STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

October 22, 2018

VIA E-MAIL

The Honorable Karen Williams Weaver
Mayor of Flint
1101 South Saginaw Street
Flint, Michigan 48502

Dear Mayor Weaver:

SUBJECT: Order Under MCL 325.1015(2) of Michigan's Safe Drinking Water Act

An Order under MCL 325.1015(2) of Michigan's Safe Drinking Water Act, 1976 PA 399, as amended, is enclosed with this letter. The Michigan Department of Environmental Quality (MDEQ) does not often issue orders unilaterally because the MDEQ and the entity in question nearly always agree to the content of a stipulated order entered with the consent of both parties. The MDEQ has been unable to reach a stipulated order with the city of Flint (City).

I strongly emphasize that the quality of the City's water is high. The City's water system is perhaps the most monitored system in the country. For more than two years, that monitoring has proven that the City's water system is stable. From the perspective of lead and copper control, the quality of the City's water matches or exceeds that of comparable water systems in Michigan.

The enclosed Order addresses long-term technical and managerial issues with the City's water system, not the current quality of the City's water. The City relies heavily on state and federal technical support to manage its water system. The reliance on outside entities for long-term technical support is not the preference of either the City or the MDEQ. The MDEQ shares the City's goal that the City achieve long-term self-reliance. The purpose of the enclosed Order is to establish firm deadlines that chart the path toward achieving that goal.

On August 11, 2017, the MDEQ identified several deficiencies in the City's water system related primarily to its technical, managerial, and financial capacity to sustainably produce high-quality water on a long-term basis without significant outside support. The MDEQ and the City have worked informally since that time to address the outstanding deficiencies, with some success. For example, the City has strengthened its existing contract with a private firm to ensure there is a qualified operator in charge of the City's water plant; has designated an employee to be a cross connection control manager; has updated its emergency response plan; and has adopted several recommended standard operating procedures.

Notwithstanding those improvements, some deficiencies remain outstanding. The MDEQ has attempted to negotiate a consent order with the City that contains enforceable deadlines by which the City will resolve those outstanding deficiencies. For example, the City still needs to adopt several standard operating procedures; fill vacant positions; and implement its plan to fully achieve technical, managerial, and financial capacity. The City has repeatedly committed informally to resolve the outstanding deficiencies, but it has been unwilling to agree to enforceable deadlines. Experience has shown that enforceable deadlines are necessary to ensure that the City's water system can provide adequate and healthful water to the City's residents, in compliance with state and federal law, on a sustainable, long-term basis.

Under MCL 325.1015(2), the Order will be effective 30 days from the date of this letter. Within those 30 days, the City can request a public hearing [not a contested case hearing because this Order is not issued under MCL 325.1015(3)], but the request must comply with Rule 325.10202 of the Michigan Administrative Code. If the City requests a public hearing, then the Order will not be effective until the public hearing is complete, at which time the MDEQ will notify the City by letter of the effective date of the Order.

Once the Order is effective, the City can appeal it to either the Genesee County Circuit Court or the Ingham County Circuit Court, if it so chooses. Michigan's Safe Drinking Water Act does not contain a method of judicial review specific to the Order, and the Order is not the result of a contested case hearing under the Administrative Procedures Act, 1969 PA 306, as amended, so any appeal by the City would be under MCL 600.631. Note that an appeal under MCL 600.631 would not automatically stay the Order, and the procedure for filing the appeal would be governed by MCR 7.123, including a strict 21-day deadline to file a claim of appeal.

Again, I strongly emphasize that the quality of the City's water is high. The enclosed Order is intended to enable the City to reach the shared goal of the City and the MDEQ that the City achieve long-term self-reliance.

If you have any questions regarding this matter, please contact Mr. Eric J. Oswald, Director, Drinking Water and Municipal Assistance Division, at 517-284-6544; oswalde1@michigan.gov; or MDEQ, P.O. Box 30817, Lansing, Michigan 48909-8311; or you may contact me.

Sincerely,

C. Heidi Grether

C. Heidi Grether
Director
517-284-6700

Enclosure

cc/enc: Ms. Cathy Stepp, Regional Administrator, United States Environmental Protection Agency (USEPA), Region 5
Ms. Linda Holst, Acting Director, Water Division, USEPA, Region 5
Mr. Keith Creagh, Director, Michigan Department of Natural Resources
Mr. Richard Baird, Governor's Office
Mr. S. Peter Manning, Michigan Department of Attorney General
Mr. Aaron B. Keatley, Chief Deputy Director, MDEQ
Mr. Eric J. Oswald, MDEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

In the matter of:
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502
_____/

DWMAD Order No. 399-09-2018

ORDER

This document results from findings by the Department of Environmental Quality (DEQ), Drinking Water and Municipal Assistance Division (DWMAD). The DEQ found that the city of Flint (City) located at 1101 South Saginaw Street, Flint, Michigan, is in violation of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), and the administrative rules promulgated thereunder, being 2009 ACS, R 325.10101 *et seq.* and Title XIV of the Public Health Service Act: Safety of Public Water Systems (Safe Drinking Water Act), Title 42 of the United States Code (USC), §300f *et seq.* (SDWA). The City is a supplier of water as defined under Act 399 and the SDWA through the City's ownership and operation of a Class D1 water treatment system and S1 water distribution system. The DEQ orders the City to resolve the violations set forth herein.

I. BACKGROUND

1.1 The SDWA establishes national primary drinking water regulations that apply to each public water system in each state.

1.2 Section 1420 of the SDWA establishes that a State must develop a program to ensure that all new community water systems demonstrate technical, managerial, and financial capacity to comply with all national primary drinking water regulations in effect on the date of commencement of operations and that a State shall develop and implement a strategy to assist public water systems in acquiring and maintaining technical, managerial, and financial capacity. 42 USC, §300g-9.

1.3 Section 1452(a)(3) of the SDWA provides:

> (A) In General - Except as provided in subparagraph (B), no assistance under this section shall be provided to a public water system that--
> (i) does not have the technical, managerial, and financial capability to ensure compliance with the requirements of this title; or
> (ii) is in significant noncompliance with any requirement of a national primary drinking water regulation or variance.
> (B) Restructuring - A public water system described in subparagraph (A) may receive assistance under this section if--
> (i) the use of the assistance will ensure compliance; and
> (ii) if subparagraph (A)(i) applies to the system, the owner or operator of the system agrees to undertake feasible and appropriate changes in operations (including ownership, management, accounting, rates, maintenance, consolidation, alternative water supply, or other procedures) if the State determines that the measures are necessary to ensure that the system has the technical, managerial, and financial capability to comply with the requirements of this title over the long term. 42 USC, §300j-12(a)(3).

1.4 The DEQ has been delegated primary responsibility for the implementation and enforcement of the public water system program in Michigan by the United States Environmental Protection Agency. The DEQ has regulatory power over public water supplies and suppliers of water under MCL 325.1003 and 42 USC, §300g-2.

1.5 Act 399 and its corresponding rules, along with the SDWA and its corresponding rules, are pertinent to providing safe and reliable public drinking water.

1.6 MCL 325.1003b and MCL 325.1004(2)(b) authorize the DEQ to conduct capacity assessments and determine if a water system has technical, financial, and managerial capacity to meet all the requirements of Act 399 and the SDWA.

1.7 MCL 325.1015(2) provides that the DEQ "may order the supplier of water to make alterations in the waterworks system or its method of operation as may be required or considered advisable by the department [DEQ] to ensure the public water supply is adequate, healthful, and in conformance with state drinking water standards."

1.8 Section 1431(a) of the SDWA provides that "the Administrator, upon receipt of information that a contaminant which is present in or is likely to enter a public water system or an underground source of drinking water may present an imminent and substantial endangerment to the health of persons, and that appropriate State and local

authorities have not acted to protect the health of such persons, may take such actions as he may deem necessary in order to protect the health of such persons." 42 USC, §300i(a).

1.9 Section 1419 of the SDWA requires States to implement a program for the certification of operators of community and nontransient noncommunity public water systems. 42 USC, §300g-8.

1.10 In accordance with R 325.10504 and R 325.11905, a Type I public water supply is required to obtain certified operators of treatment systems and distribution systems.

1.11 R 325.10504(c) provides that Type I public water supplies shall "Submit waterworks system operation reports and maintain records" and R 325.11111 provides "A public water supply shall maintain adequate records on the operation of the water distribution system, on the location and type of maintenance performed, and on the type of materials and appurtenances used."

1.12 Unless specifically waived by the DEQ, a Type I public water supply shall prepare, or cause to be prepared, an emergency response plan. Michigan Administrative Code (MAC), R 325.12302(1); 42 USC, §300i-2.

1.13 In accordance with R 325.11404(1), a water utility shall develop a comprehensive control program for the elimination and prevention of all cross connections. The plan for the program shall be submitted to the DEQ for review and approval. Public water supplies may use the Cross Connections Rules Manual prepared by the DEQ, Water Bureau, under R 325.10113 as guidance when developing a cross connection control program. When the plan is approved, the water utility shall implement the program for removal of all existing cross connections and prevention of all future cross connections.

1.14 This Order constitutes a final order of the DEQ pursuant to Michigan Compiled Laws (MCL) 325.1015(2), enforceable in accordance with MCL 325.1021, MCL 325.1022, 42 USC, §300g-3, and 42 USC, §300j-8. The City must achieve compliance with the aforementioned regulations in accordance with the requirements contained in Section III, Compliance Program, of this Order.

II. FINDINGS

2.1 On August 7, 2017, DWMAD staff conducted a sanitary survey of the City's drinking water system to evaluate the City water distribution, storage, pumping, and limited treatment systems with respect to Act 399 and the SDWA.

2.2 On August 11, 2017, the DWMAD issued a Significant Deficiency Violation Notice (SDVN) to the City, listing a summary of significant deficiencies, minor deficiencies, and recommendations applicable to the City's water system (Attachment A). The SDVN directed the City to either complete corrective action or be in compliance with a corrective action plan and schedule within 120 days.

2.3 The City failed to correct the significant deficiencies identified in the SDVN within 120 days and did not enter into a corrective action plan.

2.4 The City provided a written response to the SDVN on September 8, 2017 (Attachment B).

2.5 A follow-up letter dated March 21, 2018, was sent to the City by the DWMAD, summarizing corrective actions that had been completed and providing dates to complete other corrective actions (Attachment C).

2.6 **Correction of the significant deficiencies and deficiencies listed in the SDVN and March 21, 2018, letter is necessary to ensure the public water supply in Flint is adequate, healthful, and in compliance with state and federal drinking water standards, to prevent contaminants from entering the water supply, and to prevent imminent and substantial endangerment of public health.**

III. COMPLIANCE PROGRAM

IT IS, THEREFORE, ORDERED THAT the City shall undertake the following actions to ensure that Flint's water system can provide safe drinking water to the public on a long-term, sustainable basis:

3.1 The City shall, not later than **December 31, 2018**, select and approve one of the cross connection control model programs from the DEQ's Cross Connection Rules Manual and submit the approved model to the DEQ for review and approval.

3.2 If the City does not get a cross connection control program approved as required in paragraph 3.1, the City shall, not later than **December 31, 2018**, submit to the DEQ an updated list of water accounts classified as high hazard, low hazard, and other, and a schedule for conducting inspections at those accounts.

3.3 If the City does not get a cross connection control program approved as required in paragraph 3.1, the City shall, not later than **June 30, 2019**, conduct and document at least 100 cross connection inspections required in 2019 at high-hazard accounts and at least 100 cross connection inspections required in 2019 at low-hazard accounts.

3.4 The City shall, within **five days** of entry of this Order, submit a time line indicating when it will approve of those Standard Operating Procedures submitted by the Arcadis Group on June 4, 2018, that the City has not already approved as of the date this Order is entered.

3.5 The City provided a July 25, 2018, Technical, Management, and Financial Capacity proposal in which it explains its plan to achieve its technical, managerial, and financial (TMF) capacity by fiscal year (FY) 2023 (Attachment D). The City acknowledges that the revenue generated by the City's Water Department is not sufficient to support the operating costs of the City's water system but does not believe it would be politically or financially possible to increase customer rates until several years from now. So the proposal describes several steps the City plans to take leading up to FY 2023 to achieve TMF capacity without raising customer rates. **Beginning on the date this Order is effective, and every six months thereafter until the City achieves TMF capacity**, the City shall provide a signed certification to the DEQ that demonstrates the City's progress towards completing its plan to achieve TMF capacity (Certified Progress Report). **Beginning on the date 12 months from the date this Order is effective, and every 12 months thereafter**, the City's Certified Progress Report must include an evaluation showing that the City can still achieve TMF capacity by FY 2023 without increasing customer rates.

3.6 **By no later than March 31, 2019**, the City shall complete a preliminary inspection of the Cedar Street Reservoir using a remotely operated vehicle (which does not require taking the reservoir out of service) or, preferably, a method by which the City can inspect one chamber of the reservoir at a time without taking the reservoir completely out of service. The City shall then submit to the DEQ, for review and approval, an inspection report and plan for promptly completing any necessary improvements of the Cedar Street Reservoir identified by the preliminary inspection. The City shall then complete a full inspection of the Cedar Street Reservoir **within 45 days of the date the Dort Reservoir is brought into service**. The City shall then submit to the DEQ, for review and approval, an inspection report and plan for completing any necessary improvements of the Cedar Street Reservoir identified by the full inspection.

3.7 On October 15, 2018, the City produced an updated organizational chart for its Utilities Water Division (Attachment E). **Within 30 days of the effective date of this Order**, the City shall produce a plan that (1) identifies which position is filled by which specific F&V contractor; (2) specifically identifies how many vacant spots remain for each position, if any;(3) a schedule for filling each open spot that requires all spots to be filled no later than **December 31, 2018;** and (4) a written commitment that the City's contractor who serves as the operator in charge of the City's water plant is fully authorized to direct city employees not employed by that contractor to make any changes to plant operations required by the contractor.

3.8 The City shall complete and submit the design of chemical feed system improvements by no later than **March 31, 2019**, for DEQ review and approval and complete construction of the chemical feed system improvements by no later than **December 31, 2019**.

3.9 By no later than **December 31, 2018**, the City shall purchase a generator that is compatible with the Cedar Street Reservoir's electrical system or execute a contract for emergency services at that reservoir that will guarantee the provision of a generator that is compatible with the reservoir's electrical system. The DEQ recognizes that if the City successfully implements its redundancy plan involving the Dort Reservoir and Genesee County, the requirement in this paragraph will likely not be necessary. But the DEQ

remains concerned about the potential impact a significant emergency would have on the City's water system in the interim period before the City's redundancy plan is implemented. The City has acknowledged the risk during the interim period but has declined to mitigate that risk because it considers mitigating the risk to be too expensive.

3.10 By no later than **December 31, 2018**, the City shall install pumps at Torrey Road and complete design of upgrades to the Cedar Street Reservoir pumps for DEQ review and approval. Upgrades to the Cedar Street Reservoir pumps shall be completed by **March 31, 2020**.

