MISSISSIPPI STATE DEPARTMENT OF HEALTH

REPORT OF INSPECTION OF DRINKING WATER SUPPLY

PWS: 0250008 **Class:** A

An inspection of the CITY OF JACKSON water supply in HINDS county was made on 11/09/2020. Present at the time of inspection was TERENCE A BYRD, OPERATOR; CHARLES E WILLIAMS JR, OWNER; WRITER. Official CHARLES E WILLIAMS JR Address PO BOX 17 JACKSON MS 39205 W.W. Operator TERENCE A BYRD Address 2430 LADD STREET JACKSON MS 39209 No. Connections 65640 No. Meters ___ Population Served 156959 Field Chemical Analysis: pH ___ Cl2(free) ___ Cl2(total) ___ H2S N/A Iron ___ Fluoride ___ Point of Sampling DISTRIBUTION Water Rates ___

COMMENTS

Technical: 2 Managerial: 4 Financial: 4

OVERALL CAPACITY RATING: 3.3 / 5.0

1. The plants were inspected on November 9, 2020. Present at JH Fewell were Terence Byrd, James Perry, Mousetta Spann, Chris Ward, Roy Bennett, and Keith Allen. Present at OB Curtis were Terence Byrd, Mousetta Spann, Latanya Thomas, Robert Loftin, Leander Crowley, Demarcus Whitlock, and Keith Allen. The wells and tanks were inspected on November 11, 2020. Present were Terence Byrd, James Perry, and Mousetta Spann. The records at the Hood Building were inspected on November 13, 2020. Present were Dr. Charles Williams, Mary Carter, Mousetta Spann, and Terence Byrd.

2. The following deficiencies noted in the February 2020 Sanitary Survey have been resolved:

   a.) The raw water transmission lines from the reservoir to OB Curtis have been cleaned out.

   b.) The microscreens at OB Curtis have been replaced. They were online and operating properly at the time of inspection.

   c.) All 12 flocculation motors ahead of the membrane plant at OB Curtis were online at the time of inspection.

   d.) Both plants have had an A-licensed operator onsite for all shifts.

3. The following deficiencies noted in the February 2020 Sanitary Survey were underway, but not yet fully resolved:
   a.) The walkway replacement project at JH Fewell had started at the time of inspection. Contractors were onsite working on the electrical component of the project.

   b.) Of the 16 individual components of the claritrac system at JH Fewell, all but two were operating in automatic at the time of inspection. Mr. Byrd reported the two actuators needed were on the way.

   c.) All three basins at OB Curtis had claritracs working in manual mode. Ms. Spann reported that Basin 3 would be running in automatic once some final parts arrived in a few weeks.

   d.) The cover for the membrane system has been approved by the SRF Engineering Director.

   e.) The Maddox Road ground tank has a plan of work outlined to resolve items listed in the inspection report. The TV Road tank will be inspected once the City is able to use that booster station.

   f.) The dilution system for the soda ash system was online and the operators were happy with its operation. That and the ACH feed system were still operating in manual at the time of inspection.

   g.) Based on logbook records, the chlorine and ammonia feeds alternate between running in manual and in automatic. Ms. Spann reported the problem with one ammonia tank should be fixed by the end of the year. When asked about the times when chlorine is not feeding at all, Mr. Loftin reported there is an on-going problem with the scales and that they were working on it.

   h.) The majority of the online monitoring devices measuring pH, chlorine, turbidity, and electrical charge (streaming current) have been replaced. The City must continue replacing inoperable meters and work on the communication part of the system as well.

   i.) The new corrosion control study at JH Fewell was in process at the time of inspection.

4. The following deficiencies noted in the February 2020 Sanitary Survey have not had action at the time of inspection:
   a.) The intake building at the reservoir is in failing condition with hole in the roof. The potassium permanagate feed system at this location is inoperable.

   b.) The Membrane Integrity Testing (MIT) is the GE/Suez Zeeweed Z500D system's method of proving the fibers are achieving LT2 Log Removal Values (LRV) for cryptosporidium removal. If a train fails MIT, and the LRV is not reported, then the City cannot assure their customers and MSDH that they are properly treating the water to Safe Drinking Water Act Standards. There are various reasons as to why the MIT fails, but according to the CFR, none of those matter for regulation purposes. The MIT must be functioning for all trains in order to stay online. If they cannot pass MIT, then the train must be taken offline immediately.

   c.) The conventional filters at both treatment facilities are overdue for rehabilitation. Filter media needs to be replaced and some underdrains and/or valving need to be repaired and/or updated. Due to filter performance records submitted, MSDH is limiting the capacity of JH Fewell to 20 MGD.

