STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF CITIZENS WATER OF WESTFIELD, LLC FOR (1) AUTHORITY TO INCREASE RATES AND CHARGES FOR WATER UTILITY SERVICE AND APPROVAL OF A NEW SCHEDULE OF RATES AND CHARGES; (2) AUTHORITY TO IMPLEMENT AND APPROVAL OF A SYSTEM DEVELOPMENT CHARGE; AND (3) APPROVAL OF CERTAIN REVISIONS TO ITS TERMS AND CONDITIONS APPLICABLE TO WATER UTILITY SERVICE.	**)))))))))))))**	**CAUSE NO. 46020**

PUBLIC'S EXHIBIT NO. 4

REDACTED TESTIMONY OF CARL N. SEALS

ON BEHALF OF

THE INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

June 21, 2024

Respectfully submitted,

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

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CERTIFICATE OF SERVICE

This is to certify that a copy of the ***Public's Exhibit No. 4 – Redacted Testimony of Carl N. Seals on behalf of the OUCC*** has been served upon the following captioned proceeding by electronic service on June 21, 2024.

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REDACTED TESTIMONY OF OUCC WITNESS CARL N. SEALS
CAUSE NO. 46020
CITIZENS WATER OF WESTFIELD, LLC

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is Carl N. Seals, and my business address is 115 West Washington Street, Suite 1500 South, Indianapolis, Indiana 46204.

Q: By whom are you employed and in what capacity?

A: I am employed by the Indiana Office of Utility Consumer Counselor ("OUCC") as the Assistant Director in the Water/Wastewater Division. My qualifications and experience are set forth in Appendix A.

Q: What is the purpose of your testimony?

A: I provide an overview of Citizens Water of Westfield's ("CWW" or "Petitioner") current operation. I describe capital improvement projects CWW plans to complete and explain why certain costs should not be included in Petitioner's rate base.

Q: Does your testimony include attachments?

A: Yes. My testimony includes the following attachments:

- OUCC Attachment CNS-01 – Utility Dashboard
- OUCC Attachment CNS-02 – System Process Schematic
- OUCC Attachment CNS-03 – Attachment EJB-2 Capital Projects
- OUCC Attachment CNS-04 – Response to OUCC Data Request 4-22
- OUCC Attachment CNS-05 – 2019 Master Plan
- OUCC Attachment CNS-06 – Well Nos. 8, 9 & 10 Inspection Reports
- OUCC Attachment CNS-07 – Well Terminology, pictures
- OUCC Attachment CNS-08 – Layne Hydro Aquifer Assessment (Confidential)
- OUCC Attachment CNS-09 – IFA Central Indiana Water Study
- OUCC Attachment CNS-10 – Cherry Tree Clearwell Cost Estimate
- OUCC Attachment CNS-11 – 146th St Main Extension Cost Estimate

Q: Please describe the review and analysis you conducted to prepare your testimony.

A: I reviewed CWW's Petition and testimony and its Indiana Utility Regulatory Commission ("IURC" or "Commission") Annual Reports for 2014 through 2023. I prepared data requests and reviewed CWW's responses, which included CWW's 2019 Master Plan and a confidential 2013 Layne Hydro report on CWW's White River North Aquifer Assessment. I reviewed the Commission's orders in CWW's most recent cases. I reviewed reports CWW filed with the Indiana Department of Environmental Management ("IDEM") and researched information on wellfields, aquifers, and the impact of gravel mining facilities on these aquifers. Finally, on May 23, 2024, OUCC Analyst Kristen Willoughby and I met with Ed Bukovac, Debi Bardhan-Akala, and David Peck (all with Citizens or CWW) and visited CWW's River Road and Cherry Tree plants, the 146th Street booster station and tank, and the 191st Street booster station.

Q: If you do not discuss a specific topic, does that mean you agree with Petitioner?

A: No. It is neither practical nor reasonable for me to testify on every issue or item presented in Petitioner's testimony, exhibits, work papers, or discovery responses. Petitioner's case-in-chief addresses a broad and significant number of issues, while my testimony addresses a subset of the issues. Its scope is strictly limited to the specific items I address.

II. CITIZENS WATER OF WESTFIELD'S SYSTEM

Q: Please describe CWW's characteristics.

A: CWW is an investor-owned utility providing water service to approximately 23,147[1] customers located primarily in Washington Township of Hamilton County. This service

[1] 2023 Annual Report, page W-1, Year End Customers (Column (d)).

territory includes the City of Westfield. The City of Westfield formerly owned portions of this system, and before that, Hamilton Western Utilities built the existing treatment plants.[2] CWW's 2015-2023 IURC Annual Reports set forth some general operating statistics, which I summarize in OUCC Attachment CNS-01. CWW's service infrastructure includes three treatment plants, multiple interconnections with Citizens Water, four booster stations, and six storage facilities.[3] A system process schematic (OUCC Attachment CNS-02) shows the very interconnected nature of the CWW system. This high level of interconnection exists not only with regard to Citizens Water but also with regard to CWW's ability to move raw (well) water between its wellfields and Cherry Tree, River Road, or White River North plants.[4] This schematic was prepared in 2019 *before* some of the now-existing interconnections were placed in service and is not complete in that regard.

