow diagram of Scenario I Alternative.

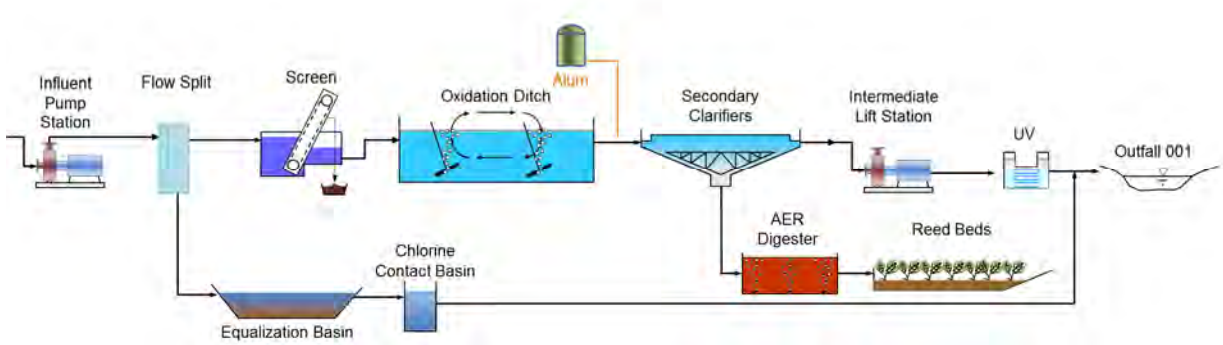


Figure 4. Scenario I Process Flow Diagram – Phase 2 Alternative

4.3. Scenario II- Biological Nutrient Removal

In addition to the improvements outlined Scenario I, both anaerobic and anoxic treatment basins could be added to achieve biological nutrient removal (BNR). The anticipated annual average effluent concentrations for Scenario II is a TN of 10 mg/L, a TP of 1 mg/L, and a CBOD5 and TSS of 10 mg/L each. The BNR treatment will be achieved with an anaerobic selector basin for biological phosphorus removal and an anoxic zone with a mixed liquor recycle from the aerobic zone to promote denitrification and total nitrogen removal. Scenario II will also include a chemical feed system using alum to enable phosphorus reduction during potential biological phosphorus removal process upsets and to treat the recycle stream resulting from the biosolids processing. Figure 5 depicts the process flow diagram of Scenario II.

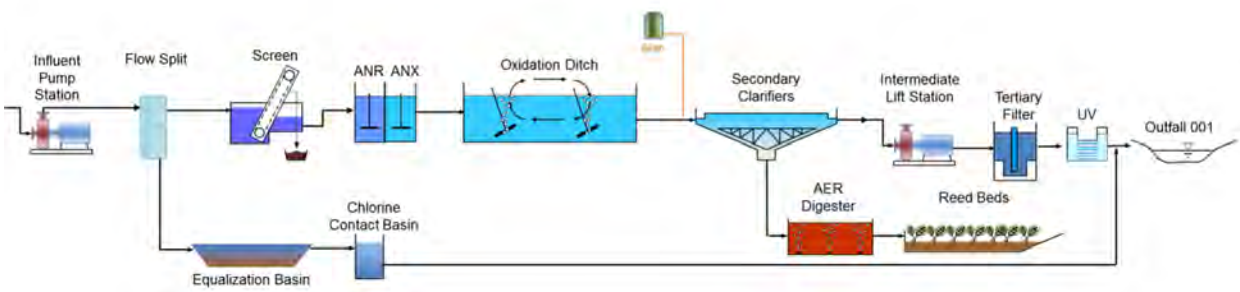


Figure 5. Scenario II Process Flow Diagram

4.4. Scenario III – Enhanced Nutrient Removal

In addition to the improvements outlined Scenario II, filtration will be added to achieve enhanced nutrient removal (ENR). The anticipated long-term average effluent concentrations for Scenario III is a TN of 5 mg/L, a TP of 0.5 mg/L, and a CBOD5 and TSS of 5 mg/L each. The ENR treatment will be achieved with a dentrification filter with the addition of a carbon source to promote further dentrification reducing the amount of total nitrogen from 10 mg/L, achievable in Scenario II, to 5 mg/L in Scenario III. Scenario III will include additional chemical alum feed to enable further phosphorus reduction. Figure 6 depicts the process flow diagram of Scenario III.

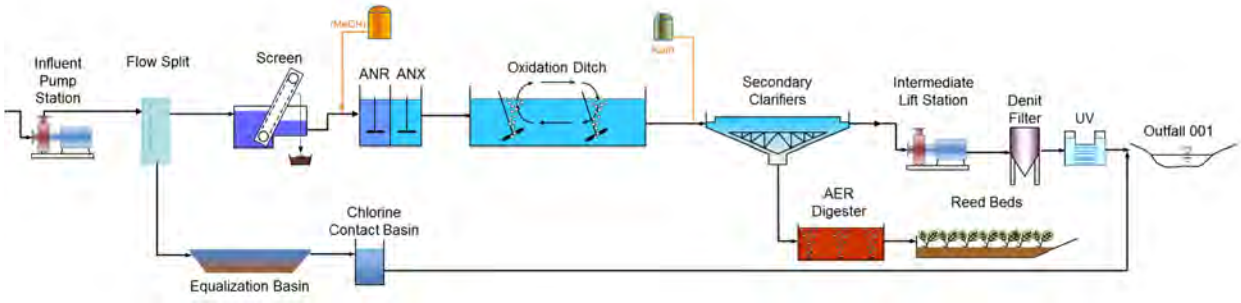


Figure 6. Scenario III Process Flow Diagram

4.5. Scenario IV – Limits of Technology

Reverse osmosis (RO) represents the current highest form of treatment that could be used to further reduce effluent TN and TP beyond the levels that can be achieved by ENR. However, RO is not a proven technology for use in municipal wastewater treatment applications with respect to effluent nutrient discharge quality due to its limited body of research.

According to WERF (2010), the current limit of technology (LOT) for TN removal ranges between 3 mg/L and 4 mg/L for municipal wastewater treatment. The level of TN removal that any proven technology can achieve depends on the effluent rDON, or refractory dissolved organic nitrogen, concentration. The level of effluent rDON for a typical municipal WWTF effluent can range from 1 to 2 mg/L, but higher concentrations are not uncommon and can be due to certain types of industrial contributions or may be generated as a byproduct of the treatment process. To yield an effluent TN near the TMDL WLA of 0.9 mg/l, effluent total inorganic nitrogen (TIN) concentrations of less than 0.8 mg/l would be required and the effluent rDON would have to be almost completely removed. According to WERF (2011), RO may have the potential to reduce rDON, and is known to remove nitrate and ammonia; however, depending on the membrane type, effluent rDON concentration reductions ranging from 50% and 90% are more likely. Therefore, it is unlikely effluent rDON concentrations could be reduced to a level required to meet the TMDL TN WLA. Also, such a low effluent TIN would require secondary and tertiary nitrogen removal processes with carbon addition capable of reducing TSS concentrations to less than 2 mg/L. Such a treatment train would require high levels of automation, highly skilled operations staff, and full redundancy throughout the liquid treatment process.

Similarly, the TMDL TP WLA of 0.007 mg/L also represents an unachievable limit given the current LOT. According to WERF, the current LOT for TP is in the range of approximately 0.1 mg/L (Clark et al. 2016). Currently, two of the most advanced phosphorus removal plants in the country include the Rock Creek and Durham facilities located in Oregon. They were designed to meet one of the most restrictive TMDL-based phosphorus limits (0.1 mg/L) outside of Missouri. These facilities have successfully achieved effluent TP concentrations near 0.07 mg/L by employing chemical clarification and media filtration. However, even using such advanced technologies, it is unlikely average effluent TP could be reduced to level necessary to meet the TMDL WLA, which is approximately an order of magnitude lower than what is achieved at these treatment facilities.

In addition to RO having very high operations and maintenance (O&M) cost, RO produces a deionized permeate that is toxic to aquatic life. Diverting flow around the RO process and recombining it with the RO effluent should address concerns with toxic deionized permeate discharges. An additional treatment step would be required to condition the permeate by adding back salts and minerals to the plant effluent prior to discharge. Treatment of 100% of the plant flow would result in high capital and O&M expenditures, while still not likely attaining the effluent TN concentration required by the TMDL.

In addition to these concerns, RO also produces a reject brine that required some form of disposal. Typical methods used for disposal of brine from an RO process consist of injection

wells; however, the use of this disposal method is currently not allowed in the state of Missouri. Other methods of disposal such as evaporation ponds are not applicable for this climatic area. Therefore, brine concentration and crystallization would most likely be the required disposal method if using an RO process. The significant energy requirements associated with further concentration of the brine and subsequent heating for evaporation would result in a considerably higher capital and annual O&M cost as compared to injection wells. In addition, this residuals management process would produce much higher levels of greenhouse gas emissions due to energy consumption. Figure 7 depicts the process flow diagram of Scenario IV.

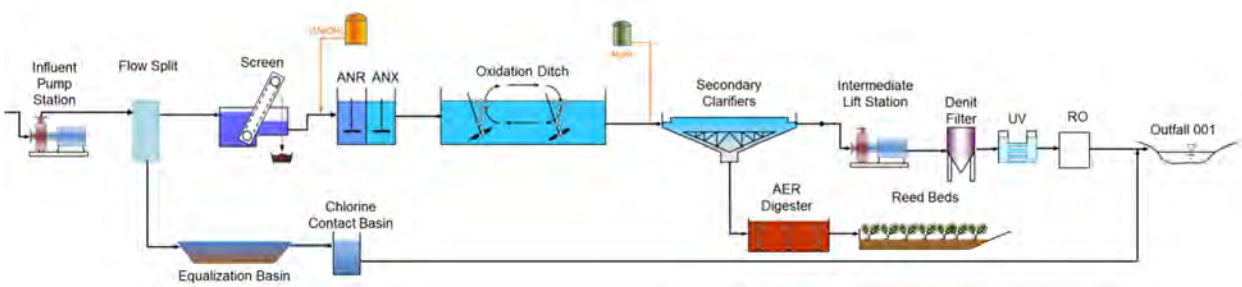


Figure 7. Scenario IV Process Flow Diagram

4.6. Comparison to TMDL WLAs

Anticipated effluent quality for each of the scenarios were compared to the Spring Creek TMDL WLAs (Table 1). None of the scenarios are capable of meeting all of the TMDL WLAs. As previously discussed, the TMDL WLAs for TN and TP are not achievable even with the most advanced treatment technologies. Therefore, water quality standards cannot be achieved and a variance would be required for any of the alternatives.

Table 2. Comparison of Anticipated Average Effluent Quality to TMDL WLAs.

Parameter	Average Effluent Concentration (mg/L)						
	TMDL WLA	Scenario I – Existing Improvements		Scenario I- Alt	Scenario II- BNR	Scenario III – ENR	Scenario IV –LOT
		Phase 1B	Phase 2				
$CBOD_5$	3.3	15	15	15	10	5	3
TSS	5	15	15	15	10	5	3
Total Nitrogen	0.289	22	15	15	10	5	3
Total Phosphorus	0.007	5	5	1-2	1	0.5	0.1

Note: Nutrient concentrations are achievable as an annual average.