5. While there are still so many outstanding issues with the water system, MSDH requests that the Weekly Operating Reports with logbook entries continue.

6. The following comments outline the changes made to the Design Capacity Calculations. Based on these changes, the City is at 78%. If at any time filters or trains are brought back online, we will recalculate the Design Capacity.

   a.) JH Fewell: The three 2.0 MGD filters have not been included in the capacity calculations for several years. But all twelve 2.5 MGD filters have been counted. This year, only the online filters were included in the calculations. This includes three 2.0 MGD filters and eight 2.5 MGD filters. This did not affect the plant's ability to treat their assigned 20 MGD. It did affect the contact time in the online filters and put more importance on the chlorine dosage and the UV light disinfection.

   b.) OB Curtis Conventional: Credit was given for the four online filters, bringing that side's capacity from 25 MGD to 16.8 MGD. The CT calculations were not changed. If CT is met at 25 MGD, it is met at the lower flow of 16.8 MGD.

   c.) OB Curtis Membrane: Credit was given for the two trains that are consistently passing MIT, bringing that side's capacity from 25 MGD to 8.4 MGD.

   d.) Due to the 1.0 MG tank at Byram being unable to fill, it has been taken out of the calculations.

7. The lab equipment at JH Fewell should mirror the equipment at OB Curtis. Currently JH Fewell can run all water quality parameters except color, iron, free ammonia, and monochloramine. Since the City uses chloramines as their disinfectant, each plant should be able to check all four parameters (free chlorine, total chlorine, free ammonia, monochloramine) to be assured treatment is adequate.

8. All online filters at both plants had turbidities less than 0.3 NTU at the time of inspection. Membrane train #3 had passed MIT with a 4.138 and train #6 had passed MIT with a 4.453.

9. The yards at the Suncrest and Magnolia tanks have trees that have limbs hitting the tanks. These limbs need to be cut back to prolong the life of the exterior paint.

10. There was sewer filling up the ditch and flowing into the yard at the Forest Ave tank. This is a major public health issue and should be addressed immediately.

11. Ms. Spann reported that they had recently conducted a warranty walk-through for the soda ash project. A punch list of items was created to get items repaired or replaced before the warranty period expires. Two of these items include a transfer pump and a circulation motor.

12. The current target for pH is 9.0 or greater and the current target for alkalinity is 35 mg/L or greater. At the time of inspection, both plans were meeting the pH target but not the alkalinity. (T1, T2-1)

13. The five tanks inspected this year were the two ground tanks at JH Fewell, Maddox Rd, Cedar Hills, and Chastain. City officials need to follow up with the recommendations made on those tank reports. (T2-3)

14. The water loss report presented at the inspection showed an annual water loss of greater than 40%. (T4-1)

15. Credit was not given for T5-1 because the system does not have the ability to provide water during a prolonged power outage. In order to get credit, the City will need to obtain generators capable of operating enough of the plant capacity to keep pressure in the system during a prolonged power outage.

16. Credit was not given for T5-2 because the City needs both treatment plants and the wells to provide water for all customers. If any of them were to go offline, the others could not compensate.

17. Ms. Carter reported that while a cut-off list is generated each billing cycle, the City is still not cutting off delinquent accounts. (F3)

18. Below is a breakdown of the water quality parameters recorded during the inspection:

	JHF	OBC HS #1	OBC HS #2
pH	9.75	9.65	9.68
Cl2 free	0.2 mg/L	0.1 mg/L	0.2 mg/L
Cl2 total	3.8 mg/L	3.2 mg/L	2.6 mg/L
Free ammonia	0.38 mg/L	0.2 mg/L	0.05 mg/L
Monochloramine	3.06 mg/L	3.08 mg/L	2.34 mg/L
Iron	0.01 mg/L	0.02 mg/L	0.00 mg/L
Manganese	0.01 mg/L	0.007 mg/L	0.017 mg/L
Turbidity	0.213 NTU	0.176 NTU	0.105 NTU
Alkalinity	23.5 mg/L	50.4 mg/L	45.6 mg/L
Hardness	53.9 mg/L	19.8 mg/L	17.2 mg/L
Color	4	2	4
Fluoride	1.2 mg/L	1.07 mg/L	0.92 mg/L

Completed by Amy L. McLeod, E.I. on 11/30/2020.