Q: Please briefly describe Petitioner's treatment plants.

A: CWW's three treatment plants are Cherry Tree, Greyhound Pass, and River Road, all of which are located deep in the southern (Greyhound Pass) and southeastern (River Road, Cherry Tree) portions of CWW's service area. Based upon the process schematic, these plants can reliably provide 12.7 million gallons per day (MGD) to CWW's system.[5] The Cherry Tree and River Road plants are less than a mile apart as the crow flies, located on either side of gravel mining operations in the area.

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[2] Verified from asset listing provided in response to OUCC DR 23-1.
[3] Petitioner's Exhibit 4, Case-in-Chief Testimony of Ed Bukovac, page 5.
[4] As shown in the schematic, Greyhound Pass is not interconnected to other wells and is stand-alone.
[5] Growth in customers and the system is generally towards the north.

Q: Please briefly describe Petitioner's interconnections with Citizens Water.

A: According to its response to OUCC Data Request 16-23, CWW maintains the following interconnections with Citizens Water.

Table 1

Location	In-Service Year	MGD
Gray Road	2014	2.5
County Line	2015	1.5
River Road (12-inch)	~2000	2.5
Moontown Booster	1999	3.1
191st Booster	2019	6.0
WRN (raw water)	2020	2.5
Total		18.1
Source: Response to OUCC DR 16-23, 16-34		

As shown in Table 1, these interconnections provide Petitioner's Westfield system with access to an additional 18.1 MGD, making 30.8 MGD the total available supply, including both self-produced and interconnected sources.[6] Average sales per day in 2023 were 7.3 MGD.[7]

Q: How has CWW historically relied upon its interconnections for supply?

A: As the following chart shows, it appears CWW is increasingly able and willing to rely upon its interconnections for additional water. The ratio of water purchased for resale to water sold to customers has risen almost steadily from zero to 16% over the past 9 years.[8]

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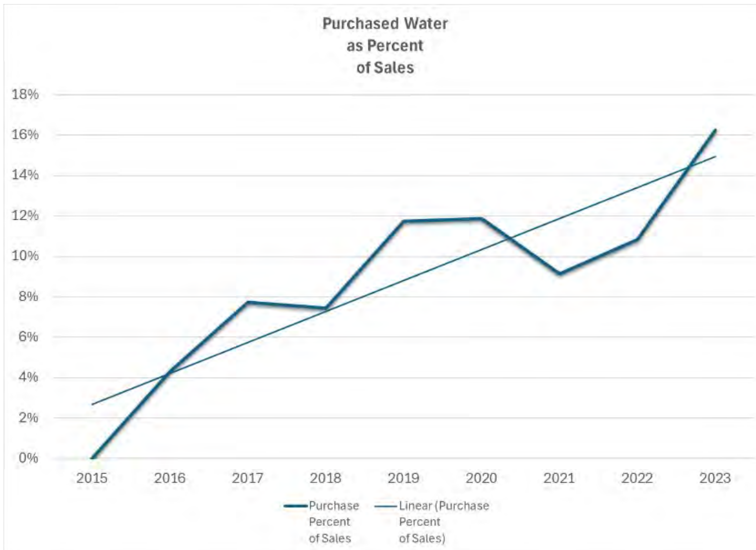
[6] 12.7 MGD (plants) + 18.1 MGD (interconnections) = 30.8 MGD total.
[7] Average sales per day calculated from 2023 IURC Annual Report and appearing in attached Dashboard.
[8] IURC Annual Reports, 2015-2023, page W-6.

Table 2



III. PROPOSED CAPITAL IMPROVEMENTS

Q: What projects has Petitioner requested in its capital improvement program?

A: A complete list of the projects in Petitioner's Attachment EJB-2 is attached to my testimony as OUCC attachment CNS-03. I will be addressing the following projects listed in Attachment EJB-2:

Table 3

Project Number	Project Name	Project Spend In-Service Link Period July 2023 - June 2024	Project Spend In-Service Test Year July 2024 - June 2025	Projected In-Service Date
1268CBA - Westfield Water Storage & Supply	River_Road_Well_17	$1,199,612	$0	4/30/2024
1267CBA - Westfield Water Facilities	Cherry Tree Clear Well Expansion	$5,850,894	$0	5/30/2024

Q: Why are you addressing these two projects?

A: My review of data request responses and additional research into the need for Well No. 17 and the Cherry Tree Clearwell Extension show Petitioner completed these projects without adequate analysis supporting their need and efficacy.

A. Well No. 17

Q: Please describe the River Road Well No. 17 project.