3.11 By no later than **December 31, 2018**, the City shall produce a plan explaining how it will have the TMF capacity necessary to consistently operate its water system once the State-funded contracts for technical assistance (John Young) and training assistance (Nick Pizzi) expire. Also by that date, the City shall submit a detailed plan containing an implementation schedule for the items listed in the plan previously provided to the City by Arcadis Group in the June 4, 2018, Flint Drinking Water Distribution System Optimization Plan.

3.12 The City shall submit all reports, work plans, specifications, schedules, or any other writing required by this section to the DWMAD Director at DEQ, DWMAD, P.O. Box 30817, Lansing, Michigan 48909-8311. The cover letter with each submittal shall identify the specific paragraph and requirement of this Order that the submittal is intended to satisfy.

IV. DEQ APPROVAL OF SUBMITTALS

4.1 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Order to be submitted to the DEQ by the City for DEQ review and approval, the following process and terms of approval shall apply.

4.2 All work plans, proposals, and other documents required to be submitted by this Order shall include all of the information required by the applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Order.

4.3 In the event the DEQ disapproves a work plan, proposal, or other document, it will notify the City, in writing, specifying the reasons for such disapproval. The City shall submit, within 30 days of the date of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the City of this disapproval.

4.4 In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it will notify the City, in writing, specifying the modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the City to submit, prior to implementation and within 30 days of the date of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications. If the revised work plan, proposal, or other document is still not acceptable to the DEQ, the DEQ will notify the City of this disapproval.

4.5 Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Order and shall be enforceable in accordance with the provisions of this Order.

4.6 Failure by the City to submit an approvable work plan, proposal, or other document within the applicable time periods specified above, constitutes a violation of this Order and shall subject the City to the enforcement provisions of this Order.

4.7 Any delays caused by the City's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the City's responsibility to comply with any other deadline(s) specified in this Order.

4.8 No informal advice, guidance, suggestions, or comments by the DEQ regarding reports, work plans, plans, specifications, schedules, or any other writing submitted by the City will be construed as relieving the City of its obligation to obtain written approval, if and when required by this Order.

V. EXTENSIONS

5.1 The City and the DEQ agree that the DEQ may grant the City a reasonable extension of the specified deadlines set forth in this Order. Any extension shall be preceded by a written request to the DWMAD Director at the address in paragraph 3.12 no later than ten (10) business days prior to the pertinent deadline, and shall include:

a. Identification of the specific deadline(s) of this Order that will not be met.
b. A detailed description of the circumstances that will prevent the City from meeting the deadline(s).
c. A description of the measures the City has taken and/or intends to take to meet the required deadline(s).
d. The length of the extension requested and the specific date on which the obligation will be met.

The DWMAD Director shall respond in writing to such requests. No change or modification to this Order shall be valid unless in writing from the DEQ and, if applicable, signed by both Parties.

VI. REPORTING

6.1 The City shall verbally report any violation(s) of the terms and conditions of this Order to the DWMAD Director by no later than the close of the next business day following detection of such violation(s) and shall send a written report to the DWMAD Director within five (5) business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The City shall report any anticipated violation(s) of this Order to the DWMAD Director in advance of the relevant deadlines whenever possible.

VII. RETENTION OF RECORDS

7.1 Upon request by an authorized representative of the DEQ, the City shall make available to the DEQ all records, plans, logs, and other documents required to be maintained

under this Order or pursuant to Act 399, the SDWA, or their respective rules. All such documents shall be retained by the City for at least a period of three (3) years from the date of generation of the record unless a longer period of record retention is required by Act 399, the SDWA, or their respective rules.

VIII. RIGHT OF ENTRY

8.1 The City shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the facility at all reasonable times for the purpose of monitoring compliance with the provisions of this Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to the SDWA or any other applicable statutory provision.

IX. ENFORCEMENT

9.1 This Order is enforceable under both the criminal provisions of MCL 325.1021 and the civil provisions of MCL 325.1022.

X. GENERAL PROVISIONS

10.1 This Order in no way affects the City's responsibility to comply with any other applicable local, state, or federal laws or regulations.

10.2 Nothing in this Order is or shall be considered to affect any liability the City may have for natural resource damages caused by the City's ownership and/or operation of the facility. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.

10.3 In the event the City sells or transfers the facility, it shall advise any purchaser or transferee of the existence of this Order in connection with such sale or transfer and condition the sale or transfer of the facility on the agreement of the purchaser or transferee to comply with this Order. Within 30 calendar days, the City shall also notify the DWMAD Director, in writing, of such sale or transfer, the identity and address of any purchaser or transferee, and confirm the fact that notice of this Order has been given to

the purchaser and/or transferee. The purchaser and/or transferee of this Order must agree, in writing, to assume all of the obligations of this Order. A copy of that agreement shall be forwarded to the DWMAD Director within 30 days of assuming the obligations of this Order.

10.4 This Order does not resolve any criminal action that may result from the violations identified in this Order.

XI. TERMINATION

11.1 This Order shall remain in full force and effect until terminated by a written Termination Notice (TN) issued by the DEQ. Prior to issuance of a written TN, the City shall submit a request consisting of a written certification that the City has fully complied with the requirements of this Order. Specifically, this certification shall include:

a. The date of compliance with each provision of the compliance program in Section III and the date any fines or penalties were paid.
b. A statement that all required information has been reported to the DWMAD Director.
c. Confirmation that all records required to be maintained pursuant to this Order are being maintained at the facility.

The DEQ may request additional relevant information after receiving the City's certification and request but before issuing a TN.

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This ORDER is hereby issued against the city of Flint under MCL 325.1015(2).

C. Heidi Grether

By: C. Heidi Grether, Director
Michigan Department of Environmental Quality

10.22.18

Date

APPROVED AS TO FORM:

Nate Gambill

By: Nathan Gambill (P75506)
Assistant Attorney General
Environment, Natural Resources, and
Agriculture Division
Department of Attorney General
P.O. Box 30755
Lansing, Michigan 48909

October 22, 2018

Date

Attachment A

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
SAGINAW BAY DISTRICT OFFICE

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

August 11, 2017

SIGNIFICANT DEFICIENCY VIOLATION NOTICE

Mr. Sylvester Jones, Administrator
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502

Dear Mr. Jones:

SUBJECT: Water System Sanitary Survey, WSSN: 2310
Significant Deficiency Violation Notice

The Department of Environmental Quality (DEQ) has completed a sanitary survey of the city of Flint (City) drinking water system. The purpose of the survey is to evaluate the water system with respect to the requirements of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). In addition, the enclosed sanitary survey form was updated to gather information on the City water distribution, storage, pumping, and limited treatment systems. The sanitary survey does not include an evaluation of the water filtration plant. A complete engineering evaluation of the water filtration plant was recently completed by CDM Smith and others, and would form the basis of any future recommendations if the City elects to operate the water filtration plant.

The following table summarizes our findings from our survey of the water system:

Survey Element	Findings
Source	**Significant Deficiencies noted**
Treatment	Recommendations made
Distribution System	**Significant Deficiencies noted**
Finished Water Storage	**Deficiencies noted**
Pumps	Recommendations made
Monitoring & Reporting	Recommendations made
Management & Operations	**Significant Deficiencies noted**
Operator Compliance	**Deficiencies noted**
Security	**Deficiencies noted**
Financial	**Significant Deficiencies noted**
Other	---

A summary of the significant deficiencies, minor deficiencies, and recommendations applicable to your water system is enclosed for your information.

Our investigation is considered complete. This significant deficiency begins as of the date of receipt of this letter and will continue until you complete corrective action. **You must complete corrective action within 120 days of receipt of this letter or be in compliance with a corrective action plan and schedule approved by this office. You are directed to contact us within 30 days of receipt of this letter to discuss appropriate corrective action.** You must also notify us in writing within 30 days of correcting the significant deficiency.

If you have any factual information you would like us to consider regarding the significant deficiencies identified in this Significant Deficiency Violation Notice please provide it in a written response by September 8, 2017.

If you have any questions or wish to discuss the sanitary survey or Significant Deficiency Violation Notice, please contact me at the phone number listed below or by email to londonr@michigan.gov.

Sincerely,

Robert A London

Robert A. London, P.E.
Surface Water Treatment Engineer
Engineering Unit
Drinking Water and Municipal Assistance Division
989-450-7834

bl/snh
Enclosures
cc/enc: Mr. Robert Jones, F&V Operations
Mr. Mark Adas, City of Flint
Mr. Rob Bincsik, City of Flint
cc: Mr. Eric Oswald, DEQ
Ms. Sue Maul, DEQ

Community Water Supply Section
Engineering Unit
Phone: 989-450-7834
Fax: 989-891-9213

WSSN: 02310

Drinking Water and Municipal Assistance Division

Water System Sanitary Survey

City of Flint Water System

(Distribution System, Limited Treatment, Storage, and Pumping)

August 7, 2017

Sanitary Survey of Community Water Supply - Review Summary

Water Supply: City of Flint — WSSN: 02310
County: Genesee — District: 92
Evaluator: Bob London — Date: 8/7/2017

Category	Comment	N/A	NotEv	NoD/R	Rec	Def	SigDef
Source							X
Construction & Maintenance	*No long-term decision on primary/backup sources*						X
Standby Power	*Appropriate level of standby power is dependent on source selection*				X		
Isolation	*No concerns with current GLWA or potential KWA/GCDC sources*			X			
Source Water Protection	*No formal source water protection program, but no concerns*			X			
Capacity	*Lack of decision on source affects planning, finances,staffing, etc.*						X
Treatment	*Survey does not include filtration facilities (use is to be determined)*				X		
Disinfection	*Permanent facilities and Improved SCADA if GLWA water used*				X		
Fluoride		X					
Phosphate Addition	*Permanent facilities and improved SCADA if GLWA water used*				X		
Softening		X					
Iron/Manganese Removal		X					
Arsenic Removal		X					
Pretreatment		X					
Filtration (gravity or membranes)		X					
C*T		X					
Other	*Permanent facilities and improved SCADA if GLWA water used*				X		
Distribution System							X
Interconnections w/ Other WS	*A mutual aid agreement is recommended with nearby utilities*				X		
Hydrants & Valves	*Recent efforts very good, but formal long-term program needed*						X
Service Lines & Metering	*Programs for meter and galvanized service replacement are needed*						X
General Plan	*Prepared through State contract - City needs to assume responsibility*				X		
Cross Connections	*No inspections conducted, inadequate administration*						X
Construction & Maintenance	*Age of system, water accountability, number of breaks*						X
Capacity	*Water age is a concern due to oversized mains/reduced demands*				X		
Finished Water Storage	*Does not include Dort Reservoir and CW#4 (use is to be determined)*					X	
Construction & Maintenance	*Cedar St. needs Inspection, West Side off line due to condition*					X	
Controls				X			
Capacity	*Backup Power rec. at Cedar Street; Arcadis evaluating volumes*				X		
Pumps (All Pumping Facilities)	*Does not include pumps at water plant site (use is to be determined)*				X		
Construction & Maintenance	*Torrey Road pump upgrade has been delayed*				X		
Controls	*Electrical gear/control upgrades recommended/VFDs recommended*				X		
Capacity				X			
Monitoring & Reporting					X		
Bacteriological Monitoring				X			
Chemical Monitoring	*Completed with State assistance - City needs to assume responibility*				X		
MOR or Annual Pumpage Repor				X			
Consumer Confidence Report	*Prepared with State assistance - City needs to assume responibility*				X		
Analytical Capabilities				X			
System Management & Operation							X
Owner Responsibility	*Lack of decision on source affects planning, finances,staffing, etc.*						X
Capacity Development	*Concerns with long-term source, budget, staffing/cert., plans/studies*					X	
Reliability Study	*Prepared with State assistance - City needs to assume responibility*				X		
Operations Oversight	*Treatment - contract w/F&V Operation; Distribution - In-house staff*				X		
Permits				X			
Operator Compliance						X	
Operator Certification	*Difficulty hiring/retaining certified operators*					X	
Technical Knowledge & Training	*Training*				X		
Security						X	
Emergency Response Plan	*Status of ERP is unknown*					X	
Site Security (Fences, Alarms...)				X			
Financial							X
Rates	*Raftelis Study predicts a revenue vs. expenses gap*				X		
Budget & Capital Imp. Plan	*Lack of decsion on source affects budget, planning, financing*						X
Other							

N/A - Not Applicable
NotEv - Not Evaluated
NoD/R - No Deficiencies/Recommendations Made
Rec - Recommendations Made
Def - Deficiencies Identified
SigDef - Significant Deficiencies Identified

WATER SYSTEM SANITARY SURVEY

GENERAL

Basic Information

WSSN:	02310	Supply:	City of Flint	County:	Genesee
Date:	8/7/2017	Reviewed by:	Bob London	District:	RAL/North

Primary Contact:	Sylvester Jones	Copy To:	Mark Adas
SDWIS Role:	AC, FC	SDWIS Role:	
Title:	City Administrator	Title:	City Engineer
Telephone:	810-766-7346 x 2025	Telephone:	
Cell Phone:		Cell Phone:	810-610-7771
Fax:		Fax:	
e-mail:	sjones@cityofflint.com	e-mail:	madas@cityofflint.com
Address:	1101 S. Saginaw Street Flint, MI 48502	Address:	1101 S. Saginaw Street Flint, MI 48502

Population:	98,310	Year:	2015	Basis:	Census update

Operator Training and Certification - Treatment

Treatment Capacity:	18 MGD			
Treatment Classification:	D-1	Certification	Op. #	Exp. Date
Operator in Charge:	Robert Jones (F&V Operations)	D-1, F-2, S-1	5026	7/15/2018
Backup Operators:	Catherine Garnham (F&V)	F-1, S-1	5194	7/15/2019
	Stewart Beach (F&V)	F-1, S-1	2273	1/15/2019
Operations Supervisor:	Vacant			
Operations Foreman (4):	Scott Dungee	F-3, S-4	5550	7/15/2019
	Chris Wilcox	F-4	18586	1/15/2018
	Dominic Smoot	D-3	20034	1/15/2020
	Vacant			
Operator/Maintainer (4):	Scott Ball	F-4	18394	1/15/2018
	Jeff Maksymowski	None	20033	
	Josh Pickett	None		
	Robert Stinson	None		
Maintenance Supv. (2):	Mike Beckley	F-4, S-4	13782	7/15/2018
	Chris Koryciak	F-4, S-4	4653	1/15/2020
Maintainer/Operator (2):	Vacant			
	Vacant			
Instrument Technician:	Vacant			
Lab Supervisor:	Will Bradley	F-3	11941	7/15/2017
Lab Technicians:	Heather Kot	D-4	20031	1/15/2020
	Vacant			

Do the operators receive adequate technical training? Yes
If not, explain:

Comments on Training and Certification:
The City entered into a contractual agreement with Fleis and Vandenbrink Operations (F&V) for Operator-In-Charge and Certified Backup Operator services for the treatment system on June 22, 2017. F&V is responsible for providing training and certification of contract operations staff.