Reviewed by Greg Caraway, P.E. on 12/09/2020.

If you have any questions, please call (601)576-7518.

pc:

CHARLES E WILLIAMS JR, OFFICIAL
TERENCE A BYRD, OPERATOR

Mississippi Department of Health
Bureau of Public Water Supply

STANDARD FORM

FY 2021 Public Water System Capacity Assessment Form

NOTE: This form must be completed whenever a routine sanitary survey of a public water system is conducted by a regional engineer of the Bureau of Public Water Supply

PWS ID#: 0250008 Class: A Survey Date: 11-09-2020 County: HINDS
Public Water System: CITY OF JACKSON Conn: 65640
Certified Waterworks Operator: TERENCE A BYRD Pop: 156959

CAPACITY RATING DETERMINATION

Technical (T) Capacity Rating: [**2**] Managerial (M) Capacity Rating [**4**] Financial (F) Capacity Rating [**4**]

Capacity Rating = $\frac{T + M + F}{3} = \frac{10}{3} = 3.3$

Overall Capacity Rating = 3.3

Completed by Amy L. McLeod, E.I. on 11/25/2020
Reviewed by Greg Caraway, P.E. on 12/09/2020

Comments:

Technical Capacity Assessment	Point Scale	Point Award
[T1] Does the water system have any significant deficiencies? [(Y) N]	N - 1pt. Y - 0pt.	0
[T2] 1) Was the water treatment process functioning properly? [Y (N)] (i.e. Is pH, iron, chlorine, fluoride, etc. within acceptable range?) **2)** Was needed water system equipment in place and functioning properly at the time of survey? [(Y) N] (**NOTE:** Equipment deficiencies must be identified in survey report.) **3)** Were records available to the regional engineer clearly showing that all water storage tanks have been inspected and cleaned or painted (if needed) within the past 5 years? [(Y) N NA] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	0
[T3] 1) Was the certified waterworks operator or his/her authorized representative present for the survey? [(Y) N] **2)** Was PWS Operations record up to date and properly maintained? [(Y) N] (Are minimum days being met based on system classification) **3)** Was the water system properly maintained at the time of survey? [(Y) N] **4)** Did operator/system personnel satisfactorily demonstrate to the regional engineer that he/she could fully perform all water quality tests required to properly operate this water system? [(Y) N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	1
[T4] 1) Does water system routinely track water loss and were acceptable record available for review? [(Y) N] **2)** Is water system overloaded? (i.e. serving customers in excess of MSDH approved design capacity)? [Y (N)] **3)** Was there any indication that the water system is/has been experiencing pressure problems in any part(s) of the distribution system? [Y (N)] (based on operator information, customer complaints, MSDH records, other information) **4)** Are well pumping tests performed routinely? [(Y) N NA] (**NOTE:** YES FOR #1 & YES OR N/A FOR #4 AND NOs FOR #2 & #3 required to receive point)	1)Y - pt. 2)N - pt. 3)N - pt. 4)Y - pt.	1
[T5] 1) Does the water system have the ability to provide water during power outages? (i.e. generator, emergency tie-ins, etc.) [Y (N)] **2)** Does the water system have a usable backup source of water? [Y (N)] (**NOTE:** Must be documented on survey report)	All Y - 1 pt. Else - 0 pt.	0
TECHNICAL CAPACITY RATING = [2] (Total Points)		