A: The Project Planning Memo included in Attachment EJB-3 shows the River Road Well No. 17 ("Well No. 17") project was identified to address insufficient available water supply needs in the Westfield system and is located adjacent to the River Road treatment plant. This location is also the site of existing River Road Wells 8, 9, and 10. The estimated cost of this project is shown as $1,199,512 in Attachment EJB-2, but this was subsequently shown as $1,351,774 in a January 2023 "Detailed Project Cost Estimate" provided in response to OUCC Data Request 4-22 (see OUCC Attachment CNS-04).

Q: Do you have concerns regarding this project?

A: Yes. Given that adequate alternative supply options already exist, as I described above, CWW has not established this project is more cost effective over the long run as an additional source than receiving additional water from one of its interconnections.

Q: Did Petitioner perform or conduct any cost-benefit analyses or lifecycle cost analyses regarding Well No. 17? Did these include any analysis that compared the cost of constructing and operating Well No. 17 to purchasing additional water?

A: No. In response to OUCC Data Request No. 24-2, Petitioner indicated CWW had not performed a cost-benefit analysis or a lifecycle cost analysis to compare the cost of constructing and operating Well No. 17 to the cost of purchasing additional water.

Q: Why should CWW have conducted a cost-benefit analysis or lifecycle cost analysis?

A: Petitioner should have compared the lifecycle costs of constructing Well No. 17 as opposed to purchasing additional water from its affiliate, Citizens Water, to determine the most cost-effective means of obtaining additional water supply. Since there are multiple existing interconnections with Citizens Water, and especially given the northward growth of the system, it may have been less expensive for Petitioner, and ultimately its customers, for

CWW to simply purchase additional water rather than construct a $1.2 million well and incur the cost to operate and maintain the well for 25-30 years.[9] IDEM requires water and wastewater utilities to prepare a life cycle cost-benefit analysis when obtaining a permit to expand their water or wastewater treatment plants (*See* Ind. Code § 13-18-26-3). This analysis is a best practice that provides benefits to ratepayers and should have been employed before constructing Well No. 17.

Q: Were alternatives to the Well No. 17 project considered?

A: It does not appear any alternative to Well No. 17 was seriously considered, based on Petitioner's response to OUCC Data Request 16-29:

> OUCC DATA REQUEST NO. 29:
>
> Was any sort of analysis performed to decide whether to add a well at River Road as opposed to purchasing additional water through one of the interconnections? If yes, please provide this analysis. If no, please explain how the decision was made.
>
> RESPONSE:
>
> No. The well was determined to be in a productive area of the aquifer and in relatively close proximity to the River Road Treatment Plant. *In addition, the raw water lines on-site had been previously installed, prior to Petitioner's acquisition of the utility, to make a connection to a well in the same vicinity.* (emphasis added)

Thus, it appears Well No. 17 may have been installed, at least in part, simply because raw water lines were already available. No support was provided regarding the productivity of the aquifer.

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[9] Three of the interconnections located in the northern portion of the system, 191st Street, Moontown Road, and Gray Road, can supply 11.6 MGD to the CWW system.

Q: Do you have concerns about the aquifer in which Well No. 17 is located?

A: I am concerned that, as noted in both the confidential 2013 Layne Hydro "White River North Aquifer Assessment" and the 2021 IFA "Central Indiana Water Study," the underlying aquifer has potential problems that do not appear to be going away. I am also concerned that Well No. 17 appears to be in the same area as Wells 9 and 10, which are already experiencing production challenges according to the 2019 Master Plan.

Q: Please describe the challenges you mentioned regarding River Road Wells 9 and 10.

A: The 2019 Master Plan (OUCC Attachment CNS-05) indicates River Road Wells 9 and 10 cannot be operated at the same time without significant and prohibitive drawdowns:

> Wells No. 9 and 10 have gate valves on the pump discharge throttled severely. This is allowing the pumps to operate without breaking suction in the well, however results in unnecessary and excess energy use by pumping against a mostly closed valve. Well 8 appears to be operating at its rated design point and is not throttled.
>
> According to Westfield operators, Wells No. 9 and 10 significantly impact the pumping water level in each other and *cannot be operated at the same time* without significant and prohibitive drawdowns.
>
> (emphasis added) (page 12 of 65 in OUCC Attachment CNS-05)

Pumping against a mostly closed valve increases energy usage, and it also reduces the output of the well. This is confirmed by the well inspection reports received in response to OUCC Data Request 20-4, which I have included in part (covering only Well Nos. 8, 9, & 10) as OUCC Attachment CNS-06. The table below, which I prepared, shows the decline in flow (GPM), static levels, and pumping levels over time. (For reference, a summary and graphical depiction of common well terms can be found in OUCC Attachment CNS-07.)