5. Alternative Discharge Location

In addition to evaluating different treatment technologies, the City also considered discharging to a different waterbody. Discharges to adjacent watersheds with Outstanding State or National Resources Waters including Little Piney Creek and the Current River were eliminated from consideration. The closest potentially feasible discharge location is the Meramec River, which is approximately 6 miles northeast of the facility (Figure 8).

The Meramec River alternative would require the construction of a new effluent pump station and effluent forcemain. Existing planned improvements would be required regardless of the potential discharge location. While some additional level of pollutant removal may be required for a Meramec River discharge, these costs were not considered as part of this evaluation. The total estimated cost for the alternate discharge location is $11,071,000. This cost includes the construction of both the force main and pump station, a 25 percent construction contingency and all anticipated engineering, surveying and construction administrative costs. Detailed costs are provided for in Appendix B.

The estimated cost for the alternative discharge location to the Meramec River would more than double the construction costs of the existing planning WWTF improvements. This alternative is not considered practicable.

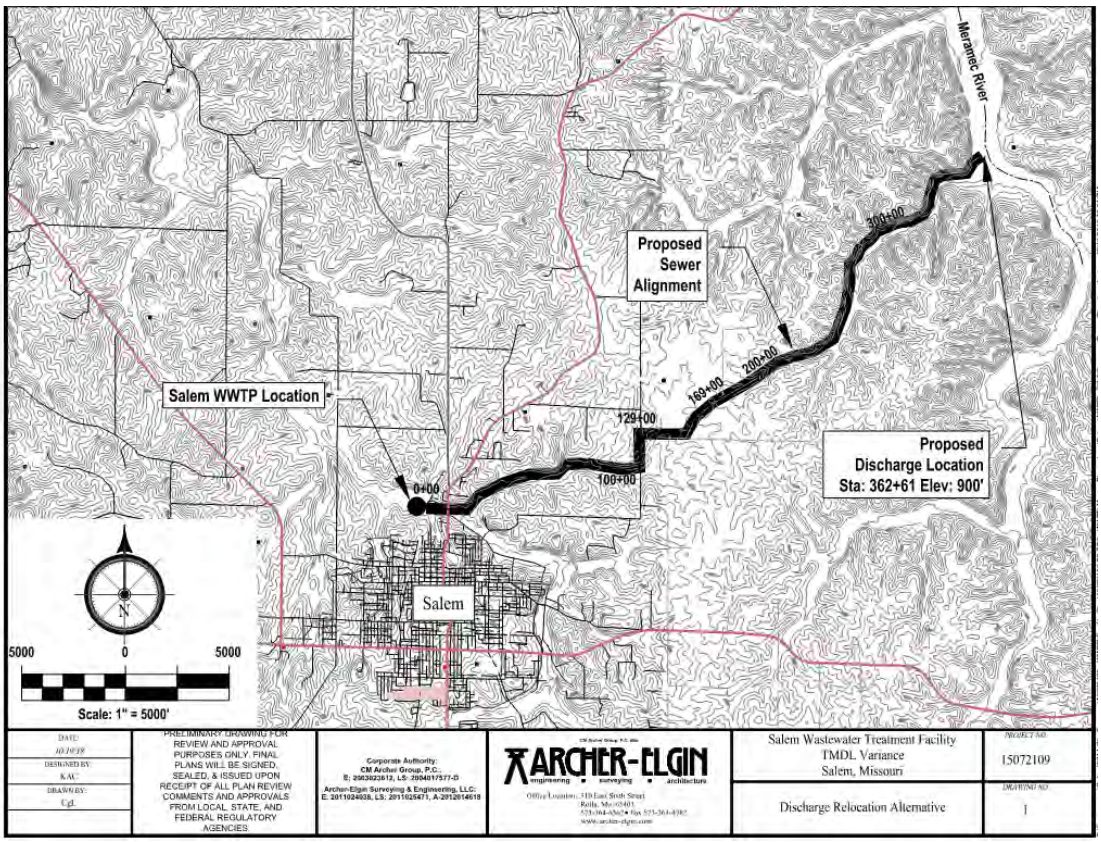


Figure 8. Discharge Relocation Alternative.

6. Financial Capabilities Assessment

Per Factor 6 of 40 CFR 131.10(g), variances from water quality standards may be granted if the necessary pollution controls beyond technology-based standards cause “substantial and widespread economic and social” impacts. The analyses below demonstrate that controls beyond the existing planned improvements (Scenario 1) are not economically feasible and would cause substantial and widespread economic and social impacts in the City without additional grant funding.

6.1. Funding Sources

The City’s sewer program has historically been funded by a capital improvement sales tax, sewer user fees, loans, and grants as described below. These funding sources cover existing operations and Scenario I, Phase 1 improvements at the treatment facility. Currently, there is no mechanism in place to fund the Scenario I, Phase 2 improvements or any improvements beyond Phase 2.

Capital Improvement Fund

The City’s capital improvement fund is used to account for the financial resources that are restricted, committed, or assigned to expenditure for capital outlay, including the acquisition or construction of capital facilities and other capital assets. It is funded by a capital improvement sales tax, which imposes a one-half of one percent (0.5%) sales tax on all retail sales made within the City. It is used to fund a variety of projects, and until recently, was used to help fund sewer upgrades. However, starting in fiscal year 2020, the capital improvement fund will no longer be used to fund any expenses associated with the WWTF or collection system.

Sewer Fund

The Sewer Fund is one of the City’s major Enterprise Funds. As with other City Enterprise Funds, the costs of funding sewer services is financed or recovered primarily through user charges. The Sewer Fund is funded from user rates, which have increased 76% since 2015 (Table 2). Since fiscal year 2013, the City’s Sewer Fund has been operating at a deficit with expenses exceeding revenue in most years (Figure 9). Although expenses have been increasing over this period, increased user fees have helped close this gap in recent years.

Table 3. Salem Residential User Sewer Rates since 2015.

Adopted	2015	2016	2017	2018
Base Rate	$6.00	$6.00	$6.00	$6.00
Vol. Rate/1,000 gallons	$2.70	$3.00	$3.93	$5.65
Bill for 5,000 gallons	$19.50	$21.00	$25.65	$34.25
% Increase Since 2015	--	7.7%	32%	76%

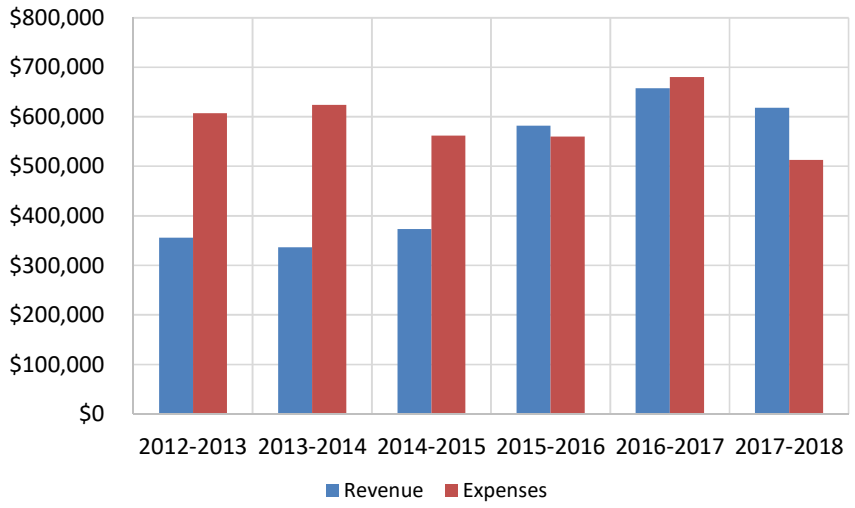


Figure 9. Annual Revenue vs. Operating Expenses for Sewer Services.

Series 2017 Certificates

In April 2017, the City issued $7,335,000 of Series 2017 certificate of participation (COP). The COP was issued to pay the costs of installing automatic meter reading infrastructure, building sewer system extensions and implementing Phase 1 upgrades to the WWTF. The COP bears interest from 1.2% to 3.7% and is due on November 1, 2037. In fiscal year 2020, revenues from sewer collection fees will fund 60% of the 2017 COP debt service, or approximately $300,000. The annual debt service requirements of the Series 2017 COP at June 30, 2017 are as follows:

For the Year Ending June 30	Principal	Interest	Total
2018	-	219,601	219,601
2019	285,000	214,882	499,882
2020	290,000	211,142	501,142
2021	290,000	206,792	496,792
2022	295,000	201,817	496,817
2023-2027	1,610,000	903,889	2,513,889
2028-2032	1,860,000	652,818	2,512,818
2033-2037	2,210,000	301,695	2,511,695
2038	495,000	9,157	504,157
	$7,335,000	$2,921,793	$10,256,793

Rural Sewer Grant

MDNR's rural sewer grant program is available for communities of less than 10,000 and covers up to 50 percent of the eligible costs up to $500,000. The City received the full grant amount of $500,000 to partially fund Scenario I, Phase 1b improvements. MDNR is in the process of replacing the rural sewer grant program with one that includes a higher cap, but requires matching funds through the State Revolving Fund (SRF). The City does not currently utilize any SRF funding.

6.2. Substantial Impact Analysis

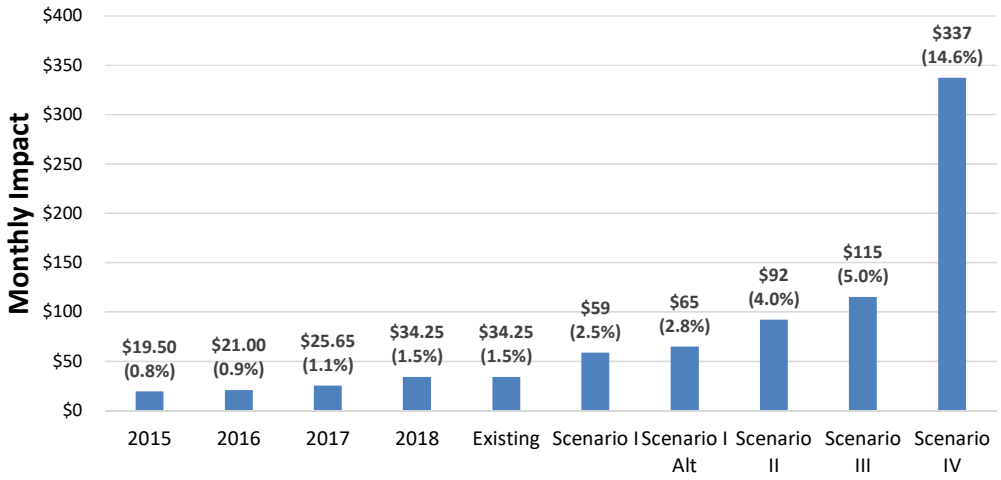
EPA (1995) suggests that two economic tests be used to evaluate the likelihood that substantial impacts will occur as the result of implementing a particular wastewater treatment alternative. The first test, called the municipal preliminary screener (MPS), evaluates whether or not residents can afford a pollution control alternative by comparing the expected annual pollution control cost to the community MHI. If the MPS indicates substantial impacts are likely, the analysis proceeds to the second test. The Secondary Test relies on several indicators to assess the economic health of the community as a whole. Results from the MPS and secondary test are then jointly evaluated in the Substantial Impacts Matrix to determine whether the alternative is likely to have substantial economic impacts on the community.