Public Water System: CITY OF JACKSON PWS ID #: 0250008

FY 2021 Public Water System Capacity Assessment Form Survey Date: 11-09-2020

Managerial Capacity Assessment	Point Scale	Point Award
[M1] Were all SDWA required records maintained in a logical and orderly manner and available for review by the regional engineer during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[M2] 1) Have acceptable written policies and procedures for operating this water system been formally adopted and were these policies available for review during the survey? [(Y) N] **2)** Have all board members (in office more than 12 months) completed Board Member Training? [Y N (NA)] **3)** Does the Board of Directors meet monthly and were minutes of Board meetings available for review during the survey? (**NOTE:** Quarterly meetings allowed if system has an officially designated full time manager) [Y N (NA)] (**NOTE:** ALL YESs or NAs required to receive point. NA - Not Applicable)	All Y - 1 pt. Else - 0 pt.	1
[M3] Has the water system had any SDWA violations since the last Capacity Assessment? [(Y) N]	N - 1pt. Y - 0pt.	0
[M4] Has the water system developed a long range improvements plan and was this plan available for review during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[M5] 1) Does the water system have an effective cross connection control program in compliance with MSDH regulations? [(Y) N] **2)** Was a copy of the MSDH approved bacti site plan and lead/copper site plan available for review during the survey and do the bacti results clearly show that this approved plan is being followed? [(Y) N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	1
MANAGERIAL CAPACITY RATING = [4] (Total Points)		

Financial Capacity Assessment	Point Scale	Point Award
[F1] Has the water system raised water rates in the past 5 years? [(Y) N] (**NOTE:** Point may be awarded if the water system provides acceptable financial documentation clearly showing that a rate increase is not needed, i.e. revenue has consistently exceeded expenditures by at least 10%, etc.)	Y - 1pt. N - 0pt.	1
[F2] Does the water system have an officially adopted policy requiring that water rates be routinely reviewed and adjusted as appropriate and was this policy available for review during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[F3] Does the water system have an officially adopted cut-off policy for customers who do not pay their water bills, was a copy of this policy available for review by the regional engineer, and do system records (cut-off lists, etc.) clearly show that the water system effectively implements this cut-off policy? [Y (N)]	Y - 1pt. N - 0pt.	0
[F4] Was a copy of the water system's officially adopted annual budget available for review by the regional engineer and does the water system's financial accounting system clearly and accurately track the expenditure and receipt of funds? [(Y) N]	Y - 1pt. N - 0pt.	1
[F5 - Municipal Systems] 1) Was a copy of the latest audit report available for review at the time of the survey? [(Y) N] **2)** Does this audit report clearly show that water and sewer fund account(s) are maintained separately from all other municipal accounts? [(Y) N] (**NOTE:** Yes answer to all questions required to receive point.)	All Y - 1 pt. Else - 0 pt.	1
[F5 - Rural Systems] 1) Was the latest financial report / audit report available for review? [Y N] **2)** Does the latest financial report show that receipts exceeded expenditures? [Y N] (**NOTE:** Yes answer to both questions required to receive point)	All Y - 1 pt. Else - 0 pt.	
FINANCIAL CAPACITY RATING = [4] (Total Points)		

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

System: **CITY OF JACKSON**
ID: **0250008** Class: **A** County: **HINDS**

Date Completed: **11/25/2020**
Connections - Actual: **65640** Equivalent: **84521**
Design Capacity: **107639** Percent Design Capacity: **84521/107639 = 78.5%**

J H FEWELL WATER TREATMENT PLANT

**** CT calculations for FEWELL *****
There are four disinfection segments at Fewell, and the contact time must be determined for each segment to achieve 4-log inactivation of viruses, 3-log inactivation of Giardia, and 3.5-log inactivation of Crypto.

Fewell is required to achieve 0.3 turbidity units 95% of the time to comply with the SWTR. If this treatment is achieved, credit can be given for 2-log removal of viruses & Crypto and 2.5-log removal of Giardia. Free chlorine, chloramination, and UV disinfection must then attain the remaining 2-log inactivation of viruses, 0.5-log inactivation of Giardia, and 1.5-log of Crypto.

Book values:
CT required for 0.5-log inactivation of giardia at 10C and pH at 6.5 = 19 mg/L min
CT required for 2-log inactivation of viruses at 10C and pH at 6.5 = 3 mg/L min

The first segment is free chlorine contact between the point of chlorine injection (at the head of the outlet pipe from the sedimentation basin) and the point of ammonia injection (at the end of the outlet pipe just prior to ammonia injection).

The second is the contact time of free chlorine in the filters during normal filter operation.

The third is the contact time in the clearwell.

The fourth is the UV disinfection.

BASED ON THE TURBIDITY FILTER DATA SUBMITTED ON MONTHLY OPERATING REPORTS, MSDH IS SETTING A MAXIMUM TREATMENT CAPACITY OF 20 MGD. THE 7/13 MGD SPLIT BETWEEN BASINS IS BASED ON STANDARD OPERATION WHEN 20 MGD IS BEING TREATED.