The City is investigating a contract service agreeement with Hach for analytical equipment maintenance due to the vacant Instrument Techncian position. The instrument technician at the wastewater plant may also be available to provide limited assistance.

The State of Michigan has entered into several agreements for training and technical assistance for City of Flint personnel, and has provided training on several occasions at the water treatment plant for City personnel. A comprehensive list of training is contained in Appendix A. The City is responsible for providing adequate training in the future to maintain a competent and properly-certified staff.

WATER SYSTEM SANITARY SURVEY

GENERAL

Operator Training and Certification - Distribution

Distribution Classification:	S-1	Certification	Op. #	Exp. Date
Operator in Charge:	Robert Bincsik	F-4, S-1	13784	1/15/2020
Backup Operator:				
Water Dist. Formen:	Howard Swickard	S-2	5091	1/15/2019
	Paul Simpson	S-2	4849	1/15/2018
	Jeff Church	S-3	12559	4/15/2020
	Curtis Brooks	None		
Senior Water Dist. Operators:	Jason Bradley	None		
	Dave Hurt	None	17277	
	Rich Johnson	None		
	Jeremy Keefer	None	16060	
	Chris Kennedy	None		
	Phil Kuczera	None		
	Brandon McNiel	None		
	Jon Mochty	None		
	Mark Pavwoski	None	13288	
	Keith Ross	None		
	Juan Sattiewhite	None		
	Don Thompson	None		
	Dan Wells	None	18922	
Water Dist. Operators:	Clarence Scott	None		
	Greg Sumner	None		
	Fabian Villareal	None		
	Nancy Prieur	None		
	Lester Muma	None	14567	
Water Dist. Op. Trainee:	Marc Arter	None		
	Jason Gutierrez	None		
	Ben Gutierrez	None	4366	
	Mark May	None		
	Vacant (8 positions)			

Do the operators receive adequate technical training? Yes

If not, explain:

Comments on Training and Certification:

The State of Michigan has entered into several agreements for training and technical assistance for City of Flint personnel, and has provided training on several occasions at the water treatment plant for City personnel. A comprehensive list of training is contained in Appendix A. The City is responsible for providing adequate training in the future to maintain a competent and properly-certified staff.

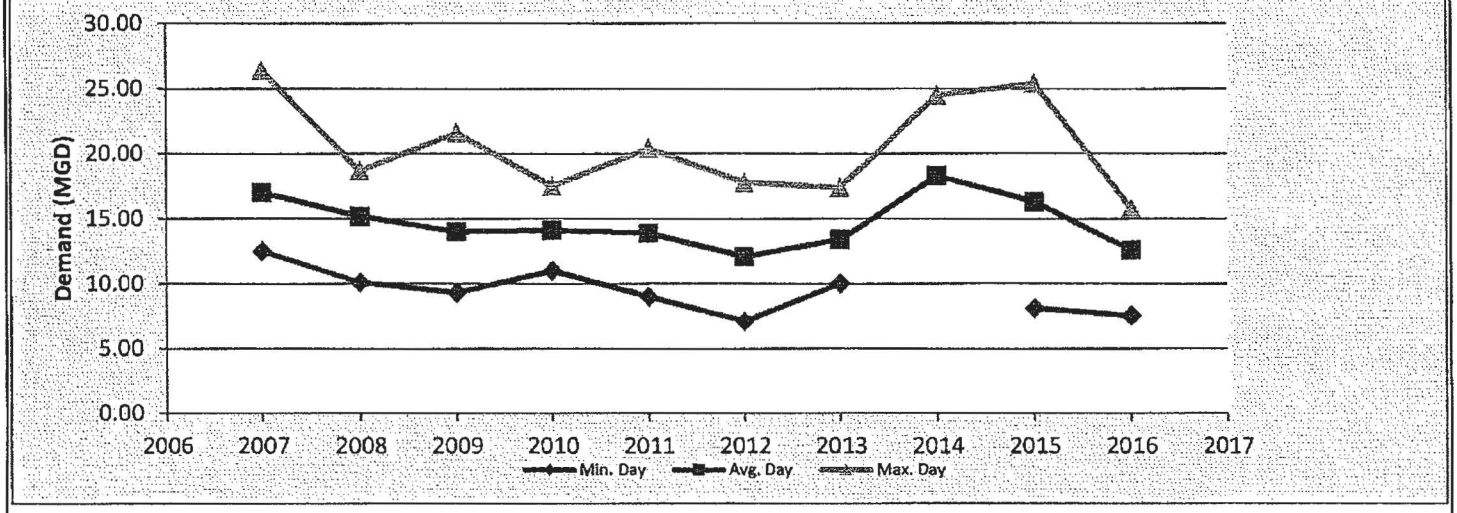
Ownership

Ownership:	City
Consent Agreement:	NA
Escrow Account:	NA
Annual Fee:	Active
Comments:	

SOURCE

Capacity

Year	Demand (MGD) Max. Day	Date	Avg. Day	Min. Day	Date	Max/Avg	Population History	G/C/D	% unacct.H_2O
2007	26.4		17.0	12.50		1.55			
2008	18.7		15.2	10.10		1.23			
2009	21.6		14.0	9.30		1.54			
2010	17.5		14.1	11.00		1.24			43%
2011	20.4		13.9	9.00		1.47			39%
2012	17.8		12.1	7.10		1.47			40%
2013	17.4		13.4	10.00		1.30			50%
2014	24.5		18.3			Data from 2014/2015 includes WTP operation. Do not use for capacity determination.			
2015	25.4		16.3	8.10					
2016	15.8		12.6	7.54		1.25			



Five Year Max. Day	17.8	(Excludes 2014 and 2015, which reflects WTP operation)
Ten year Max. Day	26.4	
Five Year Avg. Day	12.7	(Excludes 2014 and 2015, which reflects WTP operation)
Max Day for capacity requirements:	18.0	(Based on original raw water contract with KWA and anticipated reduction in lost water from DWRF project)

Purchase Contract

Principal Parties of Contract: GLWA, City of Flint

Date of Contract:	10/16/2015	
Expiration Date:	9 months from execution, but extendable based on circumstances	
	The contract was officially extended July 11, 2016	
Annual Volume Available by Contract:	593,000	Mcf (= 4.436 Bgal)
Maximum Day Available by Contract:	21.4	MGD
Maximum Hour Available by Contract:	22.4	MGD measured over one hour
Maximum Delivery Pressure Cited in Contract:	60	PSI
Minimum Delivery Pressure Cited in Contract:	40	PSI

Comments on the Purchase Contract:
A short-term agreement was reached with the Great Lakes Water Authority (GLWA) in 2015 to allow the City of Flint to discontinue routine use of its water treatment plant. The agreement with GLWA was based on the previous agreement with the Detroit Water and Sewerage Department (DWSD). The agreement was set to expire within 9 months of execution, but included provisions to extend it as necessary based on local circumstances. A 30-year purchase agreement was proposed by GLWA, but Flint City Council has not approved it as of the date of this survey. The City was required to approve the proposed agreement or propose a reasonable alternative that was protective of public health by June 26, 2017, and failed to do so. The DEQ has determined that the City's failure to act presents an immediate threat to public health. The City does not have a secure, long-term source agreement at this time.

STORAGE

Ground Level Storage - Construction, Controls & Maintenance

Identification	Dort Reservoir	Clearwell No. 4
Location	Water Treatment Plant	Water Treatment Plant
Function	Finished Water Storage (currently off line but is intended for routine use)	High Service Pump Suction
Type	Concrete, 2-cell	Concrete
Nominal Volume (Gallons)	20,000,000	3,000,000
Calculated Usable Volume (Gallons)		
Date Constructed	1952	1954
Date Inspected		
Buried/At Grade	At grade	Buried
Floor Slab, Elevation		
Floor Relief Valves-Float Prevention (Y/N)		
Sump Area (Y/N)		
Floor Slopes to Sump (Y/N)		
Sump Floor Elevation		
Sump Dimensions		
Date Painted/Coated Inside		
Paint/Coating System		
NSF Std 61 Compliant (Y/N)		
Cathodic Protection		
Leaks (Y/N)		
Reservoir Isolation Valve		
Basin Drain (Hydrant/Pumps)		
High Alarm		
Low Alarm		
Alarm Type		
Normal High Water Level		
Normal Low Water level		
Range of Operation		
Chart recorder		
Telemetering System	Wireless/SCADA	Wireless/SCADA
Vents Screened		
Overflow Screened		
Access Hatches Locked		
Hatches Watertight and Overlap		
Overflow Splash Pad		
Site Fenced/Locked	Locked - at WTP	Locked - at WTP
Usable Storage	0	0

Comments on Ground Level Storage: At present, and as GLWA water is currently being received, the City is not capable of using the Dort Reservoir or Clearwell No. 4. A thorough inspection, and completion of any necessary maintenance/repairs, would be necessary before returning these reservoirs to service.

STORAGE

Ground Level Storage - Construction, Controls & Maintenance

Identification	Cedar Street Reservoir	West Side Reservoir
Location	Cedar St./Fenton Rd.	Dupont St./Jean Ave.
Function	Distribution Storage	Distribution Storage
Type	Concrete, 2-cell	Concrete, 2-cell
Nominal Volume (Gallons)	20,000,000	12,000,000
Calculated Usable Volume (Gallons)	14,000,000	0 (off line at this time)
Date Constructed	1948	1970
Date Inspected	~2000	2017
Buried/At Grade	At grade	At grade
Floor Slab, Elevation		
Floor Relief Valves-Float Prevention (Y/N)		
Sump Area (Y/N)		
Floor Slopes to Sump (Y/N)		
Sump Floor Elevation		
Sump Dimensions		
Date Painted/Coated Inside	N/A (concrete)	N/A (concrete)
Paint/Coating System	---	---
NSF Std 61 Compliant (Y/N)	---	---
Cathodic Protection	No	No
Leaks (Y/N)	No	Yes
Reservoir Isolation Valve	Yes	Yes
Basin Drain (Hydrant/Pumps)		
High Alarm	Yes	Yes
Low Alarm	Yes	Yes
Alarm Type	Noted on SCADA	Noted on SCADA
Normal High Water Level	20'	
Normal Low Water level	6'/16' (summer/winter)	
Range of Operation	Depends on season	Depends on season
Chart recorder	SCADA at WTP	SCADA at WTP
Telemetering System	Wireless/SCADA	Wireless/SCADA
Vents Screened	Yes	Yes
Overflow Screened		Yes
Access Hatches Locked		Yes
Hatches Watertight and Overlap	Yes	
Overflow Splash Pad	Storm drain w/air gap	Storm drain w/air gap
Site Fenced/Locked	Yes	Yes
Usable Storage	14,000,000	0

Comments on Ground Level Storage:
The West Side Reservoir (WSR) was inspected in 2017. The reservoir was shut down several months ago due to a leaking link seal/coupling through the wall on the influent line. The inspection report recommends approximately $90,000 of miscellaneous repairs such as brick work and tuck pointing, repainting of pipes and metal surfaces, replacement of downspouts, replacement of the influent line link seal, etc., to prevent the reservoir from deteriorating. There were no other major structural or sanitary concerns. The Arcadis Group will be providing a recommendation on the long-term need for the WSR. Until that recommendation is received, the City will not make a decision on whether to proceed with the repairs. The City has experienced a significant drop in the number of water main breaks since the West Side Reservoir was removed from service. Several sources have recommended that Soft Starts or VFDs be installed on the West Side booster pumps to reduce or eliminate pressure spikes within the distribution system, which may be related to main breaks.

STORAGE

Elevated Storage - Construction, Controls & Maintenance	
Location	WTP (elevated)
SDWIS Facility ID (Site Code)	
Volume	2,000,000
Type	Elevated, multi-leg
Material	Steel
O.F. Elevation	
Date Constructed	1952
Date Inspected	2009
Date Painted Inside	2009
Paint System	
NSF Std 61 Compliant (Y/N)	Yes
Date Painted Outside	
Cathodic Protection	Yes
Tank Isolation Valve	Yes
Tank Drain (Hydrant)	Yes
Altitude Valve	Yes
Mud Valve	Yes
High Alarm	Yes
Low Alarm	Yes
Alarms Received By	Operations center
Total Head Range (Feet)	
Normal High Water Level	
Normal Low Water level	
Normal/Average Pressure	74
Data Recording System	SCADA
Control Signal Type	Wireless/SCADA
Auxiliary Power for Controls?	
Control System Adequate?	Yes
Vents Screened	
Overflow Screened	
Access Hatches Locked	
Expansion Collar Lubricated	
Mixing System	None
Overflow Splash Pad	
Adequate Security?	Yes - at WTP
Operator Visit Frequency	Daily - at WTP
Comments:	

Total Usable Storage Capacity - Ground + Elevated)			
Usable Storage	2,000,000		
Total Usable Storage (gal)	16,000,000	16.0	Mgal
Total Usable Storage/Max Day	61%		
Total Usable Storage/Avg. Day	126%		
Comments:			

Pumping

Pumping Stations - Construction, Controls & Maintenance						
Location:	Pump Station 4 (Water Treatment Plant)					
Function:	Pumping water from the Dort Reservoir and the 3 MG reservoir to the Distribution System					
Pump Number	1	2	7	8	9	
Year Installed						
Type	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.	
Current Capacity (MGD)	0	0	20	20	6	
Current Capacity (GPM)	0	0				
Basis	Inoperable	Inoperable				
Current TDH (FT)						
HP	800	1000	800	800		
Original Name Plate GPM						
Corresponding MGD						
Original Name Plate TDH (FT)						
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?						
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)						
Maintenance History	Refer to next page for maintenance history of pumps and motors					

Comments on Booster Pumping:
A number of improvements would be required if the water plant is returned to operation or if the City elects to routinely use the Dort Reservoir. The improvements are included in the CDM Smith Engineering Report on the Water Treatment Plant.

AUXILIARY POWER

Power Type	Dual primary feeds with auto-transfer		
Fuel Type		Starting Frequency	
Capacity (gpm)		Load Testing Frequency	

Total Pump Capacity (gpm)		mgd	
Firm Pump Capacity (gpm)		mgd	
Auxiliary Power Capacity (gpm)		mgd	
Max Day Demand @ this location		mgd	
Peak Hour @ this location		gpm	(Hydropneumatic Stations)
Avg Day Demand @ this location		mgd	
Firm Pump Capacity/Max Day		%	
Peak Hour/Firm Pumping Capacity		%	(Hydropneumatic Stations)
Aux. Power Capacity/Avg Day		%	

Comments:
Dual primary electrical feeds are not truly independent. If routine use of Control Station 4 is desired, on-site auxiliary power is recommended.