Average annual pollution control costs were determined by estimating anticipated residential sewer rates and resulting bills needed to fund each of the alternatives identified in Section 4. The existing residential sewer rates in the City include a base rate of $6 per month plus a volumetric rate of $5.65 per 1,000 gallons used. These rates are equivalent to a $34 per month sewer bill ($408 per year) assuming 5,000 gallons per month usage. To fund the alternative treatment scenarios, volumetric rates would need to be increased significantly (Table 3 and Appendix C). Based on the analysis, resulting average monthly bills for Scenarios I through IV would range from $59 to $337. Relative to the 2013-2017 American Consumer Survey (ACS) MHI of $27,740, the MPS ranges from 2.5% to 14.6% (Figure 10). EPA (1995) suggests that MPS values in excess of 2% will result in substantial impacts.

Table 4. Estimated Total Pollution Control Costs for Scenarios I through IV

Alternative	Scenario I	Scenario I Alt	Scenario II	Scenario III	Scenario IV
Construction Costs	$8,334,000	$8,793,000	$13,357,000	$18,532,000	$66,716,000
Bond Issuance	$333,000	$352,000	$534,000	$741,000	$2,669,000
Legal	$83,000	$88,000	$134,000	$185,000	$667,000
Debt Service Reserve Account	$875,000	$923,000	$1,403,000	$1,946,000	$7,005,000
Existing Annual O&M Costs	$437,000	$437,000	$437,000	$437,000	$437,000
Additional Annual O&M	$80,000	$135,000	$270,000	$299,000	$1,976,000
20-year Total Present Value*	$16,651,000	$17,930,000	$25,036,000	$31,407,000	$109,850,000
Base Rate	$6	$6	$6	$6	$6
Volumetric Rate/1,000 gal.	$10.58	$11.78	$17.22	$21.83	$66.26
Residential Monthly Rate†	$59	$65	$92	$115	$337
Future Bill as % of MHI‡	2.5%	2.8%	4.0%	5.0%	14.6%
Existing Bill as % of MHI§	1.5%	1.5%	1.5%	1.5%	1.5%

*Present worth costs in 2019 dollars based on a 20 year period and 4% interest rate.
†Residential rate estimated for 5,000 gallon usage.
‡Based on an MHI of $27,740 (2013-2017 ACS)
§Existing bill includes Phase 1a and 1b upgrades.



Notes: % of MHI shown in parentheses. Billing impact assuming 5,000 gallons per month usage rate.

Figure 10. Residential Billing Impacts

Per EPA (1995) guidance, if the MPS indicates substantial impacts are likely, the analysis proceeds to the secondary test. The secondary test relies on the following indicators to assess the economic health of the community as a whole.

- **Bond Rating** – The S&P Global Ratings assigned its 'BBB' rating to the City's series 2017 certificates of participation.

- **Overall Net Debt as a Percent of Full Market Value of Taxable Property** - Overall net debt is a community's debt that is repaid by property taxes. It excludes debt repaid by user fees. When compared to the full market value of taxable property, it provides a measurement of debt burden on residents and gauges the ability of the community to issue additional debt. As of December 31, 2017, the overall net debt as a percent of the full market value of taxable property is 0%.

- **Unemployment Rate** – The unemployment rate is the percent of a community's labor force that is unemployed. The 2013-2017 ACS shows that Salem had an unemployment rate of 8.1% as compared to the statewide average of 5.8% and a nationwide average of 6.6%. As of May 2019, the statewide and nationwide unemployment rate had dropped to 3.3% and 3.6%, respectively (U.S. Bureau of Labor and Statistics). A contemporaneous unemployment rate is not currently available for the City; therefore, this indicator was not scored in the matrix.

- **Median Household Income** - EPA has historically accepted the median household income (MHI) to be a good socioeconomic indicator. According to the 2013-2017 ACS profile, the MHI for Salem was $27,740. For comparison, this is a little over half the state median of $51,542.

- **Property Tax Revenues as a Percent of Full Market Value of Taxable Property** - This indicator measures the burden that property taxes currently have on residents and helps in evaluating the funding capacity to support new expenditures (EPA 1995). In 2017, the assessed valuation of taxable property was $47,515,607 with an estimated market value of $250,082,142. Property tax revenues for the City in 2017 were $315,925. Therefore, the property tax revenues as a percent of full market value of taxable property was 0.13% in 2017.

- **Property Tax Collection Rate** - The property tax collection rate measures the efficiency of the tax collection system (EPA 1995). Indirectly, it measures whether or not the current property taxes are burdensome. Residents are more likely to avoid paying or pay late if the taxes are excessive. The City had an average tax collection rate of 99% in 2017.

Based on results of EPA's secondary test, the City has an overall average score of 2.4. EPA (1995) considers a score within the range of 1.5 to 2.5 as mid-range (Table 4).

Table 5. Secondary Test Indicators and Assessment Results for the City of Salem

Secondary Indicator	Benchmarks			Salem Value	Score
	Weak (a)	Mid-Range (b)	Strong (c)		
Bond Rating	Below BBB or Baa	BBB or Baa	Above BBB or Baa	BBB	2
Overall Net Debt as % of Full Market Value of Taxable Property	Above 5%	2% - 5%	Below 2%	0%	3
Unemployment Rate[1]	Above National Average	National Average 3.6%	Below National Average	NA[3]	--
Median Household Income[2]	Below State Median	State Median $51,542	Above State Median	$27,740	1
Property Tax Revenues as a Percent of Full Market Value of Taxable Property	Above 4%	2% - 4%	Below 2%	0.13%	3
Property Tax Collection Rate	< 94%	94% - 98%	> 98%	99%	3
a. Weak is a score of 1 point b. Mid-Range is a score of 2 points c. Strong is a score of 3 points				**SUM**	**12**
				AVERAGE	**2.4**

[1] If the community's employment rate is equal to the national average unemployment rate, plus or minus 1%, then the community's unemployment rate is assessed as being equal to the national rate.
[2] If the community's median household income is equal to the state median, plus or minus 10%, then the community's median household income is assessed as being equal to the state's median household income.
[3] Based on the unemployment rate in Dent County for May 2019.

Results of the MPS and Secondary Test should be jointly evaluated to determine whether or not the project will have significant financial impacts on the community. EPA (1995) recommends evaluating the results with a Substantial Impacts Matrix. In this matrix, the MPS for each treatment alternative is paired with the cumulative assessment score and plotted to estimate impacts. If a community's combined score falls in the upper right corner of the matrix (cells marked with an "X"), substantial financial impacts are expected to occur as a result of the pollution control project (EPA 1995). Scores that fall in the lower left of the matrix (cells marked

with "✓") indicate that the community is not expected to suffer substantial financial impacts. Scores falling in the categories marked with a "?" indicates that the impacts are unclear and may need to be evaluated in more detail (EPA 1995). According to the results of the MPS and Secondary Test evaluations for the City, Scenarios I through IV all fall in the middle right side of the matrix and are considered substantial (Table 5).

Table 6. Substantial Impacts Matrix

Secondary Score	Municipal Preliminary Screener		
	Less than 1%	**1% to 2%**	**Greater than 2%**
Less than 1.5	?	X	X
1.5 to 2.5	✓	?	X (Scenarios I - IV)
Greater than 2.5	✓	✓	?
		Estimated Financial Burden	Substantial (Scenarios I-IV)

Source: U.S. EPA (1995)
X = impact is likely to be substantial
? = impact is borderline
✓ = impact is not likely to be substantial

6.3. Widespread Impact Analysis

Where financial tests demonstrate that impacts will be substantial, additional analyses should be performed to demonstrate whether there will be widespread adverse impacts on the community and surrounding area (EPA 1995). EPA has no explicit criteria for evaluating widespread impacts, but suggests considering changes in socioeconomic indicators. A summary of potential changes are outlined below:

- The City already has a substantially lower MHI relative to the rest of the state. The 5-year 2013-2017 ACS MHI for Salem is $27,740 as compared to the state MHI of $51,542. The relatively low MHI suggests that the financial burden would be significant for a large portion of the City. It is unclear how the MHI would change under Scenarios I through VI, but could decrease as sewer rates would increase for local employers.

- Different indicators suggest that the poverty rate for the City is approximately twice the state and national rate. According to the 2013-2017 ACS, the City has an individual poverty rate of 29.9% and a family poverty rate of 23.1%. For comparison, the individual poverty rate is approximately 15-16% statewide and nationally. The family poverty rate is approximately 10-11% statewide and nationally. As another measure of poverty, 5.6% of households in the City of Salem receive cash public assistance income as compared to 2.1% statewide and 2.6% nationally. Additionally, 23.5% of City households receive food stamps as compared to 12.2% statewide and 12.6% nationally. Higher rates of poverty indicate that the increased financial burden would have more widespread impacts.

Table 7. Poverty Metrics for the City of Salem, State of Missouri and the United States

Metric	Salem	Missouri	USA
Poverty Level, % Individuals	29.9%	14.6%	14.6%
Poverty Level, % Families	23.1%	10.3%	10.5%
Cash Public Assistance Income, % Households	5.6%	2.1%	2.6%
Food Stamps, % Households	23.5%	12.2%	12.6%

Source: 2013-2017 ACS

- Businesses and industries in the City could be at a disadvantage if the sewer rates rise to an amount they cannot afford. As a result, businesses and industries could be required to reduce staff, reduce growth, or close their facilities due to high sewer rates.

- High sewer rates could negatively impact property values in the City.

- The project will increase the community's debt to an amount that may not be sustainable for the future. Salem would be financially stressed and it is unlikely the community would be able to invest in future City needs such as education, transportation, drinking water, police services, and emergency services.

7. Variance Recommendations

Based on the evaluations presented above, the City is pursuing a phased implementation of Scenario I-Alt. The cost of the planned existing improvements (Scenario I only) is projected to result in user rates that reach 2.5% of the City's MHI. This is about a 70% increase over existing user rates, which are approximately 1.5% of City's MHI without additional grant funding. Progressively higher levels of treatment are not attainable at this time given the City's limited financial resources.

The City anticipates funding Phase 2 of Scenario I by incurring additional debt that will likely be financed over a 20-year period. The City is currently working with MDNR to evaluate options for funding Phase 2 through the SRF program but a firm funding timeline has not yet been established. For planning purposes, this report assumes that the City will be able to secure funding for Phase 2 by 2023. Therefore, the next opportunity to initiate facility improvements will be in 2043 with completion estimated in 2048. It is anticipated that Scenario I-Alt will be implemented at that time. If the City cannot secure SRF funding by 2023, the variance term will need to be adjusted.

Based on this timeline, recommendations are provided below for the highest attainable condition (HAC), a pollutant minimization plan (PMP), the term of the variance, additional stream assessments, and an implementation schedule.

7.1. Highest Attainable Condition

A variance is a "time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the [water quality standards (WQS)] variance" (40 CFR § 131.10(o)). For discharger-specific WQS variances, the highest attainable condition (HAC) is specified as a quantifiable expression in one of the following three ways (40 CFR § 131.14(b)(1)(ii)(A)(1-3)):

1. The highest attainable interim criterion; or
2. The interim effluent condition that reflects the greatest pollutant reduction achievable; or
3. If no additional feasible pollutant control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.

For purposes of this variance request, the HAC is defined here by effluent conditions associated with Scenario I-Alt (Improvements with Chemical Phosphorus Removal) (Table 7). This alternative represents the greatest phosphorus reduction achievable at this time due to issues of affordability. Therefore, option 2 applies to TP. Because the selected alternative will not reduce $CBOD_5$, TSS, or TN below Scenario I (Improvement to Existing WWTF) levels, option 3 applies to these parameters and a Pollutant Minimization Program (PMP) must be developed.