CHLORINE RESIDUALS AND FLOW RATES UPDATED TO REFLECT WHAT THE PLANT WAS TREATING ON 11/09/20

CT SEGMENT 1 (pipes between sed basins and ammonia injection):
The free chlorine is measured by chlorine analyzers which communicate with the ammonia feed system. The concentration of free chlorine in the pipe between Sed Basin #3 and the filters was 3.53 mg/L. The concentration of free chlorine in the pipe between Sed Basin #4 and the filters was 4.58 mg/L.

Calculating the free chlorine contact time between chlorine injection and ammonia injection (at maximum design flows):

Sed basin #3: Pipe dimensions: Length = 351 ft; Diameter = 42 in = 3.5 ft.
Volume in pipe = 0.785 x 3.5 x 3.5 x 351 x 7.48 = 25,247 gallons
Estimated flow through Sed basin #3 train: 4 MGD
Contact time = 25,247 gallons/4,000,000 gal/day x 1440 min/day = 9.09 min

Sed basin #4: Pipe dimensions: Length = 357 ft; Diameter = 48 in = 4 ft.
Volume = 33,540 gallons
Estimated flow through Sed basin #4 train: 15 MGD
Contact time = 33,540/15,000,000 x 1440 = 3.22 min

CT SEGMENT 1 (using shortest contact time of 3.22 min) = 4.38 mg/L x 3.22 min
= 14.1 mg/L min

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

CITY OF JACKSON 11/25/2020

(Note: Virus inactivation is achieved in Segment 1; 14.1 mg/L min > 3 mg/L min)

SEGMENT 1 LOG INACTIVATION = 14.1 mg/L min/19 mg/L min * (0.5 log) = 0.37 log

CT SEGMENT 2 (Disinfection in filters):
Disinfectant contact time between filters and clearwell/storage outlet:
Calculate volume of water in filters and estimated residence time:
Volume = L X W X D (where D = depth of water above filter media)
= (20 ft x 10 ft x 1.5 ft) * 7.48 gal/cu.ft. * 8 filters +
(25 ft x 28 ft x 3 ft) * 7.48 gal/cu.ft. * 3 filters
= 17,952 gallons + 47,124 gallons
= 65,076 gallons
Residence time = (65,076 gallons/19,000,000 gallons/day)* 1440 min/day
Residence time = 4.93 minutes

CT SEGMENT 2 (assuming chlorine concentration = finished water chlorine concentration = 0.3 mg/L)
CT SEGMENT 2 = 0.2 mg/L * 4.93 minutes = 0.986 mg/L min

SEGMENT 2 LOG INACTIVATION = 0.986 mg/L min / 19 mg/L min * (0.5 log) = 0.026 log

CT SEGMENT 3 (Disinfection in the clearwell):
Using the clearwell volume of 3.8 MG and a pre-determined baffling factor of 0.233:
Contact time = 3.8 MG/20 MGD x 1440 minutes/day x 0.233 = 63.7 minutes
Free chlorine measured in finished water = 0.2 mg/L
CT SEGMENT 3 = 63.7 minutes x 0.2 mg/L = 12.7 mg/L min
SEGMENT 3 LOG INACTIVATION = 12.7 mg/L min / 19 mg/L min * (0.5 log) = 0.34 log

Total CT using free chlorine = (14.1 + 0.986 + 12.7) mg/L min = 27.8 mg/L min

Total LOG INACTIVATION using free chlorine = SEGMENT 1 + SEGMENT 2 + SEGMENT 3
Total LOG INACTIVATION using free chlorine = 0.37 + 0.026 + 0.34 = 0.736 log

CT SEGMENT 4 (UV Disinfection):
At the time of the inspection, Pump 3 was pumping 7.9 MGD and dosing 26.4 mJ/sq.cm and Pump 4 was pumping 7.9 MGD and dosing 27.4 mJ/sq.cm.

According to 40 CFR 141.720 (d)(1), a dose of 3.9 mJ/sq.cm. will achieve a 1.5 log inactivation of Crypto and 1.5-log inactivation of Giardia. Therefore, the UV disinfection more than adequately achieves the remaining inactivation of Giardia & Crypto.

NOTE: Any time that the UV disinfection is offline on any service pump, that service pump MUST be taken offline as free chlorine is not enough to achieve the log credit removal for Crypto.