Table 4

Well ID	Depth	Operation	Date	Static Level	GPM	Pumping Level	Pressure	Specific Capacity	Dates of Cleaning	%chg static levels from orig	%chg pump levels from orig
RR8	107.5	Original	1997	10.9	1,810	25.8	na	120.7		-	-
RR8	107.5	Last Cleaning	2021	42.46	1,208	49.3	55	176.6		-290%	-91%
RR8	107.5	2022 Test	2022	57.04	1,202	65.43	29	143.3	2011, 2017, 2019, 2021	-423%	-154%
RR9	100.3	Original	1998	13.8	2,316	28.2	na	160.8		-	-
RR9	100.3	Last Cleaning	2021	40	2,010	70.58	29	65.7		-190%	-150%
RR9	100.3	2022 Test	2022	46.39	1,092	79.67	29	32.8	2017, 2019, 2021	-236%	-183%
RR10	107.75	Original	2003	na	1,800	na	25	na			
RR10	107.75	Last Cleaning	2020	41.38	1,512	58.8	42	86.8			
RR10	107.75	2022 Test	2022	47.97	516	59.57	98	44.5	2018, 2020		

Q: What do you conclude from reviewing these well inspection reports?

A: From these reports I conclude that static well levels (no pumping), pumping well levels, and well flow (GPM) are all declining in the area of the River Road wellfield. Given the mutual interference occurring between Wells 9 and 10 which precludes them from being operated simultaneously,[10] the decision to locate Well No. 17 in this area is questionable.

Q: Are the production challenges faced by River Road Wells 8, 9, and 10 unique to these wells?

A: No. The problem appears to be much broader than just these three wells. The 2019 Master Plan (page 9 of 65) indicates the majority of the wells have problems:

> Discussions with Westfield operators indicated that *the majority of wells are severely throttled by either partially closing a gate valve on the pump discharge or by turning down the well's VFD*. The wells are being throttled to avoid breaking suction due to the decreased water level in the aquifer. Reportedly, the pumping water level in the wells is being maintained at a minimum of 3' to 5' above the pump bowls. This confirms the findings of the 2013 Aquifer Study completed by Layne, which noted that the aquifer water levels appear to be decreasing as a result of increased mining operations. (emphasis added)

As such, it appears other wellfields supporting Petitioner's Cherry Tree and River Road plants are experiencing similar challenges. This is also supported by the 2013 Layne Hydro

[10] According to the 2019 Master Plan.

"White River North Aquifer Assessment" and a "Central Indiana Water Study" prepared for the Indiana Finance Authority ("IFA").

Q: Have you reviewed the 2013 Aquifer Study prepared by Layne and referenced in the 2019 Master Plan (page 9 of 65)?

A: Yes. This report, titled "White River North Aquifer Assessment," was provided in a confidential response to OUCC Data Request 16-35, which I include as Attachment CNS-08. Language from the Executive Summary section of that report states as follows:

<CONFIDENTIAL>

[redacted]

[redacted]

[redacted] <CONFIDENTIAL>

This report confirms that the problems experienced with Wells Nos. 9 and 10 (and likely Well No. 17) are not unique to them and potentially extend across the local aquifer.

Q: What does IFA's 2021 "Central Indiana Water Study" say about Hamilton County's aquifer?

A: This study, included as OUCC Attachment CNS-09, looked at the future demand, availability, and options for central Indiana's water supply. With regard to Hamilton County, the study provided a couple of important insights:

> In Hamilton County, the increased demand is not offset by returns from wastewater treatment plants, so there is projected to be a local increase in the deficit [of water availability]. (page 21)

> At the same time, it is expected that withdrawals from subsurface mine dewatering will increase as the mined area expands. More underground excavations are statistically more likely to encounter fractures and other secondary porosity that can drain water from overlying saturated unconsolidated sand and gravel units. (page 24)

Q: Does gravel mining continue in the immediate area of these wells?

A: Yes. Based upon CWW's response to OUCC Data Request 20-5 and upon personal observation, significant gravel mining activities continue in this area. Gravel mining activity has been shown to have potential negative impacts on nearby wells.

Q: Did you seek additional information from CWW regarding the operation of Well No. 17?

A: Yes. In OUCC Data Request No. 24-2(b), CWW was asked to provide what operational benefit is being derived from operating Well No. 17 near the other wells in the River Road wellfield. Petitioner provided the following response, which conflicts with information included in the Master Plan:

> b) RR-17 is beneficial because it allows for periodic rotation of the existing nearby wells with little to no reduction in the base well supply capacity. Additionally, during high demand periods, all of the River Road wells (8, 9, 10, and 17) can be operated concurrently to increase available raw water supply.

Also, in OUCC Data Request No. 24-2(c), CWW was asked to describe any operational deficits caused by operating Well No. 17 near the other wells in the River Road wellfield. Petitioner provided the following response:

> c) Any operational deficits are negligible. Based on water level measurements in a monitoring well adjacent to well No. 9, well No. 17 imposes approximately 2-feet of additional drawdown in well No. 9. These wells are approximately 340-feet apart, similar to the distance between River Road wells 8 and 9.