Pumping

Pumping Stations - Construction, Controls & Maintenance				
Location:	Pump Station 4 (Water Treatment Plant)			
Function:	Pumping water from the Dort Reservoir and the 3 MG reservoir to the Distribution System			
Pump Station 4 Pump 1	Pump Station 4 Pump 2	Pump Station 4 Pump 7	Pump Station 4 Pump 8	Pump Station 4 Pump 9

Pumping

Pumping Stations - Construction, Controls & Maintenance						
Location:	Cedar Street Reservoir					
Function:	Pump from the Cedar Street Reservoir to supply the south and west areas of the City					
Pump Number	1	2	3			
Year Installed	1948	1948	1948			
Type	Horiz. Cent.	Horiz. Cent.	Horiz. Cent.			
Current Capacity (MGD)						
Current Capacity (GPM)	12	9	9			
Basis						
Current TDH (FT)	160'	160'	160'			
HP	500	350	350			
Original Name Plate GPM						
Corresponding MGD						
Original Name Plate TDH (FT)						
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?	No	No	No			
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)	No	No	No			
Maintenance History	Refer to next page for maintenance history of pumps and motors					

Comments on Booster Pumping:
Some electrical components are from the 1940's and an upgrade is needed. SCADA improvements and switchgear replacement were recently completed. A permit was issued in 2012 to upgrade the pumping station to accept a portable generator feed, but the work was not completed. The pumps are controlled remotely from the Operations Center at the water plant. Filling and emptying the Cedar Street and West Side Reservoirs is controlled by Operations staff to manage flow patterns, pressures, chlorine residuals, and water age.

AUXILIARY POWER

Power Type	None		
Fuel Type		Starting Frequency	
Capacity (gpm)		Load Testing Frequency	
Total Pump Capacity (gpm)			mgd
Firm Pump Capacity (gpm)			mgd
Auxiliary Power Capacity (gpm)			mgd
Max Day Demand @ this location			mgd
Peak Hour @ this location			gpm (Hydropneumatic Stations)
Avg Day Demand @ this location			mgd
Firm Pump Capacity/Max Day			%
Peak Hour/Firm Pumping Capacity			% (Hydropneumatic Stations)
Aux. Power Capacity/Avg Day			%

Comments:
In case of interruption of the GLWA supply, the Cedar Street Reservoir and booster pumping station is currently the primary source of water. Auxiliary power or, as a minimum, portable generator compatibility is strongly recommended.

Pumping

Pumping Stations - Construction, Controls & Maintenance	
Location:	Cedar Street Reservoir
Function:	Pump from the Cedar Street Reservoir to supply the south and west areas of the City

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

Cedar Street Station Pump 1	Cedar Street Station Pump 2	Cedar Street Station Pump 3
10/30/13 - installed new pump bearings and packing, rebalanced impeller	**2/1/10** - rebuilt motor	
12/5/16 - serviced discharge valve control cylinder	**1/26/16** - uncoupled pump and motor for motor testing	
	11/16/16 - tested switchgear and recoupled pump and motor	
	12/5/16 - serviced discharge valve control cylinder, placed pump back in service	

TREATMENT

Disinfection (sodium hypochlorite addition)

Point of Treatment		Cedar St. Booster Sta.		
Injection Point:		Reservoir inlet line		
[redacted]				
Purpose:		See comments		
Year Initiated		2016		
Product:		Havasan LB-12		
Manufacturer:		Haviland		
Chemical Strength:		14-15% (12.5% nominal)		
Dilution:		N/A		
ANSI/NSF Standard 60 Approval? (Y/N)		Yes	NSF max dose:	84 mg/L
Normal Feed Rate/Dosage		See comments	mg/L	
Avg Residual (Plant Tap) (mg/L)	free:	1.5	(goal)	
Avg Distribution Residual (mg/L)	free:			
Frequency of Residual testing	Plant Tap:	Continuous	Distribution:	Weekly
Analytical Method Used		Hach CL-17 (DPD)		
Any Overfeed Instances? (Y/N)		No	Date(s):	
Any Low Feed Instances? (Y/N)		No	Date(s):	
Pump Type:		Diaphragm	Model:	LMI C721-71FS
Number of Pumps:		1		
Pump Capacity		4 gph	gpd min:	
	psi:	100		
Chemical Storage Tank Type		55 gallon drums	Volume:	
Weight/Level Reading Method		None (relies on expected usage and visual inspection)		

SAFETY

Separate Room	Yes	Cylinder Repair Kit	N/A
Exhaust fan		Extra Chlorinator or repair kit	N/A
Fresh Air Vent		Ammonia Bottle	N/A
Door Opens Out With Panic Bar		Self Contained Air Packs	N/A
More than 1500 # Cl_2 onsite	N/A	Training Programs	
Electrical Protected from Gas?	N/A	Shower/Eye Wash	

Comments:

The free chlorine residual of water entering and leaving the Cedar Street Reservoir (CSR) is monitored continuously and is visible on the SCADA display in the Operations Center. Chlorine is added to the water when filling the CSR as appropriate to help meet the City's distribution system free chlorine residual goals. As of July 11, 2017, the chlorine feed system has flow-pacing capability, which will reduce the operational burden on City staff.

Pumping

Pumping Stations - Construction, Controls & Maintenance						
Location:	West Side Reservoir					
Function:	Pump from the West Side Reservoir to supply areas on the west side of the City during peak demand periods					
Pump Number	1	2	3	4		
Year Installed	1970	1970	1970	1970		
Type	VT	VT	VT	VT		
Current Capacity (MGD)	4	4	8	8		
Current Capacity (GPM)						
Basis						
Current TDH (FT)						
HP	100	100	200	200		
Original Name Plate GPM						
Corresponding MGD						
Original Name Plate TDH (FT)	142'	142'	142'	142'		
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?						
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)						
Maintenance History	Refer to next page for maintenance history of pumps and motors					

Comments on Booster Pumping: The City has experienced a significant significant drop in the number of water main breaks since the West Side Reservoir was removed from service. Several sources have suggested that Soft Starts or VFDs be installed on the West Side booster pumps to reduce or eliminate pressure spikes within the distribution system, which may be related to main breaks.

AUXILIARY POWER

Power Type	None		
Fuel Type		Starting Frequency	
Capacity (gpm)		Load Testing Frequency	

Total Pump Capacity (gpm)			mgd
Firm Pump Capacity (gpm)			mgd
Auxiliary Power Capacity (gpm)			mgd
Max Day Demand @ this location			mgd
Peak Hour @ this location			gpm (Hydropneumatic Stations)
Avg Day Demand @ this location			mgd
Firm Pump Capacity/Max Day			%
Peak Hour/Firm Pumping Capacity			% (Hydropneumatic Stations)
Aux. Power Capacity/Avg Day			%

Comments:

Pumping

Pumping Stations - Construction, Controls & Maintenance

Location:	West Side Reservoir
Function:	Pump from the West Side reservoir to supply area of the west side of the City during peak demand periods

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

West Side Station Pump 1	West Side Station Pump 2	West Side Station Pump 3	West Side Station Pump 4
6/7/05 - replaced motor bearings	**9/1/11** - replaced upper and lower motor bearings	**4/28/15** - rebuilt discharge valve control cylinder	**5/26/16** - replaced 4-way valve
	4/9/12 - rebuilt motor, installed new upper shaft and coupling		

TREATMENT

Disinfection (sodium hypochlorite addition)

Point of Treatment		West Side Booster Sta.		
Injection Point:				
[redacted]				
Purpose:		See comments		
Year Initiated		2016		
Product:		NaOCl		
Manufacturer:		~14-15%		
Chemical Strength:				
Dilution:		NA		
ANSI/NSF Standard 60 Approval? (Y/N)		Yes	NSF max dose:	84 mg/L
Normal Feed Rate/Dosage			mg/L	
Avg Plant Tap Residual (mg/L)	total:		free:	
Avg Distribution Residual (mg/L)	total:		free:	
Frequency of Residual testing	Plant Tap:		Distribution:	
Analytical Method Used				
Instrument:				
Any Overfeed Instances? (Y/N)		No	Date(s):	
Any Low Feed Instances? (Y/N)		No	Date(s):	
Pump Type:			Model:	
Number of Pumps:				
Pump Capacity	gpd max:		gpd min:	
	psi:			
Chemical Storage Tank Type			Volume:	220 gallons
Weight/Level Reading Method				

SAFETY

Separate Room	No	Cylinder Repair Kit	NA
Exhaust fan	No	Extra Chlorinator or repair kit	NA
Fresh Air Vent	No	Ammonia Bottle	NA
Door Opens Out With Panic Bar	Roll-up door	Self Contained Air Packs	NA
More than 1500 # Cl_2 onsite	NA	Training Programs	NA
Electrical Protected from Gas?	NA	Shower/Eye Wash	Eye wash

Comments:

Pumping

Booster Pumping Stations - Construction, Controls & Maintenance						
Location:	Torrey Road Booster Station					
Function:	Boost pressure to the southwest portion of the City, including the Hospital area					
Pump Number	1	2				
Year Installed	1954	1954				
Type						
Current Capacity (MGD)						
Current Capacity (GPM)						
Basis						
Current TDH (FT)						
HP	40	125				
Original Name Plate GPM						
Corresponding MGD	2.8	4				
Original Name Plate TDH (FT)	65'	100'				
Pump NPSH (FT)						
Centerline of Pump Intake Elev.						
Floor Elevation						
Electrical Controls Elevation						
Pumps/Motors Subject to Flood?						
Pump Efficiency						
Motor Efficiency						
Min. Reservoir WL						
Cavitation Problems (Y/N)						
VFDs (Y/N)	No	No				
Maintenance History	Refer to next page for maintenance history of pumps and motors					

Comments on Booster Pumping:
Permit 120173 was issued in 2012 for signficant upgrades to the Torrey Road Booster Station. Electrical upgrades have been completed. New pumps were purchased but were not installed as planned. The City will reportedly move forward with pump installation in the near future.

AUXILIARY POWER

Power Type	None	Power Rating (kWh)	
Fuel Type		Starting Frequency	
Capacity (gpm)		Load Testing Frequency	

Total Pump Capacity (gpm)			mgd
Firm Pump Capacity (gpm)			mgd
Auxillary Power Capacity (gpm)			mgd
Max Day Demand @ this location			mgd
Peak Hour @ this location			gpm (Hydropneumatic Stations)
Avg Day Demand @ this location			mgd
Firm Pump Capacity/Max Day			%
Peak Hour/Firm Pumping Capacity			% (Hydropneumatic Stations)
Aux. Power Capacity/Avg Day			%

Comments:

Pumping

Booster Pumping Stations - Construction, Controls & Maintenance	
Location:	Torrey Road Booster Pumping Station
Function:	Boost pressure to the southwest portion of the City, including the Hospital area

Pumps and motors are on a routine Preventive Maintenance (PM) schedule consisting of visual inspection, checking oil levels, and greasing bearings and fittings. On an as-needed basis, oil is changed, packing is adjusted, bearings are replaced, etc. Recent, non-routine work is shown below:

Torrey Road Station 2000 gpm pump	Torrey Road Station

DISTRIBUTION

Interconnections with Other Supplies

Is water purchased from other supplies? _____

If yes, list WSSN number (s): _____

No. of Emergency Connections: _____

Location	Main Size	Capacity	Metered?	Status (Regular/Emergency)	WSSN of Connection

Are valves at the interconnections exercised annually? _____

Are the interconnected mains routinely flushed? _____

Comments: Water is sold to the City of Flint by the Great Lakes Water Authority (GLWA). Flint is making a decision whether to continue purchasing water from GLWA or to upgrade the water treatment plant and treat raw water purchased from the Karegnondi Water Authority (KWA). Currently, water is tranmitted from GLWA to the water plant site, and is master-metered through Control Station 2 (CS-2). At CS-2, the City adds NaOH, orthophosphate, and sodium hypochlorite.

Distribution Piping

Mains by Material	
Cast Iron	96.64%
Ductile Iron	2.64%
Steel	0.46%
Concrete	0.22%
Other	0.03%
Galvanized	0.01%

Mains by Size	
2"	0.11%
3"	0.26%
4"	4.47%
6"	51.59%
8"	23.74%
10"	0.59%
12"	8.11%
14"	0.81%
16"	3.52%
18"	1.90%
20"	0.00%
24"	3.88%
30"	0.58%
36"	0.35%
42"	0.06%
48"	0.01%
72"	0.02%

Mains by Date of Installation	
1900 to 1910	3.50%
1911 to 1920	25.90%
1921 to 1930	34.00%
1931 to 1940	6.30%
1941 to 1950	1.20%
1951 to 1960	25.00%
1961 to 1970	2.10%
1971 to 1980	0.30%
1981 to 1990	1.70%
1991 to 2000	0.20%
2001 to Present	10.80%

Estimated percent of piping with coal tar lining _____ %

Comments:

Distribution piping data is taken from the 6/28/16 draft Asset Management Report by Rowe PSC and is based on 3,079,442 feet (583.2 miles) of water main.

DISTRIBUTION

Operational Concerns & Maintenance

Are there areas where water main breaks are frequent? Yes
If yes, identify locations: See comments

Comments:
From 2010 - 2013, the City averaged about 155 breaks per year. In 2014 - 2015, which includes the period when the water plant was in full-time operation, the City averaged about 300 breaks per year. There has been a significant reduction in the number of breaks in 2017, which may be related to taking the West Side Reservoir and pumping station off line for inspection (it is believed that surges associated with operation of pumps and valves at West Side are a significant factor in water main breaks).

Year	Number of Breaks
2012	159
2013	153
2014	316
2015	277
2016	138

The City is working toward the Partnership for Safe Water goal of not more than 15 breaks per year per 100 miles of main, which equates to 85-90 breaks per year.

Leak Detection and Condition Assessment:

The City contracted with Echologics LLC in 2015 and 2016 to conduct a leak assessment of the majority of water main in the distrbution system and a condition assessment on 24 miles of critical mains (road, railroad, and waterway crossings). A water audit was also completed, GIS data points were collected, and GIS training was provided.

The leak assessment work was divided into standard "listening" at most locations and "correlation" on 15 miles of critical mains. The "listening" portion of the leak assessment identified 82 leaks with an estimated total loss of 327 gpm. The "corrleation" portion of the assessment found no confirmed leaks, but identified four "Points of Interest (potential leak sites)" that require further investigation.

The condition assessment found that, of the critical pipes tested, 31% appeared to be in good condition, 15% were in moderate condition, 8% were in poor condition, and 46% did not return a result.

Are there areas where aesthetic water quality complaints are frequent?
If yes, identify locations:

Comments:
Operators are currently doing a good job of meeting treatment goals, and there is a significant amount of flushing and other distrbution maintenance practices taking place in an attempt to meet distribution system water quality goals; therefore, distribution system water quality is improving. Many members of the public have not regained confidence in the water system, however.