*** FEWELL DESIGN CAPACITY ****
Rated treatment capacity of plant = 20 MGD (limiting factor)
Clearwell volume = 3.8 MG
2 additional ground storage tanks @ 5MG each = 10 MG
Total storage located at the plant = 3.8 MG + 10 MG = 13.8 MG
Usable storage (volume filled in 6 hours) = 20 MGD/24 hrs/day x 6 hrs = 5 MG
Plant capacity = rated treatment capacity of plant + usable storage/200 minutes
Plant capacity = 20 MGD + (5 MG/200 min * 1440 min/day) = 56 MGD
Service pump capacity = (9+9+9+7) = 34 MGD

FEWELL DESIGN CAPACITY = 20,000,000 gal/day/1440 min/day = 13,889 GPM

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

CITY OF JACKSON 11/25/2020

O B CURTIS WATER TREATMENT PLANT

**** CT calculations for OB Curtis ****

This plant must meet 4-log inactivation of viruses, 3-log inactivation of Giardia, and 3.5-log inactivation of Crypto.

The conventional side is required to achieve 0.3 turbidity units 95% of the time to comply with the SWTR, so credit can be given by default for 2-log removal of viruses & Crypto and 2.5-log removal of Giardia. Free chlorine, chloramination, and UV disinfection must then attain the remaining 2-log inactivation of viruses, 0.5-log inactivation of Giardia, and 1.5-log of Crypto.

The membrane system is required to achieve <0.15 turbidity units 95% of the time to comply with the SWTR, so credit can be given by default for 2-log removal of viruses, 3-log inactivation of Giardia, and 2-log inactivation of Crypto. Free chlorine must achieve the remaining 2-log of viruses. Maintaining membrane integrity must achieve the remaining 1.5-log inactivation of Crypto.

MEMBRANE INTEGRITY TESTING (MIT) MUST BE COMPLETED EVERY 24 HOURS, PER THE CFR. IF THE TRAIN FAILS MIT, IT MUST BE TAKEN OFFLINE UNTIL IT PASSES. IF TRAIN TURBIDITIES EXCEED 0.15 NTU, THAT TRAIN *MUST* BE TAKEN OFFLINE UNTIL IT PASSES MIT.

**THE CONVENTIONAL SIDE OF THE PLANT HAS 4 FILTERS ONLINE AND THE MEMBRANE SIDE OF THE PLANT HAS 2 TRAINS THAT CONSISTENTLY PASS MIT. CAPACITY OF THE PLANT HAS BEEN LOWERED TO REFLECT WHAT THE PLANT CAN ACTUALLY TREAT. EACH SIDE WAS RATED AT 25 MGD.

25 MGD / 6 (FILTERS & TRAINS) = 4.2 MGD/FILTER OR TRAIN

CONVENTIONAL: 4.2 MGD * 4 FILTERS = 16.8 MGD
MEMBRANE: 4.2 MGD * 2 TRAINS = 8.4 MGD

TOTAL PLANT CAPACITY: 25.2 MGD

CT CALCULATIONS WILL REMAIN AT MAX CAPACITY OF 25 MGD

Book values:
CT required for 0.5-log inactivation of giardia at 10C and pH at 6.5 = 19 mg/L min
CT required for 2-log inactivation of viruses at 10C and pH at 6.5 = 3 mg/L min

The clearwell is divided into two separate zones based on their baffling. The conventional and membrane treatment trains feed mirror image clearwells, so the T and CT values below apply to each treatment process.

Zone 1:
Volume = 1.989 MG; BF = 0.7
T = [(1.989 MG / 25 MGD)*0.7] * 1440 min/day = 80.2 min @ 25 MGD

Zone 2:
Volume = 1.658 MG; BF = 0.3
T = [(1.658 / 25 MGD)*0.3] * 1440 min/day = 28.7 min @ 25 MGD

Total T = 80.2 + 28.7 = 108.9 min

The free chlorine residual measured from High Service 1 (conventional side) finished water = 0.1 mg/L

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

CITY OF JACKSON 11/25/2020

Ct25 = 0.1 mg/l * 108.9 minutes = 10.89 mg/L min

Virus inactivation achieved at 0.1 mg/L free chlorine at 25 MGD;
10.89 mg/L min > 3 mg/L min

Giardia log inactivation = 10.89 mg/L min / 19 mg/L min * (0.5) = 0.29 log
Remaining 0.5-log Giardia inactivation not achieved by free chlorine contact time in clearwell.