Table 8. Highest Attainable Effluent Condition for Scenario I-Alt of the Salem WWTF.

Pollutant Parameter	TMDL WLA, mg/L	HAC, mg/L
$CBOD_5$	3.3	15
TSS	5	15
Total Nitrogen	0.289	15
Total Phosphorus	0.007	1-2

Note: HAC is based on existing improvement plans, which do not include nutrient removal. Nutrient concentrations are achievable as an annual average. The HAC will need to be reevaluated following implementation and optimization of Scenario I-Alt.

The HACs in Table 7 represent anticipated effluent quality based on currently available information. These values will need to be reevaluated following implementation and optimization of Scenario I and Scenario I-Alt as described in the implementation schedule (Section 7.5).

7.2. Term of Variance

The term of the water quality standards variance must only be as long as necessary to achieve the HAC. This is estimated to be in 2050 based on the following schedule:

- Debt service payments related to Scenario I improvements are estimated to terminate in 2043. Debt service payments related to the Series 2017 COP is schedule to terminate in 2038. Funding has not yet been secured for Phase 2 improvements, but for planning purposes debt service is estimated to begin in 2023 and end in 2043.
- An additional 4 years until 2047 is needed to develop a new facility plan and complete the planned improvements.
- An additional 2 years until 2049 is need to optimize operations at the upgraded facility.
- An additional 1 year until 2050 is needed to evaluate the TMDL wasteload allocations and the Greatest Pollutant Reduction Achievable (GPRA). If the GPRA differs from the HAC in Table 7, the HAC will be redefined to match the GPRA.

This estimated term of variance may need to be modified in the future as funding needs or opportunities change or new information becomes available. Since the proposed term of variance exceeds five years, the City is committed to reevaluating the HAC and the financial needs for the variance every five years from the effective date of the variance or during the permit renewal process, whichever comes first.

7.3. Pollutant Minimization Program

Per 40 CFR § 131.14 (b)(1)(ii), a Pollutant Minimization Program (PMP) is required for any water quality standards variance when no additional feasible control technology can be identified and the highest attainable effluent condition is adopted by the State as the water quality standard. The PMP is defined at 40 CFR § 131.3(p) as “a structured set of activities to improve processes and pollutant controls that will prevent and reduce pollutant loadings.” The City is already committed to implementing a number of improvements at its WWTF and in its collection system that will result in improved water quality. These activities, which constitute a PMP, are described below.

Since 2010, the City has spent approximately $1,500,000 on collection system rehabilitation programs. The City has budgeted an additional $550,000 for this effort during fiscal year 2020. Funding for rehabilitation will continue to vary year to year, but the City anticipates spending approximately $200,000 annually going forward (approximately the average since 2010).

The City has also budgeted $980,000 for the Highway 72 sewer extension project to eliminate the lagoon located at the Salem Memorial District Hospital. The lagoon has a design flow of 0.0045 million gallons per day and is located approximately 1 mile upstream from the Salem WWTF. Pollutant loads from the lagoon will be transferred to the Salem WWTF, which will undergo a higher level of treatment. Although flows from the lagoon are minimal, it represents a pollutant loading source to the Spring Creek watershed that will be eliminated. Completion of this project is scheduled by the end of 2019.

In addition to collection system improvements, the City will implement Scenario I in phases to address necessary upgrades to keep it functioning properly. Phase 1a (intermediate pump station and UV disinfection) was completed in 2018 and completion of Phase 1b is estimated in 2020. Phase 1b improvements (estimated completion in 2020) include construction of a new Headworks Facility and other facility improvements to improve capacity and treatment capability. Completion of Phase 2 improvements is estimated at the end of 2023. Phase 2 improvements will include a new peak flow disinfection basin, removal of the existing rotors, and installation of an additional Aire-O_2 aerator/mixer combination unit.

Finally, the City will undertake steps to optimize treatment at its facility. Optimization steps are summarized below:

- A Sampling and Monitoring Protocol will be established for the collection of grab samples for dissolved oxygen within the basin and for total phosphorus, nitrogen, nitrate and ammonia within the effluent. The Protocol will require approximately 3 months to develop. Following development, the Protocol will include 1 year (minimum) of monitoring to ensure the summer and winter seasons are monitored adequately.
- Following 1 year of monitoring, the dissolved oxygen levels within the basin will be optimized through the operation of the rotors within the ditch to provide further nitrate and total nitrogen reduction. The dissolved oxygen optimization will require a 1 year period to account for season variation. No additional equipment will be necessary for this optimization.
- As part of Scenario I Phase 2, the City will optimize operation of the new Aire-O_2 aerator/mixer combination unit. Optimization of the ditch using the new Aire-O_2 unit will require 1 year of operation to provide further denitrification within the ditch through the summer and winter seasons. The combination unit can be cyclically operated to provide aeration (nitrification) and mixing (denitrification) in separate cycles. No additional equipment will be necessary for this optimization.

7.4. Stream Assessment

After completion of the planned improvements, the City requests that the department perform an instream water quality study to determine whether applicable water quality standards have been

attained in Spring Creek. The City is committed to collaboratively assessing stream conditions in Spring Creek with MDNR following completion of Phase 1 and 2 improvements at the WWTF. Phase 2 improvements are estimated to be completed in 2023 and will be followed by a period of facility optimization. Once optimized, the stream should be allowed to acclimate to the new effluent quality until approximately 2024. Stream assessment activities should commence following this time for a period of 18 months to evaluate the stream over a variety of seasonal conditions. If the stream attains the beneficial uses and is re-categorized as fully supporting aquatic life per Missouri's 305(b) assessment report, no further upgrades will be necessary as the facility is meeting the assumptions and requirements of the TMDL. However, if Spring Creek has not retained its beneficial uses, the City is committed to reassessing treatment options.

7.5. Implementation Schedule

The schedule presented below in Table 8 is meant to be an adaptive process and will be re-evaluated during each permit renewal to prevent and reduce loadings. Furthermore, any future revisions to the TMDL will be reviewed and incorporated into the variance, as appropriate. The City will submit an annual report detailing the progress that has been made during the year. Results from the annual reports will be used to make necessary revisions to the implementation activities scheduled.

Table 9. Implementation Schedule.

Task	Responsible Party	Estimated Completion Period
Facility Plan submitted	City	January 2018
Collection System Rehabilitation	City	Ongoing
Hwy 72 Sewer Extension & Hospital Lagoon Elimination	City	2019
Existing WWTF Improvements Phase 1a – Intermediate Pump Station and UV Disinfection Facility Phase 1b – Headworks, Hydraulic Improvements, and Oxidation Ditch Structural Improvements, Digester Aeration Phase 2 – Outfall 002 Elimination/Blending, Improvements to Clarifier, RAS/WAS Pump Station and Digesters, Influent Pump Station, Aeration System	 City City City	 Phase 1a: 2018 Phase 1b: 2020 Phase 2: 2023
Facility Optimization Sampling and Monitoring Optimize operation of oxidation ditch rotors Optimize operation of new Aire-O2 aerator/mixer	 City City City	 2021 2022 2024
Spring Creek TMDL Evaluation – Determine if use is attained through a series of stream monitoring	MDNR & City	2026
Facility Plan for Scenario I-Alt Improvements Submitted (if required)	City	2043
Construction Permit Application for Scenario I-Alt Improvements Submitted (if required)	City	2045
Construction Activities for Scenario I-Alt Improvements Substantially Completed (if required)	City	2045-2046
Scenario I-Alt Improvements Completed (if required)	City	2047
Optimize Scenario I-Alt	City	2048-2049
Evaluate for WQBEL/Greatest Pollutant Reduction Achievable (GPRA)	City	2050

8. Antidegradation

The City proposes to increase the design average flow of the Salem WWTF from 0.741 MGD to 1.1 MGD as part of the existing facility improvements. State and federal antidegradation regulations prohibit any degradation of high quality waters unless it is necessary to allow important economic and social development. Accordingly, an antidegradation review is required to determine if a proposed new or expanded discharge meets this requirement. Antidegradation reviews typically consists of alternatives analysis and a demonstration of social and economic importance (SEI).

8.1. Alternatives Analysis

Per Missouri's Antidegradation Implementation Procedures (AIP), an alternatives analysis must evaluate a range of non-degrading and less degrading practicable alternatives that have the potential to prevent or minimize the degradation associated with the proposed activity. The alternatives evaluation presented within this variance meets these requirements and shall serve for purposes of antidegradation. Results of the analysis demonstrate that the existing improvements (Scenario I) is the only practicable, economically efficient, and affordable alternative. Additionally, the proposed Scenario I includes significant rehabilitation and improvements that will result in water quality improvements. The City also recently added a disinfection system to meet new *E. coli* requirements and the City is revising its Industrial Pretreatment Ordinance to further control metal loadings into the WWTF.

8.2. Social and Economic Importance

The AIP defines the SEI as the social and economic benefits to the community that will occur from any activity involving a new or expanded discharge. The City is in need of expansion and significant facility rehabilitation to address a number of issues including:

- It has been over 20 years since the last upgrade
- Screening is non-functional
- Aeration is over 40 years old
- The facility is already exceeding its design flow capacity

The proposed project is critical to addressing these issues and protecting water quality. Without the proposed upgrades and expansion, the facility will continue to deteriorate and become overloaded. Without this project the facility is at risk of failure, which not only has environmental implications but could limit growth in the City.

8.3. Endangered and Threatened Species Review

MDNR requires a Missouri Department of Conservation (MDC) Natural Heritage Report for all antidegradation reviews. State regulations at 10 CSR 20-7.031(12) also prohibits variances that would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of such species' critical habitat. Therefore, an MDC Natural Heritage Review was obtained for the Salem WWTF (Appendix D). Based on the review, the following federally or state-listed threatened or endangered species or critical habitats were identified near the project site:

- Indiana bats (Myotis sodalist, federal- and state-listed endangered) and Northern long-eared bats (Myotis septentrionalis, federal-listed threatened) may occur near the project area.

It is not anticipated that the granting of this variance request will jeopardize threatened or endangered species or modify such species' critical habitat. As described in the MDC Natural Heritage Review, concerns regarding the construction and operation of wastewater systems "are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any 'Clean Water Permit' conditions."

9. Summary

The City of Salem is requesting a variance from the underlying water quality standards used to develop the WLAs for the Salem WWTF included within the Spring Creek TMDL. The specific pollutants subject to this variance request include $CBOD_5$, TSS, TN, and TP. The Spring Creek TMDL identified the Salem WWTF as the primary point source contributor of these pollutants, which have been attributed to the impairment of Aquatic Life Use support in Spring Creek (WBID 1870) due to low dissolved oxygen levels. The underlying designated use and associated criterion remain applicable for all other CWA purposes.

Pursuant to requirements at 40 CFR § 131.14(b)(1), the City has identified effluent quality associated with existing planned improvements with chemical phosphorus removal to the Salem WWTF as the highest attainable condition at this time. The primary factor precluding attainment of the underlying water quality standards used to develop the Spring Creek TMDL WLAs is specified at 40 CFR § 131.10(g)(6), which is "controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact." This is demonstrated by the fact nutrient removal technologies including BNR, ENR and LOT do not meet the meet the Municipal Primary Screener and the Secondary Tests outlined in EPA's Interim Economic Guidance for Water Quality Standards workbook (EPA 1995).