Do you receive complaints alleging illness due to the water? Yes
If yes, identify locations:
Comments:
There have been complaints of lead-related and Legionella-related illnesses during and since the water crisis began.

DISTRIBUTION

Operational Concerns & Maintenance

Are there areas where customers complain of low pressure? No

If yes, identify locations: _____ _____

_____ _____

Comments:

What is the procedure to respond to and track these complaints?
Comments:
There are a number of personal and online resources available to track and address complaints.

Distribution System Capacity

Are there areas where peak flows (including fire flow) cannot be maintained? No

If yes, identify locations: _____ _____

_____ _____

Comments:

Last ISO report date? _____ Rating _____

Proposed distribution system improvements (Location and Estimated Completion Date):
Several neighborhoods were identified for water main replacment in a 2016 DWRF Project Plan. Proposed work areas were prioritized based on several factors including occupancy, service line material, and break history. The project is in the DWRF Fundable Range, but the City must demonstrate a long-term, secure water source to qualify for funding. If funded, work would begin in 2017 or 2018.

Distribution System Optimization

An *Assessment of Current Practices and Gap Analysis Technical Memorandum* is being completed by Arcadis Group. The document compares existing conditions and practices to industry best practices, identifies "gaps" where best practices are not being achieved, and recommends improvements. The evaluation includes water quality integrity, physical integrity, and hydraulic integrity. The completed analysis is expected to provide valuable operational advice.

DISTRIBUTION

Hydrants		
Number of Hydrants	3605	(from 2013 Rowe Reliability Study)
Number Without Auxiliary Shut-Off Valves		
Number that are Self-Draining		
Number of Inoperable Hydrants	See comments	
Frequency of Hydrant inspection:		
Inspection Staff:		
Are there areas where additional hydrants are needed?		
If yes, list locations:		
Hydrant location system		Accurate?
Are hydrants color coded for capacity?	No	
Has this information been provided to the fire department?		
Frequency and seasons of hydrant flushing	Annual (fall)	
Purpose of flushing	Maintain water quality	
Is the public notified prior to flushing?	No	
Does flushing follow a specific format?	No, but a UDF program is being developed	
Is the volume of water used during flushing estimated?	No	
Do hydrants receive maintenance painting?	No	
Is a record maintained of hydrant activities?	No	

Hydrant records should include: Hydrant number, location of the hydrant, type of hydrant, size of barrel, size of bottom valve, size of lead, direction of turn, operable or inoperable, auxiliary valve type and size, weep holes plugged or unplugged, condition of hydrant (caps, chains, valve operation, operating nut, leakage & etc.), color coded capacity, flow data (gpm & psi) flushing dates, inspection dates.

Comments:

The City reported approximately 35% of hydrants being inoperable or needing repair. Recent hydrant upgrades are as follows: 2013 - 30 replaced, 11 repaired; 2014 - 12 replaced, 7 repaired; 2015 - 53 replaced, 19 repaired. Recent efforts are very good, but a high percentage still require repair or replacement.

Valves		
Number of Valves	8228	(From 2016 Rowe Reliability Study)
Number of inoperable valves	100	(See comments)
Are there areas where additional valves are needed?		
If yes, list locations:		
Valve location system	Map	Accurate?
Valve Turning Frequencies	Primary:	
	Others:	
Records Maintained?		

Valve records should include: valve number, location of valve(with witness points), type of valve, size of valve, normal operating status (open or closed), condition of valve (operable or inoperable), direction of turn, number of turns, and dates of operation.

Comments:

The City has been aggressively identifying and repairing or replacing inaccessible and inoperable valves. The City has reported that 57 valves were replaced in 2015, 85 were replaced in 2016, and 27 were replaced through March 2017. Valve boxes have been located and cleaned out. According to the Distribution System manager, a 2015 valve study identified 900 inaccessible/inoperable/problem valves, and the City is reporting that it has addressed 800 of those, leaving about 100 in need of maintenance/repair/replacement. The City has applied for DWRF funding to replace a significant amount of water main, which would result in additional valve replacement. Recent efforts are very good; however, continued progress and a long-term plan are still needed.

DISTRIBUTION

Customer Service Information

Number of service connections	56,038	(number of parcels in City)
Occupied parcels	43,406	(estimated number currently occupied)
Number of metered service connections		

Percentage of service line materials (all parcels):	
Copper	48.0%
Galvanized or lead	52.0%
Unknown	
Other	---

Ownership of Service (CWS/Customer)	
From Corp Stop to Curb Stop	City
From Curb Stop to Property Line	City
From Property Line to Meter	Customer
Meter	City

Comments: The City's FAST Start Program conservatively estimates there are 29,100 lead/galvanized service lines needing replacement. Sites with suspected lead/galvanized lines are investigated, and non-copper portions of the lines are replaced. From July 1, 2016 to June 30, 2017, the City replaced 2150 service lines. This represents slightly over 7 percent of all targeted service lines, which meets the EPA's requirement of at least 7 percent replacement each year after a lead action level exceedance.

CUSTOMER METERS

Types of meters Used	
Number of Meters with Remote Reading Devices	
Residential Meter Sizes	
Industrial/Commercial Meter Sizes	
Meter Testing/Maintenance Program	
Average Age of Meter in System	
Criteria for Changeout	
Number or Percent Changeout per Year	
Master Meter Locations	
Calibration of Master Meters	
Meter Reading Staff/Contract:	

Detailed information regarding the city's water meters and replacment program was not available at the time of the survey, and therefore the meter program could not be evaluated.

Percent of Usage by Customer Type	
% Residential	80%
% Other	20%

Large Users - % of Use	
McLaren Regional Medical Center	1%
Genesee County Jail	<1%
Hurley Medical Center (6th and Begole)	<1%
Hurley Medical Center (One Hurley Place)	<1%

Comments:
General Motors was a former customer that is now purchasing water from Genesee County, but may reconnect to the City's water system. The City is concentrating on the replacement of lead service lines. Approximately 1200 lead lines have been replaced in the last few years.

Water System Activity

Year	# of Construction Permits Issued	Permitted Amount of WM Feet
2007	6	16,556
2008	4	2698
2009	4	35,273
2010	3	10,355
2011	1	13,854
2012	2	0
2013	1	31,418
2014	2	0
2015	4	18,100
2016	3	10,300

A detailed breakdown of water main permits by purpose (new vs. replacement) was not available at the time of the survey. A review of records indicates that the majority of these permitted mains are for the replacement of existing mains. Most new main is associated with transmission of raw water. Some permits included here are for pumps, controls, storage, and other improvements.

Comments:
Some of the above-permitted main was not constructed.

DISTRIBUTION

Water Rates

What is your current rate schedule?	See comments
Are current rates adequate to support O&M and CIPS?	See comments
When was last time rates were adjusted?	2015
Has a water rate study been performed? When?	
Is there a meter charge or ready to serve charge?	Yes
Is a copy of the water rate schedule and ordinance available?	

Comments:

A rate analysis was completed in 2016 by Raftelis Financial Consultants, which indicated a "typical" monthly water bill of $53.84 for 5 ccf of water consumption. The bill includes commodity charges, operating costs, capital costs, personnel costs, etc. The Raftelis survey indentifies the commodity charge portion of a typical bill as $15.89/month, or $3.18/ccf ($4.25/1000 gallons). The Raftelis survey further indicates that the current rate structure is not sufficient to meet future expenses due to a number of factors. The actual future gap between revenue and expenses is dependent on the City's final Source Selection and associated costs. The current rate was established in 2015 through a court decision.

Repair Parts Inventory

Extra Mains (Sections for Each Size in Service)	
Repair Clamps (2 or more for each size)	
Tees, Crosses & Elbows	
Hydrants	
Valves	
Services (Corp & Curb Stops, Clamps and Lines)	
Other	

Comments:

Information about repair parts and equipment was not available at the time of the survey.

Safety Programs

Confined Space Entry Program	
Trench Safety Program	

Comments:

Information about the city's safety program was not available at the time of the survey.

PROGRAM COMPLIANCE

Cross Connection Program

Ordinance No.	Ch. 46, Art. II, Div. 4	Date:	Various
Approved Program (Y/N)?		Date:	
Staff Assigned to Program: (No., Dept and/or who)			
Is Annual Cross Connection report required (Y/N)?			Yes
Was previous year's annual report received (Y/N)?			No Date:
Was previous year's annual report acceptable (Y/N)?			No
Inspection Status:	Inactive		
Assembly Testing Frequency		High Hazard:	Low Hazard:
Assembly Testing Performance			
Recordkeeping:			
Private Well Isolation/Abandonment Procedure:			

Comments:
Annual Cross Connection Report forms have not been received for 2015 or 2016. The Cross Connection Inspector has been working primarily on plumbing permits, and inspections are not being completed.

Annual Pumpage Report

Is Annual Pumpage Report required (Y/N)?	No	
Was previous year's annual report received (Y/N)?		Date:

Comments:

Monthly Operation Reports

Are Monthly Operation Reports required (Y/N)?	Yes	
Were all previous year's reports received (Y/N)?	Yes	Timely? Yes
Are previous year's reports acceptable (Y/N)?	Yes	

If no, describe problems:

Comments:
The monthly operation report includes water purchased from GLWA, chemicals added at CS-II, water quality data at the water plant tap, and water quality data from the distribution system. Chemical treatment at the Cedar Street and West Side Reservoirs is reported on daily summary reports. Chemical feed data from the reservoirs should be included on the monthly operation reports once it is determined that daily summary reports are no longer required.

Consumer Confidence Report

Is the annual CCR required? (Y/N)	Yes	
Was the previous year's report received? (Y/N)	Yes	Date: 6/13/2017
Was the previous year's acceptable? (Y/N)	Yes	
Was the previous year's certification form received? (Y/N)	Due 10/1/17	Date:

Comments:

Emergency Response Plan

Date of ERP	2013	Acceptable?	
Filed where?			

Comments:
The most recent Emergency Response Plan on record with the DEQ is from 2013. The 2013 Sanitary Survey recommended an update Emergency Response Plan due to changes in operations. Since then, signficant changes to city and DEQ staffing and operational practices have occurred, and an updated plan is now required. If an updated plan exists, the DEQ should be notified of its availability.

PROGRAM COMPLIANCE

General Plan

Date of Most Recent Plan:	Various, up to 2016	
Filed Where?	Part of Rel. Study/Asset Mgt.	Acceptable?
	General Layout	Yes
	Facility locations & capacities	See comments
	Water Main Inventory	Yes
	Identification of Service Areas	In Contract w/GLWA
	Hydraulic Analysis	See comments
	Capital Improvement Plan	In DWRF Project Plan

Comments:
There is an existing hydraulic model of the distribution system, but fire flow contours or similar data were not provided. The U.S. EPA is in the process of developing and calibrating a new model. A draft Asset Management report was completed in 2016, which focused on the distribution system only, pending a selection of water source. Facility locations and storage and pumping capcities are included in the Reliability Study. Treatment capacities are available in this Sanitary Survey. A limited Capital Improvement Plan was also completed by Imagine Flint in 2105.

Reliability Study

Date of Most Recent Study:	2016	
Filed Where?	City, MDEQ	Acceptable?
Contents:	5 & 20 Year Demand Projections	Yes
	Source Production Totals (Monthly)	
	Customer Supply Usage (Annual)	
	Res/Comm/Ind Usage (Annual)	Residential vs.other
	Water Shortage Response Plan	See comments
	Recommended Improvements	

Comments:
The Reliability Study projects a 20 percent population loss between 2015 and 2040, which would further affect the City's ability to raise adequate revenue through water rates. The study includes a detailed water shortage response plan, and water shortage is also addressed in Chapter 46, Article 1 of the City Ordinances. The water shortage response plan may need modification once the long-term and backup supply selection is made.

Permits

Applies for and obtains permits prior to construction (Y/N):	Yes	
Reviews plans prior to submittal to DEQ (Y/N):	Yes	
Standard specifications on file at CWS (Y/N):		
If applicable, adheres to contract with supplier regarding plan submittal (Y/N):	See comments	Date:
Follows master plan for any construction (Y/N):		
Develops as-built plans (Y/N):		
Updates general plans (Y/N):		

Comments:
The water contract with GLWA allows for review and approval of projects related to: new metering facilities, water mains sized 24 inches or larger, pump stations, reservoirs, water towers, and projects in proximity to GLWA facilities. It is not known whether GLWA routinely excercises its right to do so.

PROGRAM COMPLIANCE

Capacity Development

Comments on Capacity Development: The EPA has required (in its Administrative Order) that the City must demonstrate adequate Technical, Financial, and Managerial capacity (TMF) prior to switching to another water source (i.e., other than treated water purchased from the Great Lakes Water Authority (GLWA)). The decision whether to continue to purchase water from GLWA, begin treating raw water from the KWA, or select another source has not been finalized. Because the City's source water selection decision is not finalized, it is not known whether a formal TMF demonstration will be required. However, certain aspects of a TMF demonstration are necessary regardless of source selection.

The following components of a TMF capacity assessment warrant further discussion:

Technical Capacity:
1. Source - a water system must have an adequate quantity of water available to meet demands, either through its own production facilities or secured through contract and capable of delivery from another water system. At this time, the City only has a short-term agreement with GLWA for the purchase of treated water. The DEQ had instructed the City to either approve the long-term agreement with GLWA that was negotiated by Mayor Karen Weaver, or offer a reasonable alternaivte proposal to provide drinking water from another source, by June 26, 2017. The City has not done so, and therefore does not have satifactory Technical Capacity with regard to its source.

Financial Capacity:
1. Budget - a water system must have adequate revenue to operate its water system, including operational costs, personnel costs, capital improvements, and debt retirement. As stated in the Flint Water Rate Analysis by Raftelis, operational costs and staffing levels are highly dependent on the City's final selection of a water source. Raftelis projects a future gap between revenue and expenses, although the analysis was based on routine operation of the City's water plant and other conservative assumptions. The actual future gap, if any, is dependent on source selection, the terms of any water service agreements, efforts to improve water accountability (currently around 50 percent unaccounted), availability of grants and alternative funding sources, relative levels of automation and staffing, water rates, etc. Once the source determination is made, water rates should be reviewed and, if necessary, adjusted to ensure adequate financial capcity with regard to budget. It should be noted that, in addition to other duties, water treatment/operations staff are responsible for operation of five dams on the Flint River. The time and resources needed to manage the dams must be accounted for when developing staffing and budget plans for water treatment/pumping.
Also, it has been mentioned that a low pay scale is reportedly contributing to the City's difficulty in recruting, hiring , and retaining staff.