Finally, in OUCC Data Request No. 24-2(h), CWW was asked how it established the need for and location of additional wells. Petitioner provided the following response:

> h) Annually, Citizens Water of Westfield conducts flow testing for all of the existing operating production wells. This flow testing provides an analysis of the individual well capacity and which wells require rehabilitation to improve capacity. Following rehabilitation work, wells are again flow tested and the total available well supply is computed. Due to normal deterioration in capacity over the life of the well, needs for additional wells to increase available supply capacity are identified. Citizens Water of Westfield also conducts test drilling in local and regional aquifers to verify the availability of water-bearing formation.

Q: Did Petitioner also provide a Well Record and a Well Log for Well No. 17?

A: Yes. Both documents were marked as confidential.

Q: Does the information Petitioner provided in response to OUCC Data Request Nos. 24-2(b), 24-2(c), and 24-2(h) satisfy your concerns about the ability of Well No. 17 to provide an additional supply of water?

A: Only in part. Well No. 17 is deeper than the other wells,[11] which may alleviate some concerns regarding the declining aquifer levels. However, the claim that CWW can operate Well Nos. 8, 9, 10, and 17 together is in direct conflict with problems noted throughout CWW's own 2019 Master Plan.[12] Although Well No. 17 may allow for *rotation* of wells, it is not truly adding source of supply capacity to the system if it cannot be operated in conjunction with some or all of these other wells. While CWW notes that it "can" operate these wells together, it has provided no evidence to refute the interoperability problems[13] noted in the 2019 Master Plan, other than the 2 feet of additional drawdown in Well No. 9 when Well No. 17 is operating. Thus, I remain skeptical whether Well No. 17 will truly add to CWW's capacity, especially when compared with the cost of additional purchases

[11] The new well is 122 feet, versus 107.5, 100.3 and 107.75 feet for existing wells 8, 9 & 10.
[12] Which was prepared five years ago, before additional declines in the wells as shown in the Well Inspection Reports.
[13] Wells 9 and 10 being unable to operate together as referenced in 2019 Master Plan.

from Citizens. As such, I recommend Petitioner not add any other wells in the local aquifer until another aquifer study (similar to the 2013 White River North Aquifer Assessment) has been completed.

Q: What do you recommend be done "to address insufficient available water supply to meet consumption needs in the Westfield system?"

A: I recommend that before Petitioner constructs any new water wells, CWW be required to perform a cost-benefit analysis or a lifecycle cost analysis to compare the cost of constructing and operating a new well to purchasing additional water.

Q: What do you recommend regarding the Well No. 17 project?

A: I recommend the Well No. 17 project be included in Petitioner's rate base but that additional wells not be added without a cost-benefit analysis and updated aquifer study.

B. <u>146th Street Extension</u>

Q: Please describe the 146th Street Extension project.

A: Petitioner's response to OUCC Data Request 4-22, included as OUCC Attachment CNS-10, shows the 146th Street Extension project is a component of the Cherry Tree Clearwell Expansion project ("Cherry Tree project"). While I support the expansion of the Cherry Tree Clearwell project, I do not believe Petitioner has adequately shown the scope or need for the 146th Street extension component.

Q: What is the purpose of the Cherry Tree Clearwell Expansion project?

A: According to the Project Planning Memo identified as Attachment EJB-3 to Petitioner's Exhibit 4, this project "has been identified to address the lack of finished water storage capacity at the treatment plant." Based upon my review of the testimony, responses to data requests, and the 2019 Master Plan, I agree the Cherry Tree Clearwell should have been expanded from 30,000 gallons to 500,000 gallons.[14]

Q: How does the 146th Street extension main relate to the Cherry Tree Clearwell Expansion project?

A: Petitioner's testimony and its response to data requests do not reveal whether or how the 146th Street Main extension relates to the Cherry Tree Clearwell expansion project. It simply appears as a separate line item in cost estimates for the Cherry Tree project provided in response to OUCC Data Request 4-22 and included here as OUCC Attachment CNS-10.

Q: Did you seek additional information regarding the 146th Street extension project?

A: Yes. Through Data Requests 4-5 and 21-2, the OUCC sought justification for the project. The following responses did not reassure the OUCC that the extension would be useful to CWW's operations:

> DATA REQUEST NO. 5:
>
> As part of the Cherry Tree Clear Well Expansion CWW is proposing to install a new connection to Citizens Water.
>
> a. Please explain the need for this connection.
>
> b. Please state how the connection will be used. For emergency use by CWW, daily use by CWW, for emergency use by Citizens Water, etc.
>
> RESPONSE:
>
> a. See Petitioner's Exhibit No. 4, Verified Direct Testimony of Edward J. Bukovac, p. 6, lines 11-12, and p. 7, lines 1-2. The connection is needed for enhanced reliability, supply redundancy, and the exchange of water between the systems for optimized operations.
>
> b. See response to subpart a., above.