Implementation of this variance request will not result in any lowering of existing water quality. To the contrary, this variance request allows the City to prioritize and implement environmental improvement projects in a cost-effective manner. The City plans to implement significant upgrades to the Salem WWTF, which are anticipated to improvement treatment plant performance and overall water quality. Additionally, the City is continuing its program of sanitary sewer improvements, which will reduce the number and volume of sanitary sewer overflows and bypasses at the Salem WWTF. Pursuing TMDL-based WLAs at this time would only serve to jeopardize funding for these critical environmental improvement projects resulting in overall lower water quality.

Given existing environmental and regulatory obligations, current economic conditions, and technological limitations, the City is requesting variance limits. The City anticipates that Scenario I-Alt will be implemented during the next significant upgrade following Scenario I, which will form the basis for the HAC.

A summary of variance requirements and how they are addressed is provided for in Table 9 below.

Table 10. Summary of Variance Requirements

Variance Requirement	Salem Variance
Pollutant(s) of water quality parameter(s) to which the WQS variance applies (40 CFR 131.14(b)(1)(i))	The variance applies to the underlying water quality standards used to develop the WLAs for the Salem WWTF included within the Spring Creek TMDL. The specific pollutants subject to this variance request include $CBOD_5$, TSS, TN, and TP.
Discharger(s) or permittee(s) subject to the WQS variance (40 CFR 131.14(b)(1)(i))	Salem Municipal WWTF (MSOP MO-0021768)
Will not result in any lowering of currently attained ambient water quality, unless the variance will be used for restorative activities (40 CFR 131.14(b)(1)(ii))	Implementation of this variance request will not result in any lowering of existing water quality. To the contrary, implementation of this variance will allow for upgrades to the Salem WWTF that will result in improved effluent quality.
A highest attainable condition specified as a quantifiable expression in one of the following ways (40 CFR 131.14(b)(1)(ii)(A)(1-3)): • a highest attainable interim criterion; or, • an interim effluent condition that reflects the greatest pollutant reduction achievable; or, • if not additional feasible control technology can be identified, the interim criterion or interim effluent condition that reflects the greatest pollutant reduction achievable with the pollutant control technologies installed at the time the state adopts the WQS variance, and the adoption and implementation of a Pollutant Minimization Program.	The HAC is defined here by the interim effluent condition that reflects the greatest pollutant reduction achievable with pollutant control technologies associated with Scenario I-Alt. Expressed as long-term average, proposed HACs are as follows: • $CBOD_5$ = 15 mg/L • TSS = 15 mg/L • TN = 15 mg/L • TP = 1-2 mg/L
A demonstration that attaining the underlying designated use is not feasible throughout the term of the WQS variance because of at least one of the factors listed in §131.10(g) or because of the restoration-related factor listed in §131.14(b)(2)(i)(A)(2) (40 CFR 131.14(b)(2)(i)(A))	Per Factor 6 of 40 CFR 131.10(g), treatment technologies more stringent that the proposed upgrades will result in "substantial and widespread economic and social" impacts. This is demonstrated by the fact nutrient removal technologies including BNR, ENR and LOT do not meet the meet the Municipal Primary Screener and the Secondary Tests outlined in EPA's Interim Economic Guidance for Water Quality Standards workbook (EPA 1995).

10. References

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WERF (Water Environment Research Foundation). 2010. Nutrient Management: Regulatory Approaches to Protect Water Quality Volume I – Review of Existing Practices. Prepared by HDR Engineering, Inc.

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Appendices

Appendix A

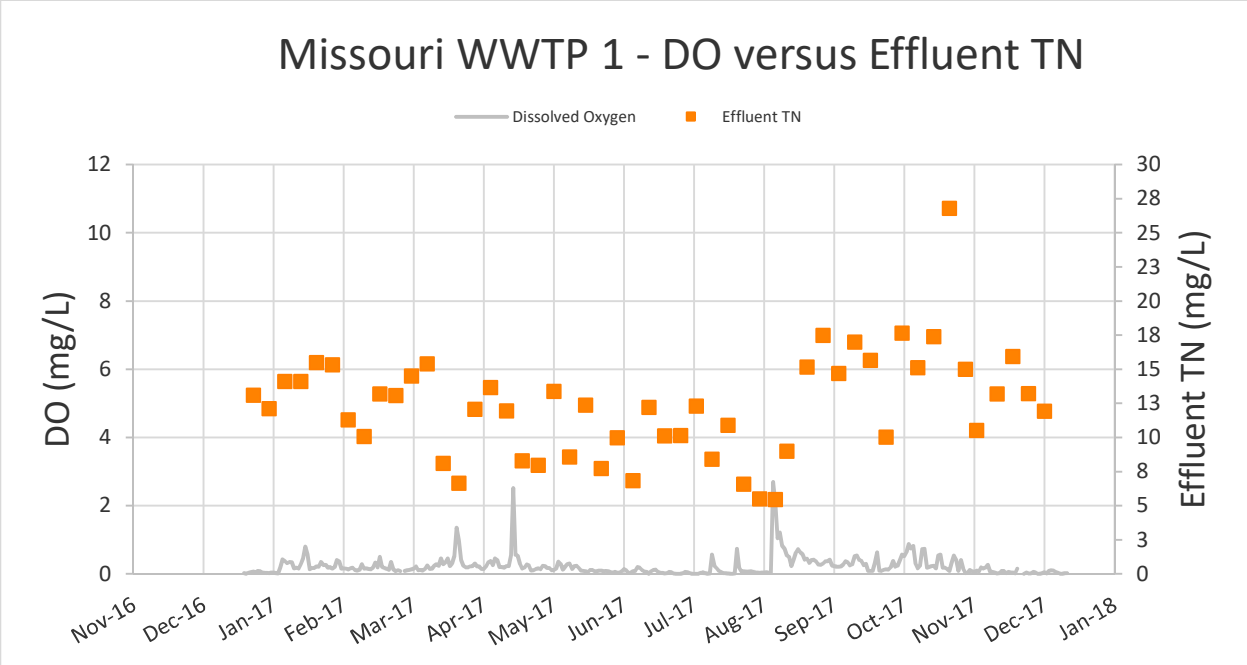
Basis for Scenario I Anticipated Nutrient Effluent Quality

Anticipated Nitrogen Effluent

Anticipated total nitrogen (TN) effluent quality for Scenario I (Phase 2) was estimated at approximately 15 mg/L based on an analysis of two Missouri facilities identified below as wastewater treatment plant (WWTP) 1 and WWTP 2. Although effluent TN at these facilities is frequently below 15 mg/L, until Scenario I (Phase 2) is fully operational and data have been collected, it is unclear if the Salem WWTF will be able to consistently achieve a TN effluent quality lower than 15 mg/L.

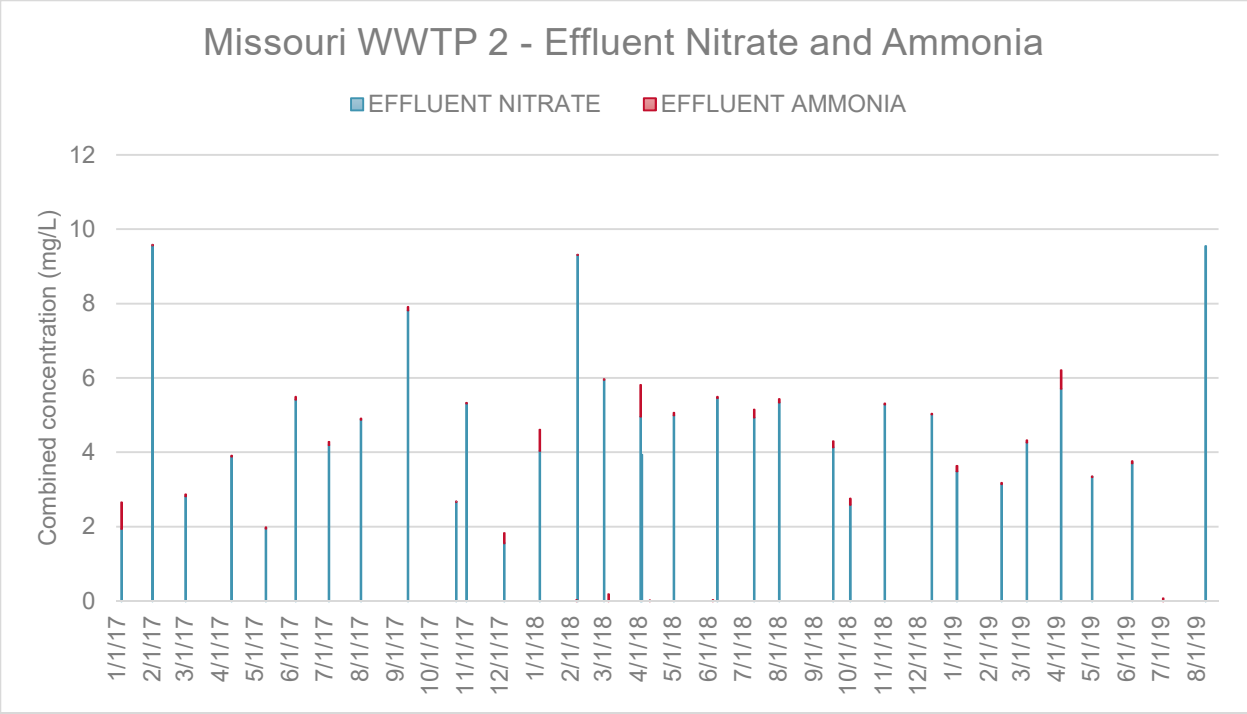
Missouri WWTP 1

The WWTP 1 has plug flow aeration basins operated with a low dissolved oxygen (DO) to allow for simultaneous nitrification and dentrification. When WWTP 1 operates at an average DO less than 0.5 mg/L, the effluent TN is less than 15 mg/L. Effluent results from the WWTP 1 are similar to what is expected from Salem's oxidation ditch following the Scenario 1 Phase 2 improvements.



Missouri WWTP 2

The WWTP 2 is a complete mix system, in which the basin operates with discrete nitrification and denitrification phases. The combined effluent ammonia and nitrate for this facility is typically less than 10 mg/L based on the complete mixing achieved within this system. Therefore, it can be assumed that the total nitrogen is less than 15 mg/L, assuming organic nitrogen and nitrite will account for approximately 5 mg/L of the remaining TN.



Anticipated Phosphorus Effluent

According to the Phosphorus and Nitrogen Removal from Municipal Wastewater[1], primary sedimentation and conventional secondary biological wastewater treatment account for approximately 2 mg/L reduction in phosphorus without the use of specific chemical or biological phosphorus removal. The typical influent phosphorus in the US ranges between 3 mg/L to 7 mg/L. Therefore, assuming the 2 mg/L reduction the effluent phosphorus levels achievable is approximately 4.5 mg/L. It is assumed the Salem WWTP will achieve approximately 5 mg/L effluent phosphorus given that is does not include primary sedimentation within the treatment train.

[1] Phosphorus and nitrogen removal from municipal wastewater: principles and practice/Richard I Sedlak, editor – 2nd ed.