Managerial Capacity:
1. Maintaining Certified Operators - a water system must place its treatment and distribution systems under the supervision of properly-certified operators. Operations staff may either be City employees or contractors. The operator currently supervising the distribution system is a City of Flint permanent employee. The operator in charge of the treatment system is a contractor with Fleis & Vandenbrink Operations. The City may attempt to recruit an internal or external candidate to supervise the treatment system.
2. Sampling Plans - a water system must prepare sampling plans, and follow the plans when conducting compliance monitoring under the Safe Drinking Water Act. The City's Total Coliform Rule sampling plan must be revised to include an additional five (5) routine sites, with associated repeat sites. The Disinfection Byproducts sampling plan is satisfactory, but may need future revisions based on the Arcadis Group distribution system optimization study. The lead and copper sampling plan is revised as necessary as additional information is obtained regarding service line materials.
3. Cross Connection Control - a water system must implement a program for the elimination of cross connections within its distribution system. It appears that due to personnel shortages, adequate time is not being devoted to cross connection control, and inspections and program administration are lacking.
4. Other Plans and Studies - a water system must complete other plans and studies as required by the Safe Drinking Water Act. The City completed a draft Reliablity Study and a draft Asset Management Plan in 2016. These studies should be finalized. Their contents are used to justify the City's Drinking Water Revolving Fund (DWRF) Project Plan and funding application. Also, an Asset Management Plan, and a 5-year and 20-year Capital Improvement Plan are required components of a Water System General Plan.

MONITORING

Bacteriological

Date of Approved Site Sampling Plan:	2/21/2017		
Number of samples required each month:	100	Basis:	Population
Certified Lab Used:	City of Flint water plant		
MCL, Monitoring or Reporting Violation(s) in past 3 years? (Y/N)	Yes	Date:	2014
Number & Type of Violations	3 MCL violations in 2014		
Public Notice Issued according to regulations? (Y/N)	Yes	Date:	Various

Comments:
The RTCR sampling plan was approved on 3/2/17 based on 20 routine sampling sites. Five more potential routine sites, with assoicated repeat sites, have been identified. The suitability of the sites will be confirmed, and the sampling plan will be expanded to 25 routine sites in the near future.

Chemical

Date of Monitoring Schedule:	5/12/2017
MCL, Monitoring or Reporting Violations(s)? (Y/N)	No
Public Notice Issued according to regulations? (Y/N)	NA
Detects for inorganics > 50% of MCL? (Y/N)	No
Detects for VOCs (Y/N)	No
Detects for SOCs (Y/N)	No
DBP Sampling Done According to Approved Plan? (Y/N/Waived)	Yes
Date of Approved Disinfection Byproduct Monitoring Plan:	7/12/2016

Comments:
The DBP Monitoring Plan may need to be updated based on the distribution system optimization study (in progress).

Lead and Copper Monitoring

No. of Samples Required:	60		
Frequency (Semi Annual/Annual/Triennial)	See comments		
Exceedance of lead or copper action level (Y/N)	See comments		
If yes, was public education issued? (Y/N)	See comments	Date:	
Next Monitoring Period:	1/1/17 - 6/30/17	(final reporting in progress)	
Corrosion Control Program Status, if applicable	See comments		
Lead service line replacement status, if applicable	Active - see Customer Sevice Information page of this sanitary survey for details		

Comments:
The city has collected two consecutive, 6-month rounds of samples (in 2016 and 2017) meeting the lead and copper action levels. The last monitoring period that exceeded the lead action level was January-June 2016. All required responses were completed in response to exceeding the action level. Samples are collected by the City, sentinel teams, and the public, and all valid tier 1 site results are used to calculate the 90th percentile lead and copper concentrations and determine compliance. The city is practicing corrosion control treatment for the incoming water from the GLWA. A corrosion control study is currently being conducted by Cornwell Engineering Group to evaluate current conditions and evaluate future possible situations (continued purchase of finished water from GLWA, purchase of water from Genesee County, treatment of KWA raw water at the Flint Water Plant, and combinations/mixing of those sources).

Radiological Monitoring

Date of Monitoring Schedule	Not Required		
Alpha, beta, radium, uranium		Date:	
Radon		Date:	
Tritium		Date:	
Detects for Rads > 50% of MCL? (Y/N)			
If yes, list		Date:	

Comments:
Radiological monitoring is the responsibility of the wholesale supplier (Great Lakes Water Authority)

Analytical Capabilities

Parameter	Analytical Method(s)	Calibration Frequency	Instruments Used	Method of Data Recording	Frequency of Measurements	Sampling Location	Location for Water Source	Analysis Run by
Alkalinity	SM 2320B Titration	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Total Hardness	SM 2340C	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Calcium Hardness	SM 3500 Ca D	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
pH	SM 4500 H+B Electrometric	Daily	Hach HQ440d Hach SL1000	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
			Hach HQ440d		Every 2 Hours Every 2 Hours	CS-II Mini Lab Tap	GLWA Supply Main In-Plant Piping	Operations staff
Conductivity	SM 2510B	Monthly	Mettler Toledo Hach SL1000	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Temperature	SM 2550B	Annually	Grade 1 Thermometer	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Fluoride	SM 4500 F-C ISE	Daily	Hach HQ440d	Manual	Daily Daily	CS-II Lab Tap	GLWA Supply Main In-Plant Piping	Lab staff
Chlorine Residual		Daily	Hach SL1000	Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
		Periodic Checks by Lab Manager	Hach Pocket Colorimeter II	Manual	Every 4 Hours Every 2 Hours	CS-II Mini Lab Tap	GLWA Supply Main In-Plant Piping	Operations staff
			Hach CL-17	Manual Manual	Continuous Continuous	CS-II WTP Basement	GLWA Supply Main In-Plant Piping	Operations staff
Chloride	SM 4500 Cl-B Argentometric	Per batch of titrant	Standard burettes	Manual	Weekly Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Turbidity	SM 2130B Nephelometric	Monthly - primary Daily - secondary	Hach 2100 N	Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Total Colform	SM 9223 B-04 Colilert	Biannual PE		Manual	Twice per day Twice per day Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
HPC	SM 9215 B IDEXX Simplate	Annual PE		Manual	Weekly Weekly Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff
Iron			Hach DR 3900	M	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab staff

Analytical Capabilities

Parameter	Analytical Method(s)	Calibration Frequency	Instruments Used	Method of Data Recording	Frequency of Measurements	Sampling Location	Location for Water Source	Analysis Run by
Sulfate			Hach DR 3900	Manual	Daily	Lab Tap	In-Plant Piping	Lab Staff
Phosphate			Hach DR 3900	Manual	Daily Daily Weekly	CS-II Lab Tap Distribution	GLWA Supply Main In-Plant Piping Per RTCR Sampling Plan	Lab Staff

Other Notes/Observations on Laboratory Practices/Capabilities

1. The lab is certified for Total Coliform, E. Coli, HPC, and fluoride.
2. Based on inspections and conversations between lab staff and DEQ field personnel, lab practices are generally satisfactory. Minor issues brought to the attention of the Lab Manager are addressed promptly.
3. Lab QA/QC appears to be greatly improved under the current Lab Manager, who is working on plans for further imprrovement.
4. The laboratory balance was last calibrated in December 2016. Scale accuracy is checked monthly using certified weights..
5. The laboratory is successfully running extra performance evaluation/proficiency testing samples each quarter for all parameters being reported to the DEQ/EPA.

TREATMENT

Disinfection (sodium hypochlorite addition)

Point of Treatment	Control Station 2		
Injection Point:	42-inch supply main		
SDWIS Facility ID (site ___)			
Purpose:	See comments		
Year Initiated	2016		
Product:	Havasan LB-12		
Manufacturer:	Haviland		
Chemical Strength:	12%		
Dilution:	NA		
ANSI/NSF Standard 60 Approval? (Y/N)	Yes	NSF max dose:	84 mg/L
Target Feed Rate/Dosage	1.0 - 1.3 mg/L		
Basis for Target Feed Rate	See comments		
Range of Incoming (GLWA) Residual	0.6 - 1.4 mg/L		
Range of Plant Tap Free Residual	0.8 - 2.0 mg/L		
Range of Distribution System Free Residual	0.2 - 2.0 mg/L		
Frequency of residual testing — Incoming:	Continuous plus 2 confirmation grabs/day		
Plant Tap:	Continuous plus 2 confirmation grabs/day		
Distribution:	Several per week		
Analytical Method Used:	DPD		
Instrument:	Hach CL-17, Hach SL1000, Hach Pocket Colorimeter		
Any Overfeed Instances? (Y/N)	No	Date(s):	
Any Low Feed Instances? (Y/N)	No	Date(s):	

Feed Pumps:

Type:	Diaphragm	Model:	Milton Roy SD46-88P
Number of Pumps:	2		
Capacity:	10 gph each	Discharge Head:	150 psi

Type:	Diaphragm	Model:	LMI C721-71FS
Number of Pumps:	1		
Capacity:	4 gph	Discharge Head:	100 psi

(Note: this model is no longer manufactured, but repair parts are believed to be readily available)

Chemical Storage Tank Type	Totes (from supplier)	Volume:	220 gallons
Weight/Level Reading Method	Staff gage on tank wall		

Comments on Sodium Hypochlorite Feed: The City purchases treated water from the GLWA, and adds sodium hypochlorite, phosphoric acid, and sodium hydroxide to meet the plant tap free chlorine residual (1.7 mg/l), orthophosphate residual (3.6 mg/l), and pH (7.5 units) goals established by the U.S. EPA's technical team. The incoming, Plant Tap, and Distribution pH ranges shown above are for the period of time when sodium hypochloride has been fed. The feed pumps now have flow-paced controls to help maintain consistent feed rates.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The sodium hydroxide tote and sodium hypochlorite tote are stored together in a garage structure with air conditioning, a portable eye wash station, and face shield/gloves/PPE.

TREATMENT

Corrosion Inhibitor (phosphoric acid addition)

Point of Treatment	Control Station 2			
Injection Point:	42-inch supply main			
[redacted]				
Purpose:	See comments			
Year Initiated	2015 (December)			
Product	Phosphoric Acid			
Manufacturer:	Brenntag			
Chemical Strength	75%			
Dilution:	None			
ANSI/NSF Standard 60 Approval? (Y/N)	Yes (NSF)	NSF max dose:	13	mg/L
Target Feed Rate/Dosage	2.4 - 2.7	mg/L		
Basis for Target Feed Rate	See comments			
Range of Incoming (GLWA) PO4	1.0 -2.2	mg/L		
Range of Plant Tap PO4	3.5 - 3.9	mg/L		
Range of Distribution System PO4	2.9 - 3.9			
Frequency of residual testing — Incoming:	Daily			
Plant Tap:	Daily			
Distribution:	Several per week			
Analytical Method Used:	Spectrophotometry			
Instrument:	Hach DR3900			
Any Overfeed Instances? (Y/N)	No	Date(s):		
Any Low Feed Instances? (Y/N)	No	Date(s):		
Feed Pumps:				
Type:	Diaphragm	Model:	LMI C921-362SI	
Number of Pumps:	2			
Capacity:	4 gph each	Discharge Head:	100	
Chemical Storage Tank Type	PE Shipping Totes	Volume:	220 gallons	
Weight/Level Reading Method	Scale markings on tote			

Comments on Phosphoric Acid Feed: The City began feeding phosphoric acid in December 2015 to improve lead corrosion control by re-establishing an orthophosphate scale on lead surfaces within the distribution system/individual plumbing systems. The EPA has established a distribution system orthophosphate residual goal of 3.5 mg/l, and the City appears to be meeting the goal more consistently since May 2017. The incoming, Plant Tap, and Distribution PO4 residual ranges shown above are for the 12-month period covering June 1, 2016 to May 31, 2017.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The phosphoric acid tote is stored in a different bay from the sodium hydroxide and sodium hypochlorite storage/feed area in a garage structure with a portable eye wash station.

TREATMENT

pH Adjustment (sodium hydroxide addition)

Point of Treatment	Control Station 2		
Injection Point:	42-inch supply main		
GLWA Facility ID Code:			
Purpose:	pH adjustment		
Year Initiated	2017 (February)		
Product	Sodium hydroxide		
Manufacturer:	Brenntag		
Chemical Strength	25%		
Dilution:	None		
ANSI/NSF Standard 60 Approval? (Y/N)	Yes (NSF)	NSF max dose:	200 mg/L
Target Feed Rate/Dosage	2.6 mg/L		
Basis for Target Feed Rate	To meet the point-of-entry pH minimum goal of 7.5 units, and the distribution system goal of 7.5 +/- 0.3 units		
Range of Incoming (GLWA) pH	7.18 - 7.47		
Range of Plant Tap pH	7.17 - 7.50		
Range of Distribution System pH	7.14 - 7.59		
Frequency of pH testing – Incoming:	Every 2 hours plus daily confirmation grab by lab staff		
Plant Tap:	Every 2 hours plus daily confirmation grab by lab staff		
Distribution:	Several per week		
Analytical Method Used:	Electrode		
Instrument:	Hach HQ440d, Hach SL1000		
Any Overfeed Instances? (Y/N)	No	Date(s):	
Any Low Feed Instances? (Y/N)	No	Date(s):	

Feed Pumps:

Type:	Diaphragm	Model:	Milton Roy SD46-88P
Number of Pumps:	2		
Capacity:	10 gph each	Discharge Head:	150 psi
Type:	Diaphragm	Model:	LMI C721-71FS
Number of Pumps:	1		
Capacity:	4 gph	Discharge Head:	100 psi

(Note: this model is no longer manufactured, but repair parts are believed to be readily available)

Chemical Storage Tank Type	PE Shipping Totes	Volume:	220 gallons
Weight/Level Reading Method	Scale markings on tote		

Comments on Sodium Hydroxide Feed: The City began feeding sodium hydroxide in February 2017 to stabilize pH levels in the distribution system. Beginning in June 2017, the sodium hydroxide dosage was gradually increased to meet the EPA's recommended distribution system pH goal of approximately 7.5 units. The incoming, Plant Tap, and Distribution pH ranges shown above are for the period of time when sodium hydroxide has been fed. The feed pumps now have flow-paced controls to help maintain consistent feed rates.

The existing treatment system was designed and installed as a temporary measure while long-term treatment decisions are being made. Chemical scales may be installed at a later date. An SOP for chemical feed has been developed for both existing (temporary) and future (permanent) treatment at CS-II. Because the City has not selected a long-term water source, final decisions have not been made regarding the future treatment layout at CS-II.

Safety: The sodium hydroxide tote and sodium hypochlorite tote are stored together in a garage structure with air conditioning, a portable eye wash station, and face shield/gloves/PPE.

TREATMENT

Corrosion Control Treatment - General Comments

As part of the U.S. EPA's Emergency Administrative Order, the City's Optimal Corrosion Control plan must be reviewed and, if necessary, revised. To accomplish this, a contract was awarded to Arcadis Group to complete a Water Distribution System Optimization study, including a Corrosion Control Plan (CCP). The CCP is being completed by Cornwell Engineering Group as a subcontractor to Arcadis Group.