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[14] According to Attachment EJB-3, "[t]he existing 30,000-gallon clearwell provides only 6-minutes of finished water storage at the high service pump total capacity of 4,450 gpm." While this claim ignores the likelihood that the wells cannot deliver 4,450 gpm to the treatment plant, a 30,000-gallon clearwell is unusually small for a similarly sized treatment plant.

DATA REQUEST NO. 2:

Reference the Cherry Tree clearwell cost estimate provided in response to OUCC Data Request 4-22, please answer the following questions:

a) What is the purpose of the 146th Street extension?"

b) Where is the "attached UE&C" estimate indicated on that line?

c) If not already provided, please provide the "attached UE&C estimate."

RESPONSE:

a. As noted in Petitioner's Exhibit No. 4, Verified Direct Testimony of Edward J. Bukovac, p. 14, A.29, lines 8 – 10, the purpose of the 146th Street Main Extension is to interconnect with Citizens Water.

b. It was inadvertently left out of the attachment.

c. See the document identified as OUCC DR 21-2.

I have included the cost estimate provided in response to OUCC DR 21-2(c) as OUCC Attachment CNS-11.

Q: Did these answers provide meaningful support showing the need for this project?

A: No. Given the highly interconnected nature of CWW's system, including both wells and treated water, it remains unclear why this project is reasonably necessary for continued reliable operations. Since Petitioner has not supported the need for this project, the cost of this project should be excluded from rate base additions.

Q: What is the total estimated cost for the Cherry Tree extension main?

A: The total estimated project cost is $903,000, according to Petitioner's response to OUCC data request 21-2 referenced above. Therefore $903,000 should be excluded from CWW's rate base additions.

IV. RECOMMENDATIONS

Q: Please summarize your recommendations.

A: I recommend that:

1) $903,000 be removed from rate base additions.
2) Petitioner perform a lifecycle cost analysis to compare the cost of the new well versus the cost of purchased water, prior to adding additional wells.
3) Petitioner update the 2013 Aquifer Study to determine its capabilities before adding new wells.

Q: Does this conclude your testimony?

A: Yes.

APPENDIX A

QUALIFICATIONS

Q: Please describe your educational background and experience.

A: In 1981 I graduated from Purdue University, where I received a Bachelor of Science degree in Industrial Management with a minor in Engineering. I was recruited by the Union Pacific Railroad, where I served as mechanical and maintenance supervisor and industrial engineer in both local and corporate settings in St. Louis, Chicago, Little Rock and Beaumont, Texas. I then served as Industrial Engineer for a molded-rubber parts manufacturer before joining the Indiana Utility Regulatory Commission ("IURC") as Engineer, Supervisor and Analyst for more than ten years. It was during my tenure at the IURC that I received my Master of Health Administration degree from Indiana University. After the IURC, I worked at Indiana-American Water Company, initially in their rates department, then managing their Shelbyville operations for eight years, and later served as Director of Regulatory Compliance and Contract Management for Veolia Water Indianapolis. I joined Citizens Energy Group as Rate & Regulatory Analyst following the October 2011 transfer of the Indianapolis water utility and joined the Office of Utility Consumer Counselor in April of 2016. In March 2020 I was promoted to my current position of Assistant Director of the Water and Wastewater Division.

Q: Have you previously testified before the Indiana Utility Regulatory Commission?

A: Yes, I have testified in telecommunications, water and wastewater utility cases before the Commission.

AFFIRMATION

I affirm the representations I made in the foregoing testimony are true to the best of my knowledge, information, and belief.

![signature: Carl N Seals]

By: Carl N. Seals
Cause No. 46020
Office of Utility Consumer Counselor (OUCC)

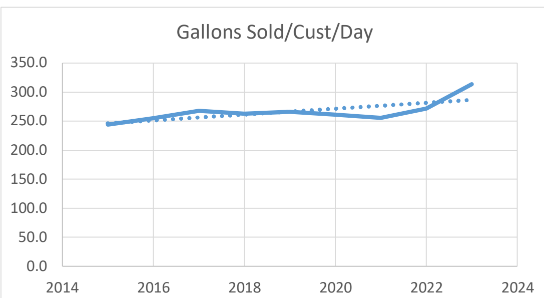
Date: June 19, 2024

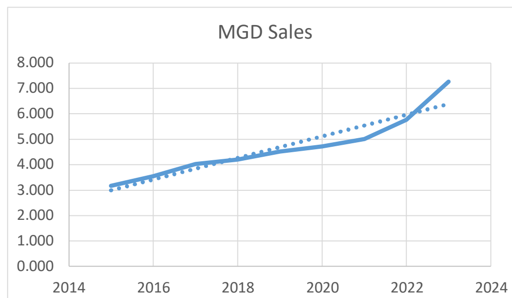
Utility Dashboard
Citizens Water of Westfield
Cause No. 46020