Appendix B

Alternative Discharge Location Memo

ARCHER-ELGIN
engineering ▪ surveying ▪ architecture

DESIGN MEMORANDUM

To: File
From: Ken Campbell, P.E.
Date: October 19, 2018
Subject: Salem WWTF – TMDL Variance
Alternate Discharge Location – Effluent Pump Station

Background

In 2010, a total maximum daily load (TMDL) study was performed for the Salem WWTF. Within the TMDL were requirements for the Facility to meet stringent nutrient criteria for effluent discharge. Numerous alternatives were developed to identify improvements necessary to meet the new effluent criteria. Alternatives included the implementation of biological nutrient removal, enhanced biological nutrient removal and limits of technology.

One additional alternative for consideration would be the conveyance of the Facility effluent to an alternate discharge location. Currently, the Salem WWTF discharges to the Spring Branch tributary of the Dry Fork. Several alternate discharge locations were identified. Facility effluent could be pumped to the Current River, located approximately 20 miles south of the Facility. However, the Current River is considered an Outstanding National Resource Water, meaning that no degradation of the watercourse is allowed.

The facility effluent can also be directed to the Meramec River approximately 6 miles northeast of the Facility. Facility effluent would be directed to an Effluent Pump Station (EPS). The EPS would be a quadraplex pump station, with one pump sized to convey the average daily flow (ADF) and three pumps sized to convey the peak flow (PF). The ADF and PF pumps would be designed to operated simultaneously during a peak flow event. Two firm PF pumps would convey the peak flow, with one PF pump being a standby unit.

Two force mains would be installed. An average daily flow (ADF) force main shall consist of 10 inch AWWA C905 DR-18 PVC. A separate peak flow (PF) force main shall be constructed and will parallel the ADF force main. The PF force main shall consist of 24 AWWA C905 DR-18 PVC.

Table 1 – Summary of Design Flows

Storm Event	Peak Flow (MGD)
ADF	1.121
PF	6.50
Maximum Month	1.904
Maximum Day	2.297

(*) Flow projection

Primary Design considerations:

- The force main and pumps should be sized to accommodate a projected 2037 average daily flow of 1.121 MGD and a peak flow of 6.50 MGD (4,514 gpm). Two force mains should be considered: one for average daily flow and one for the peak hour flow.
    - The ADF force main shall be an 10 inch diameter AWWA C-905, DR-18 PVC. An approximate duty point for preliminary design is 775 gpm at 201 ft TDH. Flygt NP3202.185 SH 72 Hp, 3 phase, 480 VAC pumps were preliminarily selected. One firm unit shall be installed; one spare unit shall be supplied.
    - The PF force main shall be an 24 inch diameter AWWA C-905, DR-18 PVC. An approximate duty point for preliminary design is 3,000 gpm at 153 ft TDH. Flygt NP3231-680, 160 Hp, 3 phase, 480 VAC pumps were preliminarily selected. Two firm units and one standby unit shall be installed.
    - The pump station site shall have an approximate site elevation of 1122.5 ft with a proposed wetwell WSE of 1105.00 ft.
    - Proposed Force Main Alignment has a length and maximal elevation of approximately 36,260 ft and 1215 ft, respectively.
    - Each pump shall be installed in separate wells to limit potential for hydraulic interactions between the pumps, as well as facilitate operator maintenance of pump discharge during normal operations of the facility.
- Emergency standby power generation shall be provided to power the site in the case of power outage. Emergency standby power generation shall be sized to accommodate the operation of the ADF pump, two PF pumps and any ancillary electrical loads. Care should be taken in the design of pump controls to limit the possibility of multiple pumps starting simultaneously.
- An overhead crane shall be provided to facilitate the removal of pumps from the station wetwell and their placement in the bed of a service truck.

Opinion of Probable Project Costs and Life Cycle Cost Analysis:

An opinion of probable project cost was generated for the proposed improvements. The opinion of probable project cost is $11,071,000. This cost includes the construction of both the force main and pump station, a 25 percent construction contingency and all anticipated engineering, surveying and construction administration costs.

A life cycle cost analysis was performed for this alternative. All anticipated annual operations and maintenances costs were accounted for in the analysis, including labor and electrical costs. Furthermore, future replacement of key pieces of equipment was planned. The analysis was performed for a planning period of 20 years. Based on the life cycle analysis, it was determined that the present work value of this alternative was $11,921,000.

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Project: Salem WWTF - Variance
Client: City of Salem, Missouri
By: KAC **Chk:**
Date: ######### **Date:**

Opinion of Probable Project Cost

Salem WWTF - Effluent Pump Station and Force Main Alternative

Salem WWTF Effluent Pump Station and Force Main Alternative - This alternative involves the construction of a force main and pump station to redirect facility effluent discharge. The force main shall consist of 10" DR-18 AWWA C-900 PVC for the average daily flows and 24" DR-18 AWWA C-905 PVC for peak flows. The two mains shall be installed within a common trench. The pump station shall have one Flygt NP3202 SH 273, 72 Hp, 460/3/60 pump (one spare unit provided) for average daily flows and three Flygt NP3315 HT 680, 140 Hp, 460/3/60 pumps (two firm, one standby) for peak flow. Average daily flow pump shall be operated via VFD; Peak flow pumps shall be constant speed.

Item No.	Description	Qty	Unit	Unit Price	Total
Force Main					
1	24" DR-18 AWWA C-905 PVC Force Main, including trenching, backfill, etc.	36,260	LF	$90.00	$3,263,400.00
2	24" Burried-service Plug Valves	36	Ea	$6,000.00	$216,000.00
3	24" Highway Bore, Steel Encasement	450	LF	$400.00	$180,000.00
4	10" DR-18 AWWA C-900 PVC Force Main, installed in common trench	36,260	LF	$35.00	$1,269,100.00
5	10" Highway Bore, Steel Encasement	450	Ea	$250.00	$112,500.00
6	10" Burried-service Plug Valves	36	Ea	$3,750.00	$135,000.00
7	2" Combination Air Valve and Vault	8	Ea	$7,500.00	$60,000.00
8	1" Combination Air Valve and Vault	8	Ea	$6,000.00	$48,000.00
9	Right of Way/Easement Acquisition	36,260	LF	$5.00	$181,300.00
Earthwork					
10	Unclassified Excavation & Embankment, including clearing, grubbing - Pump Station	4575	CY	$15.00	$68,625.00
11	Granular backfill, 1 inch clean, compacted	3926	CY	$18.25	$71,649.50
12	Erosion Control.	1	LS	$5,000.00	$5,000.00
Pavement					
13	Granular Paving	2500	SY	$15.00	$37,500.00
Yard Process Piping					
14	8" DIP Process Piping	75	LF	$160.00	$12,000.00
15	8" Buried Service Plug Valves	1	EA	$2,500.00	$2,500.00
16	14" DIP Process Piping	50	LF	$280.00	$14,000.00
17	14" Buried Service Plug Valves	1	EA	$7,500.00	$7,500.00
Equipment/Process					
18	Pump Station Pumps & Controls	1	LS	$465,000.00	$465,000.00
19	Pump Station Process Piping	1	LS	$70,000.00	$70,000.00
20	Overhead Monorail Wire Hoist Trolley	1	LS	$25,000.00	$25,000.00
21	Stainless Steel Sluice Gate, Frame and Operator	4	Ea	$15,000.00	$60,000.00
22	Aluminum Hatches, Wetwell and Valve Vault	1	LS	$27,500.00	$27,500.00
23	Electrical, Instrumentation & Control Equipment	1	LS	$250,000.00	$250,000.00
24	Emergency Standby Generator w/ ATS	1	LS	$250,000.00	$250,000.00

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Project: Salem WWTF - Variance
Client: City of Salem, Missouri
By: KAC **Chk:**
Date: ######### **Date:**

Structures					
25	Pump Station Wetwell & Valve Vault	325	CY	$750.00	$243,750.00
26	Force Main Drain Vault	13	CY	$750.00	$9,750.00
				Force Main Subtotal =	$5,465,300.00
				Pump Station Subtotal =	$1,619,774.50
				Construction SubTotal =	$7,085,075
				Contingency (25%) =	$1,771,269
				Construction Subtotal =	$8,856,343
				Engineering, Surveying & Construction Admin =	$2,214,086
				Opinion of Probable Project Cost, P =	**$11,071,000**

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Project: Salem WWTF - Variance
Client: City of Salem, Missouri
By: KAC **Chk:**
Date: ######### **Date:**

Operation & Maintenance & Replacement

Salem WWTF - Effluent Pump Station and Force Main Alternative

Equipment Replacement

Analysis Period:	20	yr	
Inflation Rate:	2.45%		(Approximate Savings Interest Rate)
Interest Rate:	3.00%		(Estimated 15-yr inflation rate projection)

Equipment Replacement:	Present Day Cost, P	F/P Interest Factor	Inflation Adjusted Cost, F	A/F Interest Factor	Annual Replacement Cost, A	Replacement Period	
ADF Pump Replacement	$35,000	1.274	44,590	0.000	$3,890	10	yr
PF Pump Replacement	$75,000	1.623	121,710	0.000	$4,530	20	yr
Overhead Trolley Hoist Replacement	$10,000	1.623	16,230	0.000	$610	20	yr
		Annual Equipment Replacement Cost:			**$9,030**		

Operation & Maintenance Costs

Maintenance Provider Costs:	$25.00	per hour
Power Usage Costs:	$0.10	per KWH
Interest Rate:	3.00%	(Approximate Finance Rate)
Inflation Rate:	2.45%	(Estimated 15-yr inflation rate projection)
Analysis Period:	20	yrs