UV disinfection - UV unit attached to each filter
Each UV unit must be dosing a minumum of 4 mJ/sq.cm. to achieve the final 1.5-log removal of Crypto and the remaining 0.21-log removal of Giardia.

IF AT ANY TIME A UV UNIT IS OUT OF SERVICE, THE CORRESPONDING FILTER MUST BE TAKEN OUT OF SERVICE. CRYPTO AND GIARDIA REMOVAL IS NOT ACHIEVED WITHOUT UV DISINFECTION

Full CT credit for the conventional side at maximum treatment capacity of 25 MGD can be given, so full CT credit at decreased capacity of 16.8 MGD can be given.

The free chlorine residual measured from High Service 2 (membrane side) finished water = 0.2 mg/L.

Using this minimum concentration throughout the clearwell and flow rate of 25 MGD, the contact time is:
T = 108.9 min
CT = 0.2 mg/L * 108.9 minutes = 21.78 mg/L min

Virus inactivation achieved at 0.3 mg/L free chlorine at 25 MGD;
21.78 mg/L min > 3 mg/L min

Giardia & Crypto log inactivation achieved by maintaining turbidities <0.15 NTU 95% of the time. Any time turbidities exceed 0.15 NTU, that train must be taken offline.

Full CT credit for the membrane side at maximum treatment capacity of 25 MGD can be given, so full CT credit at decreased capacity of 8.4 MGD can be given.

Treatment capacity is not limited on either side by CT.

TOTAL TREATMENT CAPACITY AT OB CURTIS = Conventional (16.8 MGD) + Membrane (8.4 MGD)
= 25.2 MGD

*** OB CURTIS DESIGN CAPACITY ***
Raw water pump capacity = (9+8+9+8+8+17+8+17) MGD = 84 MGD
Rated treatment capacity of plant = 25.2 MGD (limiting factor)
Service pump capacity = (8+8+12+12+12+16+16+22+22) = 128 MGD
Total storage located at the plant (clearwell capacity) = 10 MG
Usable storage (volume filled in 6 hours) = 25.2 MGD/24 hrs/day x 6 hrs = 6.3 MG
Total plant capacity = rated treatment capacity of plant + usable storage/200 minutes
Total plant capacity = 25.2 MGD + (6.3 MG/200min * 1440 min/day) = 70.56 MGD
This does not exceed the service pump capacity of 128 MGD, so:
OB CURTIS DESIGN CAPACITY = 70.56 MGD

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

CITY OF JACKSON 11/25/2020

TOTAL SYSTEM DESIGN CAPACITY

TOTAL CAPACITY OF FEWELL AND OB CURTIS PLANTS = 20 MGD + 70.56 MGD = 90.56 MGD
90,560,000 gpd / 1440 min/day = 62,889 CONNECTIONS

TOTAL ELEVATED STORAGE ON SYSTEM:
0.5 MG + 0.2 + 1.0 + 0.5 + 1.5 + 1.0 + 0.5 + 1.0 + 1.0 + 0.25 + 1.5 = 8.95 MG
*1.0 MG Byram tank taken out of calculations due to being offline

FINAL DESIGN CAPACITY FOR ENTIRE SYSTEM:
Final design capacity = 62,889 + (8,950,000 gal/200 min) = 107,639 CONNECTIONS

EQUIVALENT CONNECTIONS CALCULATIONS:

COMMERCIAL/INDUSTRIAL USAGE FACTOR CALCULATIONS:
Ciu = Average total CI use(gal)/avg total use (gal)
The Ciu factor calculated from 2019 data = 0.5
Number of Actual Connections = 54,679
Apartment Adjusted = # Units X 2/3 = 19,407 x 2/3 = 12,938
Total Adjusted Connections = Actual + Apartment Adjusted
= 54,679 + 12,938 = 67,617

Eq. connections = # of adjusted conn + (# of adjusted conn x Ciu factor x 0.5)
= 67,617 + (67,617 x 0.5 x 0.5)
= 84,521

Total final equivalent connections = 84,521

THEREFORE THIS SYSTEM IS CURRENTLY AT 84,521/107,639 = 78% CAPACITY.