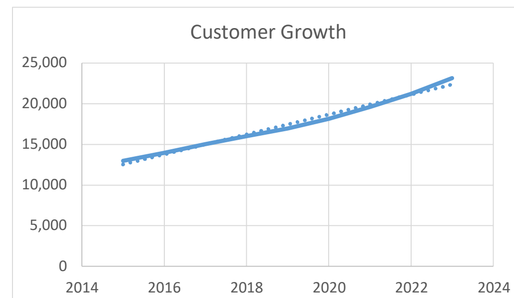
	W-1	W-6	W-6		W-6					W-6
Year	Customers Year-End	Total Pumped & Purchased	Total Sold	Non-Revenue (C - D)	System Usage	Water Loss (E - F)	Percent Loss (G / C)	Average MGD Sold	Gallons Sold/ Cust/Day	Main Breaks
2015	12,976	1,416,772	1,155,291	261,481	31,706	229,775	16.2%	3.165	243.9	5
2016	13,967	1,568,833	1,300,648	268,185	38,264	229,921	14.7%	3.554	255.1	5
2017	15,025	1,680,659	1,469,580	211,079	34,454	176,625	10.5%	4.026	268.0	6
2018	16,019	1,822,321	1,536,076	286,245	34,456	251,789	13.8%	4.208	262.7	7
2019	16,973	2,012,791	1,649,369	363,422	40,516	322,906	16.0%	4.519	266.2	11
2020	18,143	1,993,247	1,727,728	265,519	50,988	214,531	10.8%	4.721	260.9	10
2021	19,591	2,098,963	1,827,031	271,932	72,257	199,675	9.5%	5.006	255.5	12
2022	21,207	2,372,548	2,103,372	269,176	91,811	177,365	7.5%	5.763	271.7	21
2023	23,147	2,957,245	2,651,440	305,805	109,007	196,798	6.7%	7.264	313.8	8

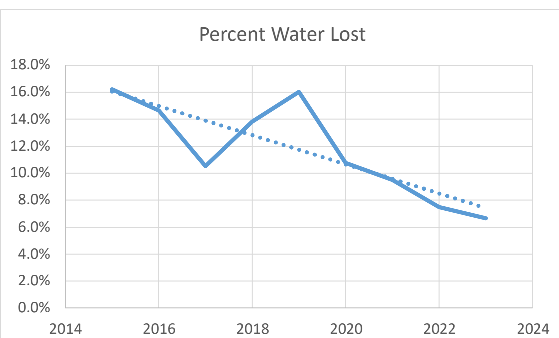
average mgd sales 2023	7.264	mgd
average cust growth	1,017	/yr

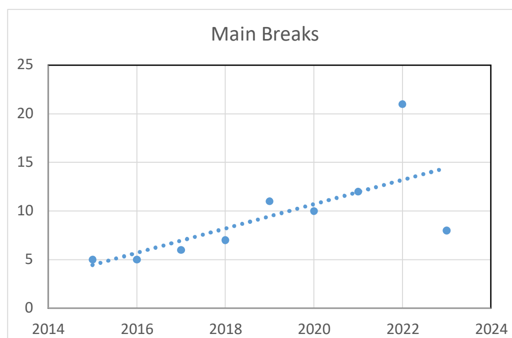
All reported in thousand gallons unless otherwise noted
System usage includes water reported as used for firefighting, backwashing, main flushing, etc.
Source: IURC Annual Reports W-1, W-6, except main breaks 2018-2021, which were corrected in DR 7-6
Customers year-end includes private fire protection and irrigation customers