Salem WWTF Eff Pump Station

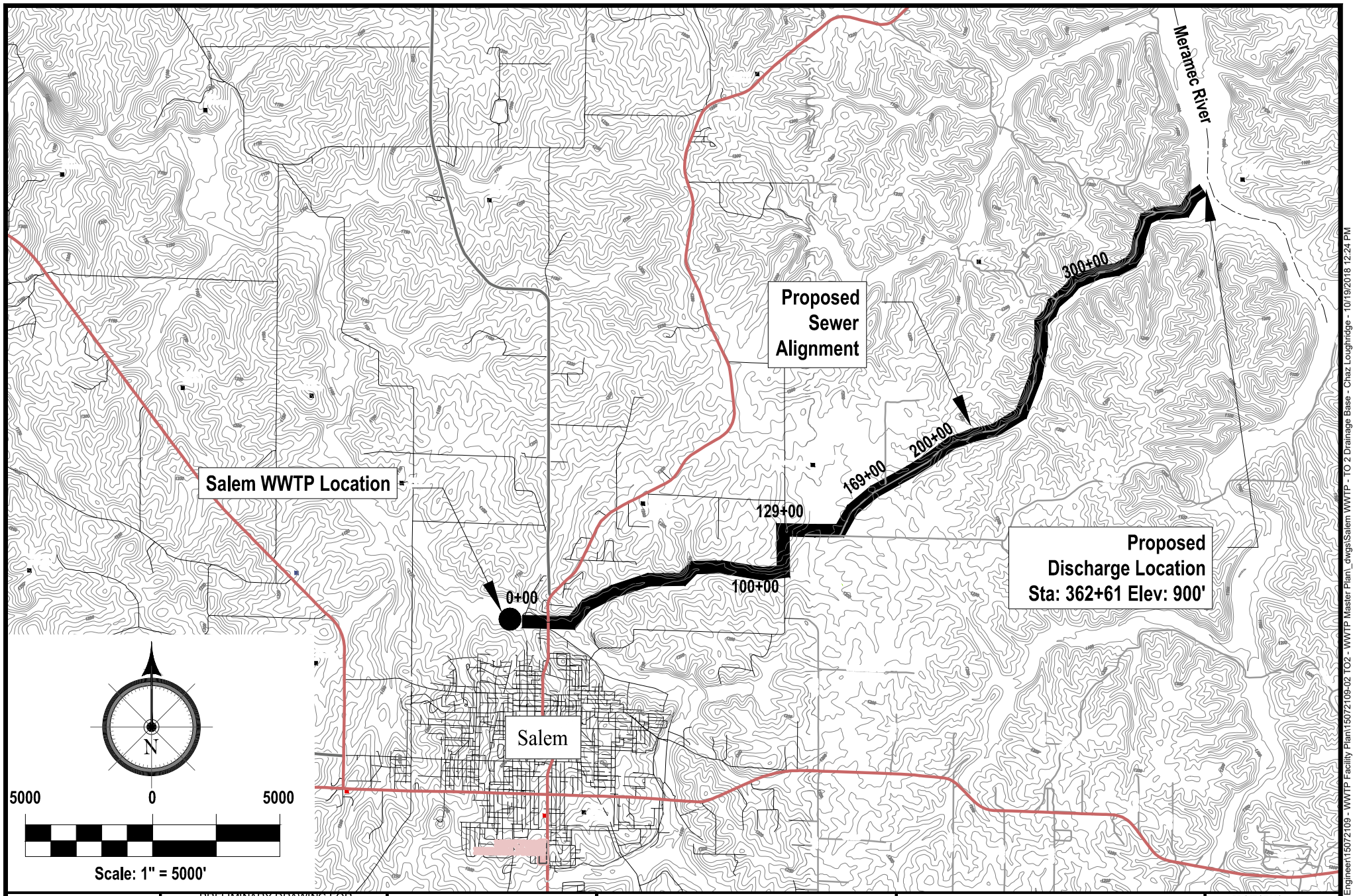
Component Maintenance:	Comp. Qty	Events per Year	Labor per Event	Yearly Labor	Yearly Costs
Pump Station Equipment Visual Inspection:	1	52	0.5	26	$650.00
ADF Pump Motor Oil Change Supplies:	--	--	--	--	$900.00
ADF Pump Motor Oil Change Labor:	1	1	4	4	$100.00
PF Pump Motor Oil Change Supplies:	--	--	--	--	$2,700.00
PF Pump Motor Oil Change Labor:	3	1	4	12	$300.00
ADF Pump Motor Overhaul/Repair Supplies:	--	--	--	--	$1,000.00
ADF Pump Motor Overhaul/Repair Labor:	1	0.2	16	3.2	$80.00
PF Pump Motor Overhaul/Repair Supplies:	--	--	--	--	$1,050.00
PF Pump Motor Overhaul/Repair Labor:	3	0.05	16	2.4	$60.00
Emergency Maintenance:	2	1	8	16	$400.00

Equipment Operation:	Comp. Qty	Hours per Year	Run Time (%)	Yearly Run Time	Yearly Costs	
Power Usage, ADF Pump Motor:	1	8760	66%	5781.6	$31,041.64	
Power Usage, PF Pump Motor:	2	8760	5%	960.1	$11,455.10	**$48,086.74**

Operation & Maintenance & Replacement (Cont.)

Salem WWTF - Effluent Pump Station and Force Main Alternative

Operation & Maintenance Cost Summary			
Annual Operation & Maintenance Cost:	**$48,087**		
Total Annual Operation, Maintenance and Replacement Cost, $A_{O\&M}$:	**$57,117**		
Total Present Worth Operation, Maintenance and Replacement Cost, $P_{O\&M}$:	**$849,760**	where $A_{O\&M}/P_{O\&M}$ =	14.88
Total Project Present Worth Cost, $P + P_{O\&M}$:	**$11,921,000**		



DATE: 10/19/18 DESIGNED BY: KAC DRAWN BY: CgL	PRELIMINARY DRAWING FOR REVIEW AND APPROVAL PURPOSES ONLY. FINAL PLANS WILL BE SIGNED, SEALED, & ISSUED UPON RECEIPT OF ALL PLAN REVIEW COMMENTS AND APPROVALS FROM LOCAL, STATE, AND FEDERAL REGULATORY AGENCIES.	Corporate Authority: CM Archer Group, P.C.: E: 2003023612, LS: 2004017577-D Archer-Elgin Surveying & Engineering, LLC: E: 2011024038, LS: 2011025471, A-2012014618	CM Archer Group, P.C. dba: ARCHER-ELGIN engineering ▪ surveying ▪ architecture Office Location: 310 East Sixth Street Rolla, Mo. 65401 573-364-6362 • Fax 573-364-4782 www.archer-elgin.com	Salem Wastewater Treatment Facility TMDL Variance Salem, Missouri Discharge Relocation Alternative	PROJECT NO. 15072109 DRAWING NO. 1

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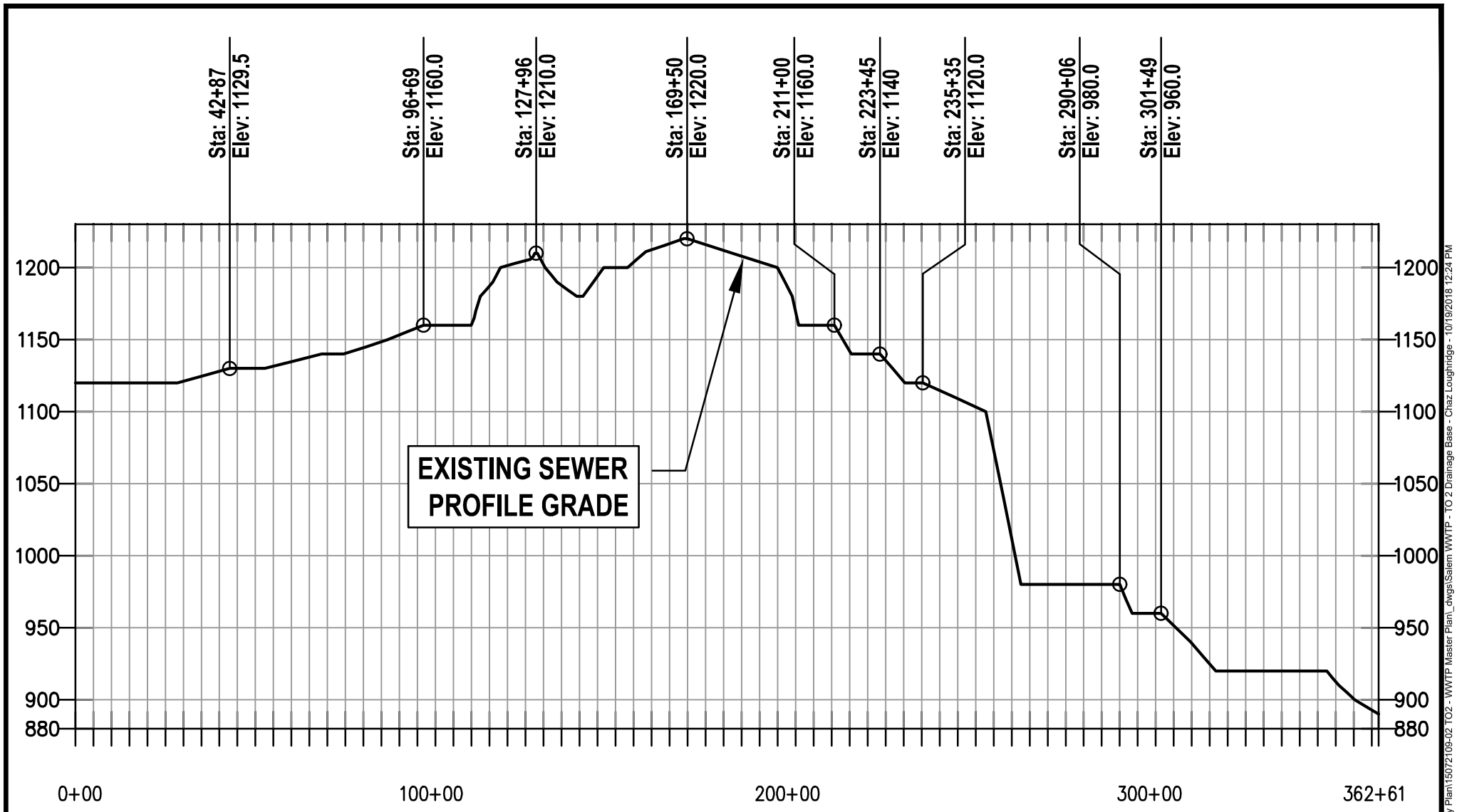

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Appendix C

Estimated Capital and O&M Costs

Salem WWTP
Capital Cost Estimates

FACILITIES	SCENARIO I - EXISTING IMPROVEMENTS						SCENARIO II - BNR	SCENARIO III - ENR	SCENARIO IV - LOT
	Phased Costs				Total Costs				
	Phase 1a (1)	Phase 1b (2)	Phase 2	Phase 2 Alt	SCENARIO I	SCENARIO I - Alt			
Influent Pump Station	-	-	$ 458,000	$ 458,000	$ 458,000	$ 458,000	$ 458,000	$ 458,000	$ 458,000
Headworks	-	$ 623,000	-	-	$ 623,000	$ 623,000	$ 623,000	$ 623,000	$ 623,000
Hydraulic Improvements	-	$ 76,000	-	-	$ 76,000	$ 76,000	$ 76,000	$ 76,000	$ 76,000
Selector Basin	-	-	-	-	$ -	$ -	$ 1,042,000	$ 1,042,000	$ 1,042,000
Oxidation Ditch(3)	-	$ 247,000	$ 217,000	$ 217,000	$ 464,000	$ 464,000	$ 577,000	$ 577,000	$ 577,000
Chemical Building	-	-	$ 355,000	$ 575,000	$ 355,000	$ 575,000	$ 575,000	$ 703,000	$ 703,000
Secondary Clarifiers	-	-	$ 488,000	$ 488,000	$ 488,000	$ 488,000	$ 488,000	$ 488,000	$ 488,000
RAS/WAS Pump Station	-	-	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000
Digesters(4)	-	-	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000
Intermediate Pump Station	$ 271,154	-			$ 271,154	$ 271,154	$ 271,154	$ 271,154	$ 271,154
Tertiary Filtration (cloth media) Building(5)	-	-	-	-	$ -	$ -	$ 1,511,000	-	-
Tertiary Filtration (dN) Building	-	-	-	-	$ -	$ -	-	$ 3,969,000	$ 3,969,000
Outfall 001 UV Disinfection Facility	$ 292,000	-	-	-	$ 292,000	$ 292,000	$ 283,830	$ 283,830	$ 283,830
Outfall 002 Chlorine Contact Basin	-	-	$ 277,000	$ 277,000	$ 277,000	$ 277,000	$ 277,000	$ 277,000	$ 277,000
Reed Curing/Drying Pad with Tensioned Fabric Roof	-	-	$ 288,000	$ 288,000	$ 288,000	$ 288,000	$ 288,000	$ 288,000	$ 288,000
Reverse Osmosis	-	-	-	-	$ -	$ -	-	-	$ 24,080,000
Subtotal	**$ 563,154**	**$ 946,000**	**$ 2,288,000**	**$ 2,508,000**	**$ 3,797,154**	**$ 4,017,154**	**$ 6,674,984**	**$ 9,260,984**	**$ 33,340,984**
Electrical I&C (20%)	$ 85,787	$ 320,000	$ 457,600	$ 501,600	$ 863,387	$ 907,387	$ 1,334,997	$ 1,852,197	$ 6,668,197
Site Piping (15%)	$ 157,898	$ 60,430	$ 343,200	$ 376,200	$ 561,528	$ 594,528	$ 1,001,248	$ 1,389,148	$ 5,001,148
Site Civil (10%)	$ 48,802	$ 70,495	$ 228,800	$ 250,800			$ 667,498	$ 926,098	$ 3,334,098
Miscellaneous	-	$ 400,000	-	-			-	-	-
Subtotal	**$ 855,641**	**$ 1,796,925**	**$ 3,317,600**	**$ 3,636,600**	**$ 5,970,166**	**$ 6,289,166**	**$ 9,678,727**	**$ 13,428,427**	**$ 48,344,427**
Contingency	-	$ 184,792	$ 664,000	$ 727,000	$ 848,792	$ 911,792	$ 1,936,000	$ 2,686,000	$ 9,669,000
Engineering	-	$ 718,000	$ 796,000	$ 873,000	$ 1,514,000		$ 1,742,000	$ 2,417,000	$ 8,702,000
Estimated Capital Cost (2019$)	**$ 856,000**	**$ 2,700,000**	**$ 4,778,000**	**$ 5,237,000**	**$ 8,334,000**	**$ 8,793,000**	**$ 13,357,000**	**$ 18,532,000**	**$ 66,716,000**

(1) Phase 1a improvement costs and electrical I&C, site piping, and site civil costs based on construction bids.