The proposed scope of the CCP (dated 12/19/16) included:

- -An evaluation of the existing Flint system (purchase of treated water from Great Lakes Water Authority)
- -The potential conversion to Genesee County as water supplier
- -A plan for treating KWA raw water at the Flint Water Treatment Plant
- -An evaluation of the interface (blending) between two sources of treated water

The DEQ recommended that the scope be flexible enough to consider other scenarios
The final CCP has not been finalized, in part due to delays caused by the City failing to select a permanent water source.

Appendix A

Classes offered at the Flint Water Treatment Plant, 2016-2017:

Safe Drinking Water Act Overview: September 27, 28, and 29, 2016 (2 hours each day) – Bryce Feighner (DEQ)
Basic Math and Hydraulics (condensed course): October 18, 19, and 20 (2 hours each day)
– Bob London and Jon Bloemker (DEQ)
Filtration: November 29, 30, and December 1, 2016 (2 hours each day) – Nick Pizzi
Rapid Mix, Flocculation, and Sedimentation: January 10 and 11, 2017 (2 hours each day) – Nick Pizzi
Jar Test Calculations: March 14, 2017 (2 Hours) – Nick Pizzi
Hands-on Jar Testing: March 15, 2017 (2 Hours) – Nick Pizzi
Chemical Feed: April 18, 2017 (2 Hours) – Nick Pizzi
Distribution Math: April 19, 2017 (2 Hours) – Nick Pizzi
Lime Softening Practice Math: April 19, 2017 (2 Hours) – Nick Pizzi
Ion Exchange Practice Math: April 20, 2017 (2 Hours) – Nick Pizzi
Basic Math: July 17, 2017 (2 Hours) – Nick Pizzi
Chemical Feed: July 18, 2017 (2 Hours) – Nick Pizzi

CITY OF FLINT

Dr. Karen Weaver
Mayor

September 8, 2017

Mr. Robert A. London, P.E.
Surface Water Treatment Engineer
Engineering Unit
Drinking Water and Municipal Assistance Division
Department of Environmental Quality
401 Ketchum Street
Suite B
Bay City, Michigan 48706

Sent via e-mail

Dear Mr. London,

This correspondence is in response to the Water System Sanitary Survey, WSSN: 2310 received on August 11, 2017. The Survey identified several ***significant deficiencies*** and ***deficiencies*** associated with the Flint water system. Additionally, ***recommendations*** are made regarding several elements of the water system. As required in your Violation Notice, the City requests the Department of Environmental Quality consider the following information when assessing the various survey elements.

Significant Deficiencies

1. **Source - The City has failed to select a long-term water supply source.**

The City administration has recommended a preferred primary long-term water source (GLWA) and is currently in litigation to support obtaining all approvals required to finalize all contracts. A final long-term water supply source selection should be completed within the 120 day corrective action time period.

2. **Distribution System – The City's cross connection program is not being implemented in a satisfactory manner.**

The City of Flint's Cross Connection manager has been performing the City's plumbing and mechanical inspections for the last two years. Therefore, cross connection inspections and backflow prevention devise testing has been deficient. The City plans to hire a cross connection manager before the end of 2017 to restart the cross connection control program. Initially, additional support personnel may be required on an "as needed" basis to catch up on the lack of cross connection activity over the last couple of years.

3. **Distribution System – The City has not provided details about maintenance and replacement programs and/or Standard Operating Procedures for hydrants, valves, meters, and galvanized service lines.**

The Standard Operating Procedures (SOPs) for the maintenance and operation of distribution system components are being developed by Arcadis as part of their Water Distribution System Optimization Plan. These draft SOPs should be available in September, 2017. Once the SOPs are reviewed and approved (planned for the end of 2017), budget and staff recommendations will be made to promote implementation of these best practices. These recommendations will be considered during the 2018 budget process.

4. **System Management and Operation – The DEQ does not have confidence that the City can continue to demonstrate the Technical, Managerial, and Financial (TMF) capacity necessary to consistently operate the water system in accordance with Act 399 after the current technical and training assistance contract expire.**

The City of Flint provided USEPA the attached August 18 correspondence addressing the managerial and operational staffing of the Utility's Water Division. The proposed staffing level (see organization chart) assumes that the mayor's water source recommendation is finalized. The City plans to achieve full staffing by the end of 2017. Training will continue until sufficient technical capabilities are achieved.

5. **Financial – The City should adopt an appropriate rate structure and administrative policies for the water system**

The City is currently undertaking a rate analysis based on the mayor's recommended water source selection. The Cost of Service analysis has been completed and provided to the FWICC Rate Subcommittee for comments. Comments have been received from the Subcommittee and these comments are being considered in the rate design. Upon completion of the rate study, appropriate rate adjustment will be considered when developing the 2018 budget.

Deficiencies

6. **Storage – The Cedar Street Reservoir requires an inspection**

The City agrees that Cedar Street Reservoir requires an inspection. However, before this inspection can be undertaken, a distribution system storage analysis is required to determine if West Side and Dort Reservoirs must be repaired/upgraded and placed in-service before draining Cedar Street Reservoir. This analysis is currently being performed by Arcadis. Hopefully, inspection of Cedar Street Reservoir can occur in 2018.

7. **Operator Compliance – The City has been unable to recruit and retain a properly-certified operator-in-charge, and is also having difficulty reaching desired staffing levels.**

Please see response to number 4. The City is interviewing candidates with appropriate credentials to be the certified operator-in-charge for the Flint water system. Additionally, Flint will continue to train existing operators to promote their achieving higher licensing levels. Hopefully, an existing operator will obtain the required licensing level through the MDEQ testing in November.

8. **Security – The City has not provided an updated Emergency Response Plan for DEQ review.**

The Emergency Response Plan will be updated by June, 2018.

Recommendations

9. **Source – An evaluation of the reliability of utility power and the need for an on-site emergency generator should be completed.**

The current treatment plant site receives electric power from two independent substations. This redundant power feed has historically provided a reliable electric power source to the treatment plant. Additional power source reliability should not be required.

10. **Treatment – Additional features should be added to the treatment system currently in operation at CS-II to enhance treatment reliability and consistency, as well as operator safety.**

The current chlorine, orthophosphate and caustic soda feed system were constructed as "temporary" facilities to treat GLWA water until a long-term water source was selected. If GLWA is designated as the long-term primary water source, the existing facilities will be modified to improve process control and monitoring, reliability, redundancy and ease of operation. Design of these improvements by CDM-Smith has commenced and will be completed after the water source selection is finalized. Construction will be completed in 2018.

11. **Distribution System – The City should plan financially for periodic updates of the General Plan, Asset Management Plan and Capital Improvement Plan.**

The City will either budget for periodic updates of these Plans or develop the in-house capabilities to properly modify the Plans to reflect changing conditions.

12. **Distribution System – The design of future water main replacement projects should strongly consider water age/water main sizing.**

A hydraulic model of the Flint distribution system has been develop and calibrated. This tool predicts water age under various hydraulic conditions in the distribution system. A storage analysis is also currently being conducted to optimize system storage considering peak demand requirements and the impact of water age on water quality. The results of these analyses will be used to develop the scope and timing of required distribution system capital improvement projects.

13. **Storage – A back-up power supply should be provided for the Cedar Street Reservoir booster station.**

The Cedar Street switchgear is compatible with the hook-up of a mobile generator. The City will either purchase a properly sized portable generator to service the booster station during a power outage or outsource this emergency response to a qualified vendor.

14. **Pumps – Upgrades to the Torrey Road and Cedar Street booster pumps should be completed.**

The Torrey Road booster pumps will be installed in 2018. The installation of pumps and VFDs in the Cedar Street booster station is included in a list of projects that will request WIIN/DWRF funding. A Project Plan will be submitted for this funding by December, 2017. Assuming the funding is approved, design will be completed in 2018 and installation in 2019.

15. **Monitoring and Reporting – The City should begin planning financially for staff to complete all monitoring and reporting requirements.**

As previously stated, the City will be fully staffed by the end of 2017. This staffing includes the water quality and laboratory support personnel to achieve MDEQ monitoring and reporting requirements, including the requirements of the Lead & Copper Rule.

The City recognizes that all ***significant deficiencies*** will not be corrected within the 120 day corrective action time period mandated in your letter. However, once a water source selection is finalized, staffing levels are enhanced, a Program Manager is contracted and SOPs are completed, the City will have made significant progress toward improving the quality and reliability of its water system operation.

If you have clarifying questions and/or need additional information, please contact me at (810) 237-2035 or via email at kweaver@cityofflint.com.

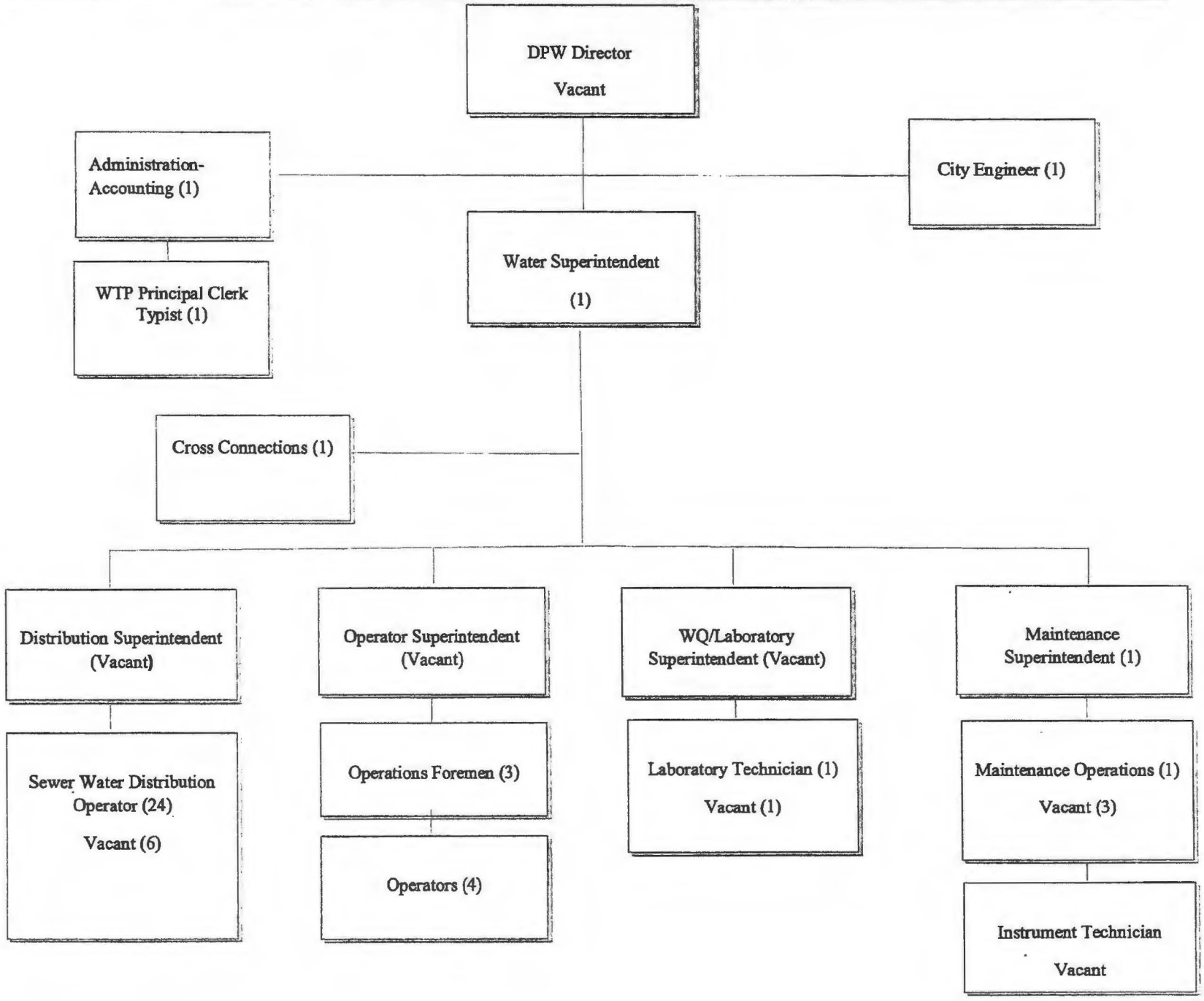
Respectfully submitted,

Karen W. Weaver

Dr. Karen W. Weaver
Mayor

cc: Mr. Eric Oswald, MDEQ
Mr. Sylvester Jones, City of Flint
Mr. Rob Bincsik, City of Flint
Mr. Mark Adas, City of Flint

Attachments:
City of Flint Correspondence to USEPA – August 18,2017
Flint Water Organization Chart


DPW Director
Vacant
Administration-Accounting (1)
City Engineer (1)
WTP Principal Clerk Typist (1)
Water Superintendent (1)
Cross Connections (1)
Distribution Superintendent (Vacant)
Operator Superintendent (Vacant)
WQ/Laboratory Superintendent (Vacant)
Maintenance Superintendent (1)
Sewer Water Distribution Operator (24)
Vacant (6)
Operations Foremen (3)
Operators (4)
Laboratory Technician (1)
Vacant (1)
Maintenance Operations (1)
Vacant (3)
Instrument Technician
Vacant

Attachment C

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
SAGINAW BAY DISTRICT OFFICE

C. HEIDI GRETHER
DIRECTOR

March 21, 2018

The Honorable Karen W. Weaver, Mayor
City of Flint
1101 South Saginaw Street
Flint, Michigan 48502

Dear Mayor Weaver:

SUBJECT: Water System Sanitary Survey, WSSN: 2310

The Department of Environmental Quality (DEQ) has reviewed the city of Flint's (City) efforts to resolve the Significant Deficiencies and Deficiencies identified in our 2017 sanitary survey of the City water system. The City, the DEQ, and the U.S. Environmental Protection Agency (EPA) have been working closely to address these issues.

The Significant Deficiencies, Deficiencies, and Recommendations listed below were identified in our sanitary survey, and the City provided a response in your September 8, 2017 letter. Based on your response, and several discussions with City staff and contractors, we have the following comments.

Significant Deficiencies

1. **Source – The City has failed to select a long-term water supply source.**

This issue is resolved. The City executed a 30-year water supply agreement with the Great Lakes Water Authority (GLWA), with an effective date of December 1, 2017. Selection of a long-term water source allows the City to move forward with addressing other water system issues.

2. **Distribution System – The City's cross connection control program is not being implemented in a satisfactory manner.**

This issue is unresolved. The City has stated its intent to fill the vacant cross connection manager position and resume cross connection control activities but has been unable to hire a permanent employee for the manager position. It is our understanding that the City is negotiating for temporary, contractual assistance to oversee its cross connection control program. The use of contractual services to implement the program is acceptable to DEQ. A permanent or contractual cross connection manager must be in place, and routine cross connection control program activities must resume, by June 20, 2018. Implementation of the cross connection program will be evaluated under item 4 (System Management and Operation) below.

3. **Distribution System – the City has not provided details about maintenance and replacement programs and/or Standard Operating Procedures (SOPs) for hydrants, valves, meters, and galvanized service lines.**

This issue is unresolved. Several SOPs were prepared for the City by the Arcadis Group as part of the City's Distribution System Optimization Plan, but the City has not indicated its formal approval of the SOPs. For each Distribution System SOP, the City must provide the following to the DEQ by April 20, 2018: a signed, dated copy of the SOP (if the City intends to implement the SOP as written), or a statement indicating that a revised SOP is necessary. If revised SOPs are necessary, signed, dated copies of the revised SOPs must be submitted to us by May 21, 2018. Also, an SOP for galvanized service lines was not submitted and a signed, dated copy must be provided by May 21, 2018. The City's implementation of the approved SOPs will be evaluated under item 4 (System Management and Operation) below.

4. **System Management and Operation – The DEQ does not have confidence that the City can continue to demonstrate the Technical, Managerial, and Financial (TMF) capacity necessary to consistently operate the water system in accordance with Act 399 after the current technical and training assistance contracts expire.**

The overall issue of demonstrating adequate TMF capacity remains unresolved until the other Significant Deficiencies and Deficiencies identified in this letter are appropriately addressed. The DEQ will continue to work with the City and with EPA to ensure TMF capacity is maintained.

5. **Financial – The City should adopt an appropriate rate structure and administrative policies for the water system.**

This issue is unresolved. Selection of a long-term water source has allowed the City to begin financial planning; however, a water rate structure must be implemented that allows the City to properly operate and maintain the water system. The City must notify us by May 21, 2018, of your plan to implement a sufficient rate structure, including an effective date for any new rates.

Deficiencies

6. **Storage – The Cedar Street Reservoir requires an inspection.**

This issue is unresolved; however, the DEQ agrees the distribution system storage analysis should be completed before an inspection plan and schedule are developed for the Cedar Street Reservoir. The City projects the analysis will be completed and the reservoir inspection will take place in 2018. The inspection must be completed, and an inspection report and plan for completing any necessary improvements must be submitted to us, by September 28, 2018.

7. **Operator Compliance – The City has been unable to recruit and retain a properly-certified operator-in-charge, and is also having difficulty reaching desired staffing levels.**

This issue is unresolved. The City has been unsuccessful in its attempts to recruit and hire critical water system staff. The City must supply a full-time operator-in-charge on a permanent or contractual basis and sufficient staffing on a permanent or contractual basis to conduct continuous treatment system operations by June 30, 2018.

8. **Security – The City has not provided an updated Emergency Response Plan for DEQ review.**

This issue is unresolved; however, the City has committed to competing the Emergency Response Plan by June 2018. We interpret this to mean an updated plan will be submitted to DEQ by June 30, 2018. This schedule is acceptable to the DEQ.

Recommendations

9. **Source – An evaluation of the reliability of utility power and the need for an on-site emergency generator should be completed.**

This issue is resolved. The selection of a long-term water source has made an evaluation of the power supply to the water treatment plant unnecessary. Power needs may be considered during the design of permanent chemical feed facilities (item 10 below).

10. **Treatment – Additional features should be added to the treatment system currently in operation at CS-II to enhance treatment reliability and consistency, as well as operator safety.**

Design of chemical feed system improvements must be completed by December 31, 2018, and construction must be completed by December 31, 2019.

11. **Distribution System – The City should plan financially for periodic updates of the General Plan, Asset Management Plan and Capital Improvement Plan.**

The City indicated its intent to budget for periodic updates or develop in-house capability to complete these tasks. The cost of completing this task must be reflected in your water rates/budget.

12. **Distribution System – The design of future water main replacement projects should strongly consider water age/water main sizing.**

The City indicated its intent to use the recently-developed hydraulic model of the distribution system during the design of water system improvements. This is acceptable to the DEQ.

13. **Storage – A back-up power supply should be provided for the Cedar Street Reservoir booster station.**

The City indicated its intent to either purchase or arrange for the use of a properly-sized portable generator at the Cedar Street Reservoir. The generator should be purchased, or the emergency services contract should be executed, by December 31, 2018.

14. **Pumps – Upgrades to the Torrey Road and Cedar Street booster pumps should be completed.**

The City indicated the Torrey Road pumps will be installed in 2018, and upgrades to the Cedar Street pumps will be designed in 2018 and completed in 2019. This schedule for completing the work is acceptable to the DEQ.

15. **Monitoring and Reporting – The City should begin planning financially for staff to complete all monitoring and reporting requirements.**

The City indicated its intent to have adequate staffing and laboratory facilities to complete these tasks. The cost of completing this task must be reflected in your water rates/budget.

If you have any questions, please contact me at the phone number listed below or by email to londonr@michigan.gov.

Sincerely,

Robert A. London, P.E.
Surface Water Treatment Engineer
Engineering Unit
Drinking Water and Municipal Assistance Division
989-450-7834

bl/ajl
cc: Mr. Mark Adas, City of Flint
Mr. Rob Bincsik, City of Flint
Mr. Robert Jones, F&V Operations
✓Mr. Eric Oswald, DEQ
Ms. Sue Maul, DEQ

City of Flint Water Department
Technical, Management and Financial Capacity

The City of Flint (COF) has identified its long-term water source and has initiated the implementation of selected projects necessary to enhance the reliability and quality of its water system. However, the enduring sustainability of its system can only be achieved if the COF has the proper technical, managerial and financial (TMF) capacity to properly operate the system. This requirement is recognized in USEPA's First Amendment to Flint's Emergency Administrative Order (Paragraph 60.b.iii) and Michigan DEQ's August, 2017 Water System Sanitary Survey.

To help define the TMF capacity requirements of the COF water system, Arcadis of Michigan LLC (Arcadis) recently completed a report entitled "Water Distribution System Optimization Plan". This analysis developed a 20-year Capital Improvement Program (CIP), an Asset Management Program, staffing requirements, performance metrics and Standard Operating Procedures (SOPs) for the COF Water Department.

The revenue generated by the COF Water Department is not sufficient to support the current operating costs of the system. This discrepancy results for several reasons – low collection rates, declining population, inaccurate meters, loss of industrial/commercial customers, and water theft. To achieve "Cost of Service" rates under current conditions, annual rate increases of 20%, 16% and 10% would be required over the next three (3) years. If collection rates were return to a level closer to industry standards (95%), three 10% rate adjustments would still be required to achieve sufficient revenue. While alternative rate design were investigated to minimizes residential customer rate impact, such as inclining block rates, none of these alternative rate designs were deemed to be politically or financially feasible.

The political and financial environment in Flint is not amenable to implementing a customer rate increase over the next several years. Therefore, revenue enhancements must be achieved through improving collections and reducing the physical and commercial water losses associated with non-revenue water. A projected five-year forecast for Water Department revenue has been developed based on the following assumptions:

- Increase Water Department revenue by adjusting the water/wastewater revenue allocation from 45%/55% to 50%/50%.
- Increased sales to General Motors ($0.4M/year)
- Improve collection rates from approximately 70% to 80% in 2019, 90% in 2020 and 95% in 2021.
- One-half of current non-revenue water (25% of purchased water) results from commercial losses (meters and theft). These losses are converted to additional revenue by the meter replacement program and an aggressive water theft prevention program
- No customer rate increases

Based on these assumptions, the Water Department revenue would be:

	FY2019	FY2020	FY2021	FY2022	FY2023
Base revenue with improved collections	$31M	$35.4M	$40M	$42M	$42M
Improved metering and eliminate water theft			$5M	$10M	$20M
Total revenue	$31M	$35.4M	$45M	$52M	$62M

It is assumed that the revenue benefits from the metering/theft programs would not be realized until after all meters are installed by the end of 2019. However, some theft issues could be resolved concurrent with meter replacement.

Future operating costs will be primarily impacted by staffing levels. Arcadis has recommended that the following positions be added to provide the appropriate TMF capacity.

- Laboratory Technician
- Cross Connection Program Manager
- Water Distribution Valve and Hydrant Crew (3)
- Customer Service/ Call Center Staff (4)
- Enterprise Asset Manager
- GIS Specialist/ Hydraulic Modeler
- Construction Inspectors
- Leak Detection Team
- Flushing Team (2)

The first six listed positions are considered "high priority". The current COF Water Department budget does include the laboratory and cross connection positions because they are directly related to water quality issues. The remaining positions have not been included in the five year plan due to budget constraints and the challenge of attracting qualified personnel. The total annual costs of these positions would be approximately $1M.

The currently forecasted operating costs for the COF Water Department are presented below.

	2018	2019	2020	2021	2022
Projected Operating Costs	$34.5M	$36M	$37M	$38M	$38.3M

Given the lack of investment in the Flint water system for several decades, the future capital expenditure requirements are significant. Over the next two years, approximately $80M of WIIN grant funds have been designated for the COF to complete numerous capital projects that enhance the water system reliability, revenue and water quality management. However,

significant additional investment is required to support small main replacement, a cross connection control program, a customer service center, valve and hydrant replacement, SCADA and security upgrades and a water loss program for the COF water system. Arcadis has identified over $300M of capital expenditure requirements over the next 20 years with the majority of these projects being small main replacement. Unfortunately, the COF will be challenged to find the funding for these projects.

The table below helps define when funds may be available to hiring additional staff and invest in the system if the revenue enhancement programs are successful.

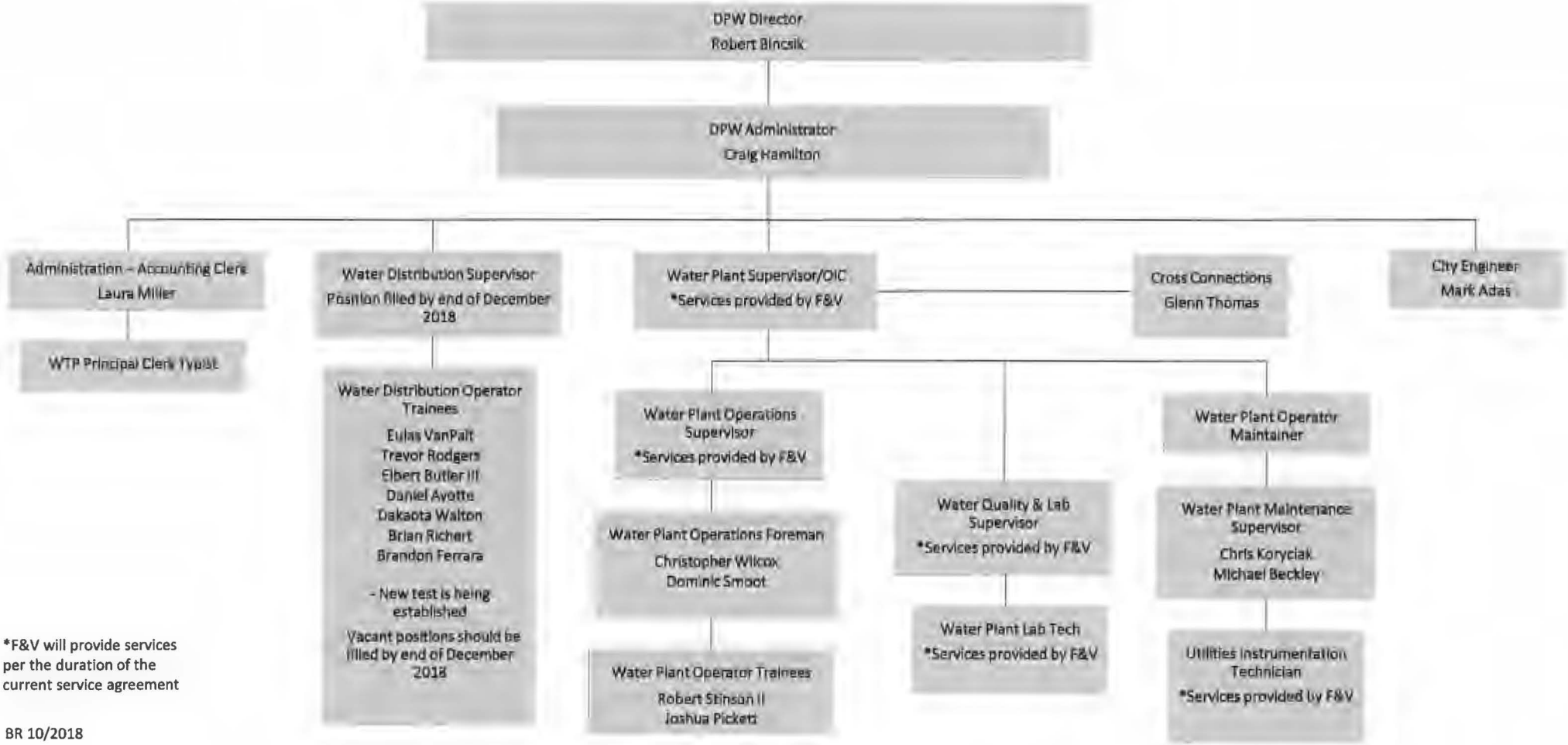
	FY2019	FY2020	FY2021	FY2022	FY2023
Revenue	$31M	$35.4M	$45M	$52M	$62M
Operating Costs	$34.5M	$36M	$37M	$38M	$38.3M
Water Fund Balance*	$8.5M	$7.9M	$9M	$9M	$9M
Funds available for staffing and/or capex			$6.9M	$14M	$23.7M

*Beginning Water Fund balance = $12M; Water Fund balance should be approximately 25% of O&M costs

Therefore, given the above discussion, the COF proposes the following plan to achieve its TMF capacity requirement:

1. Fill all COF Water Department staffing vacancies at the earliest possible date, including the laboratory technician and cross connection program manager positions. Until all vacancies are filled, outsource critical responsibilities not covered by existing staff. For regulatory acceptance, this will require committing to specific dates for hiring each position and executing contracts for outsourcing.
2. Initiate and complete the meter replacement program by the end of 2019 to enhance system revenue with more accurate and reliable meters. In conjunction with the meter replacement program, inspect the premise of all active and inactive customer accounts to identify and resolve water theft issues. Continue with an aggressive water theft prevention program. Additionally, in conjunction with the meter replacement program, collect data to assist with the prioritization of cross connection activities.
3. Adhere to water bill collection policies to return collection rates to industry standards by 2021 (greater than 95%)
4. Efficiently and effectively complete a majority of the WIIN funded construction projects in 2018 and 2019. Given the size of this program and Flint's history of limited capital projects within its distribution system, it would be difficult to perform any additional City-funded capital projects during this time period.
5. Closely monitor projected vs. actual revenues and identify and correct any variances.
6. Assuming projected system revenues are achieved through the meter, collections and water theft programs and revenues are further enhanced by community development activities, begin implementing the staffing and capital program recommended in the Arcadis report in FY2021.

Organizational Chart
Utilities Water Division



*F&V will provide services per the duration of the current service agreement

BR 10/2018