(2) Phase 1b estimates include 20% contingency applied to improvements before subtotal per CM Archer; escalation from 2018$ to 2019$; and estimated electrical I&C, site piping, and site civil costs.

(3) Assumes Option 1 Aire O2 Aerator/Mixer included for oxidation ditch improvements.

(4) Assumes Option 1 Anti-Erosion Assembly

(5) Includes costs for demolition and construction of new reed curing pad north of fence line.

(4)Assumes mechanical plant effluent will be UV disinfected following treatment.

(5)Assumes excess flows beyond the mechnical plant peak flow (3.62) and equlization basin storage (900,000 gallons) will be chlorinated prior to blending with Outfall 001 UV disinfected effluent.

Salem WWTP
O&M Cost Estimates

Existing Annual O&M

Expenses	Annual Costs
Personnel	$ 249,000
Supplies	$ 8,000
Maintenance	$ 46,000
Utilities	$ 92,500
Miscellaneous	$ 41,121
Total	$ 436,621

Additional Annual O&M

	SCENARIO I - Existing Improvements						SCENARIO II	SCENARIO III	SCENARIO IV
	Phased Costs				Total Costs				
Annual Costs	Phase 1a	Phase 1b	Phase 2	Phase 2 Alt	SCENARIO I	SCENARIO I ALT	BNR	ENR	LOT[1]
Estimated Annual Replacement Costs	$17,000	$7,000	$22,000	$22,000	$46,000	$46,000	$67,000	$71,000	
Estimated Annual Chemical Costs	$0	$0	$23,000	$77,000	$23,000	$50,000	$49,000	$73,000	
Estimated Annual Labor Costs	$0	$0	$0	$0	$0	$0	$60,000	$60,000	
Estimated Annual Electricity Usage Costs	$4,000	$100	$7,000	$8,000	$11,100	$12,100	$94,000	$95,000	
Estimated Annual O&M	**$21,000**	**$7,100**	**$52,000**	**$107,000**	**$80,100**	**$135,100**	**$270,000**	**$299,000**	**$1,976,000**

[1] Assumes $4,421 per MG for RO O&M and brine concentrator with crystallizer plus $200,000 for labor and maintenance

Appendix D

Natural Heritage Review

Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Two Report: State Listed Endangered Species and/or Missouri Species/Natural Communities of Conservation Concern

There are records for state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this website is to provide information to federal, state and local agencies, organizations, municipalities, corporations and consultants regarding sensitive fish, wildlife, plants, natural communities and habitats to assist in planning, designing and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Salem Municipal WWTF Upgrades #5242
Project Description: Description: Upgrades to the Salem Municipal WWTF Approx outfall location: -91.53969/37.65612 Receiving stream: Spring Creek County: Dent
Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Effluent Discharge, Effluent discharge - renewal or modification of discharge to stream
Contact Person: John Christiansen
Contact Information: john.christiansen2@hdrinc.com or 573-886-8932

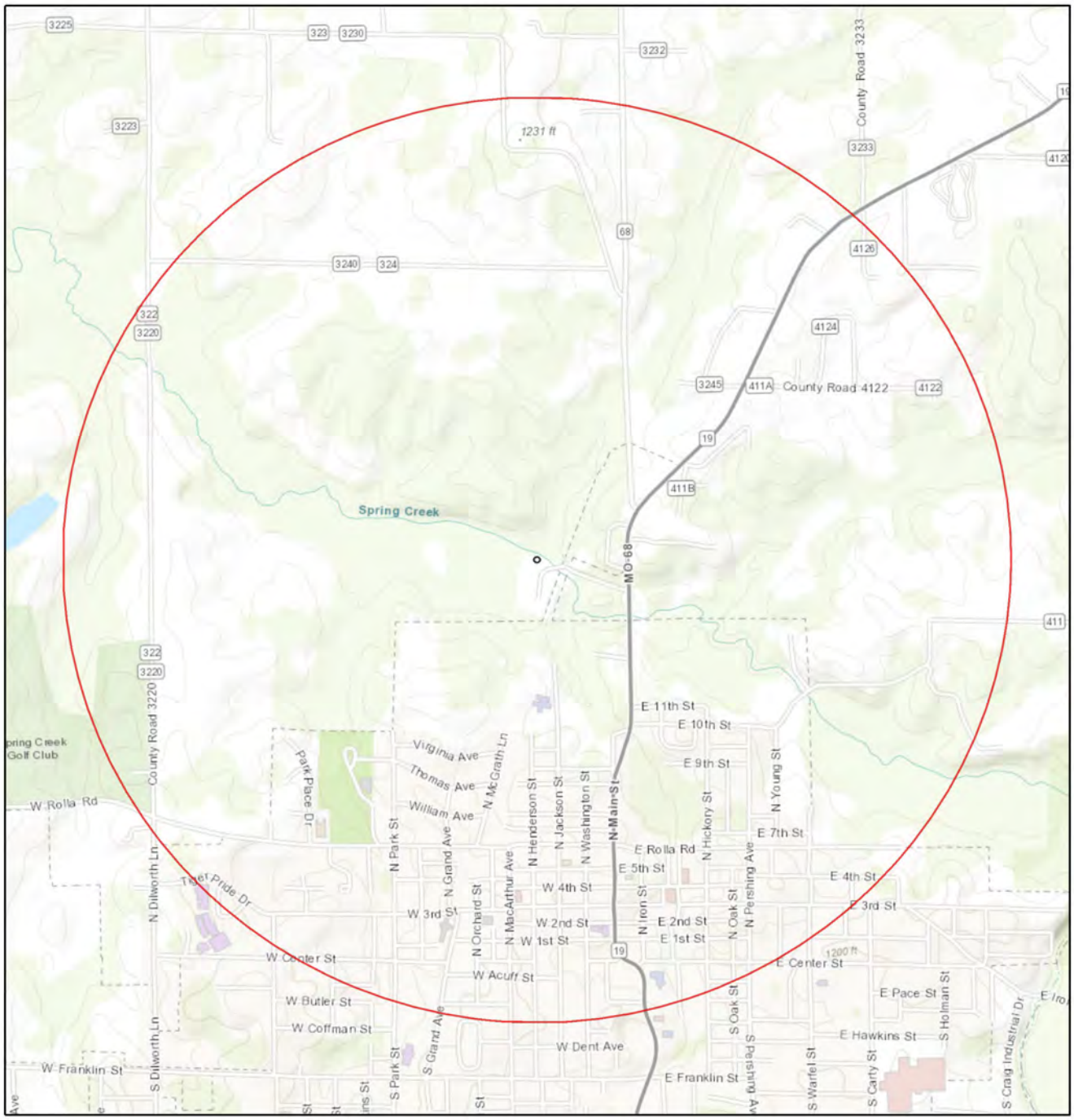
Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, Reports include information about records near but not necessarily on the project site.

The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. The information within this report is not intended to replace Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit the USFWS Information for Planning and Conservation (IPaC) website at https://ecos.fws.gov/ipac/ for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.

Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or www.modot.mo.gov/ehp/index.htm for additional information on recommendations.

Salem Municipal WWTF Upgrades



January 4, 2019

1:19,091

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

Project Boundary

Buffered Project Boundary

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Species or Communities of Conservation Concern within the Area:

There are records for state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact the Missouri Department of Conservation for further coordination.

MDC Natural Heritage Review
Resource Science Division
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182
NaturalHeritageReview@mdc.mo.gov

Other Special Search Results:

No results have been identified for this project location.

Project Type Recommendations:
Waste Transfer, Treatment, and Disposal - Liquid Effluent Discharge - New or Renewal of Permit: Clean Water Act permits issued by other agencies regulate both construction and operation of wastewater systems, and provide many important protections for fish and wildlife resources throughout the project area and at some distance downstream. Fish and wildlife almost always benefit when unnatural pollutants are removed from water, and concerns are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any “Clean Water Permit” conditions.
Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - Indiana bats *(Myotis sodalis*, federal- and state-listed endangered) and **Northern long-eared bats** (*Myotis septentrionalis,* federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April. **If any trees need to be removed for your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 ext. 100 for Ecological Services) for further coordination under the Endangered Species Act.**

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See http://mdc.mo.gov//9633 for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (?140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit (http://www.nwk.usace.army.mil/Missions/RegulatoryBranch.aspx) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (http://dnr.mo.gov/env/wpp/401/index.html), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit http://dnr.mo.gov/env/wpp/permits/index.html for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below.

MDC Natural Heritage Review
Resource Science Division
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182
NaturalHeritageReview@mdc.mo.gov

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 1 0). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 1 0-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

Additional information on Missouri's sensitive species may be found at http://mdc.mo.gov/discover-nature/field-guide/endangered-species . Detailed information about the animals and some plants mentioned may be accessed at http://mdc4.mdc.mo.gov/applications/mofwis/mofwis_search1.aspx . If you would like printed copies of best management practices cited as internet URLs, please contact the Missouri Department of Conservation.

Tab H

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Open Comment Session

Issue:

This standing item provides an opportunity for comments on any issue pertinent to the Commission's role and responsibilities. The Commission encourages any and all interested persons to express their comments and concerns.
General Public

Recommended Action:

Information only.

Tab I

Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharette/Nightingale Springs Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

January 9, 2020

Future Meeting Dates

Information:

Missouri Clean Water Commission Meeting dates and locations:

April 2, 2020
Lewis and Clark State Office Building
1101 Riverside Drive
LaCharrette / Nightingale Conference Rooms
Jefferson City, MO 65101

July 8, 2020
Lewis and Clark State Office Building
1101 Riverside Drive
LaCharrette / Nightingale Conference Rooms
Jefferson City, MO 65101

October 7, 2020
Lewis and Clark State Office Building
1101 Riverside Drive
LaCharrette / Nightingale Conference Rooms
Jefferson City, MO 65101

Recommended Action:

Information only.