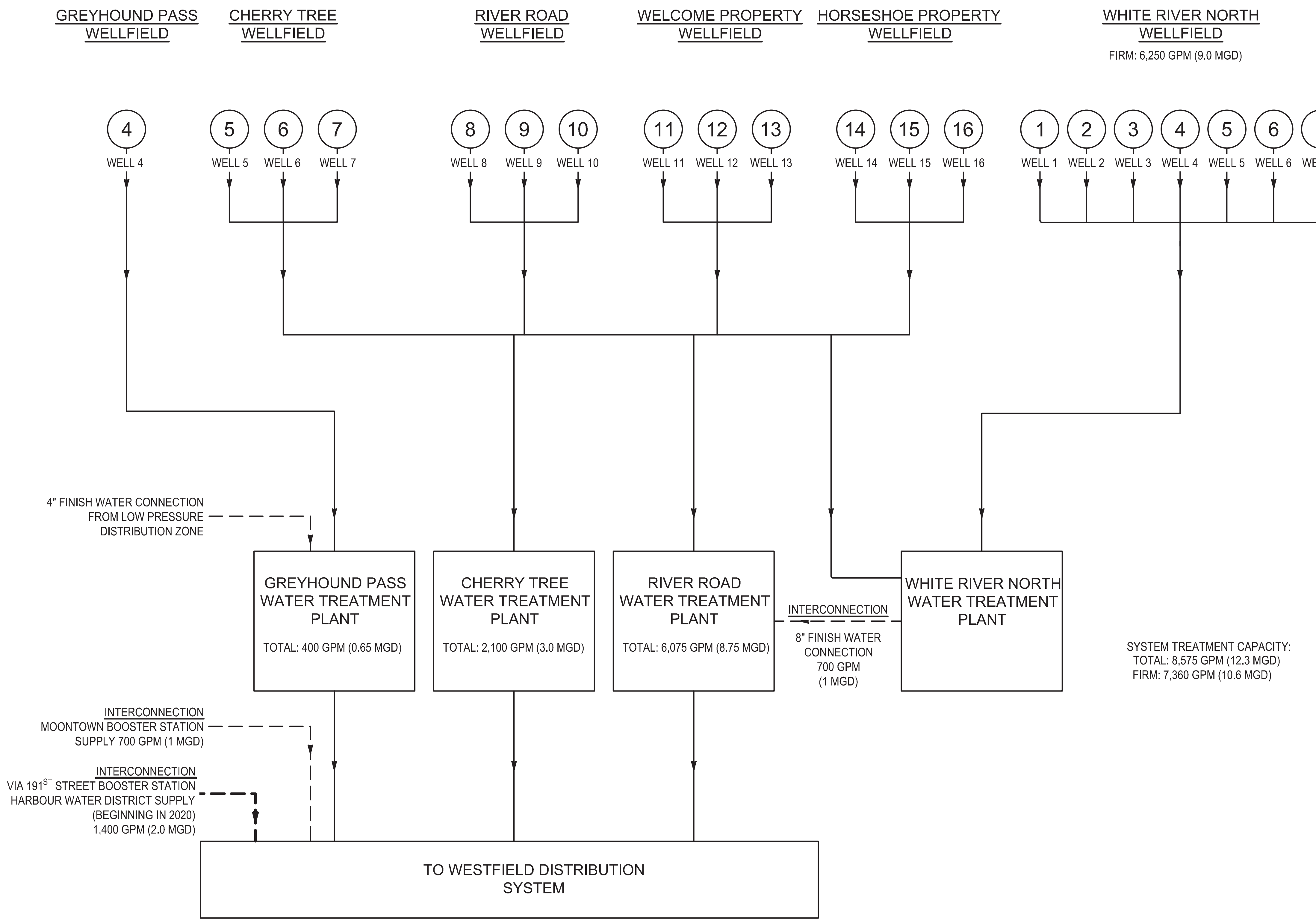








Dashed lines show results of linear regression (trend) over period shown



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LEGEND:

Westfield Well Capacity
(WELLS 4-16)

Reliable Source Capacity:
8,851 gpm (12.7 MGD)

Estimated Moderate Drought Capacity:
7,081 gpm (10.2 MGD)

NOTE:
1. SYSTEM FIRM TREATMENT CAPACITY IS REFLECTIVE OF ONE (1.75 MGD) FILTER OUT OF SERVICE AT RIVER ROAD WATER TREATMENT PLANT.
2. WHITE RIVER NORTH WATER TREATMENT PLANT CAPACITY NOT CONSIDERED IN SYSTEM TREATMENT CAPACITY.

FIGURE 2
Westfield Existing Water System Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 2

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH.dwg | Layout: FIG-2 | Plotted: 06/12/19 @ 11:05:35 | LastSavedBy: CurtisG

ATTACHMENT EJB-2

Citizens Water of Westfield, LLC

Attachment EJB-2 - Capital Project List

Project Number	Project Name	Project Spend In-Service Link Period July 2023 - June 2024	Project Spend In-Service Test Year July 2024 - June 2025	Projected In-Service Date
1267CBA - Westfield Water Facilities				
48CY05691	Cherry Tree Clear Well Expansion	$5,850,894	$0	5/30/2024
48CY06325	Cherry Tree Raw Water Valves	$232,000	$0	4/30/2024
48MW06291	CSM Facility Improvements	$100,000	$0	5/31/2024
48MW06404	Misc. Minor Plant Projects	$0	$100,000	9/30/2024
48MW06405	Misc. Minor Plant Projects	$0	$75,000	6/30/2025
Total 1267CBA - Westfield Water Facilities		**$6,182,894**	**$175,000**	
1268CBA - Westfield Water Storage & Supply				
48SS04086	River_Road_Well_17	$1,199,612	$0	4/30/2024
48TK06125	161st St Tank Rehab	$0	$850,000	5/20/2025
48SS06378	2024 WF Well Rehabilitation	$0	$220,000	9/30/2024
48SS06403	2025 WF Well Rehabilitation	$0	$250,000	6/30/2025
Total 1268CBA - Westfield Water Storage & Supply		**$1,199,612**	**$1,320,000**	
1269CBA - Westfield Water Distribution System				
48ME06142	Grassy Branch Main Extension	$0	$625,413	6/30/2025
48MR06220	Union St & David Brown MR	$0	$603,000	6/30/2025
48RI04653	WFW Private Development FY24	$742,500	$247,500	9/30/2024
48RI04654	WFW Private Development FY25	$0	$742,500	6/30/2025
48SR00860	Service Line Replacements	$200,000	$50,000	9/30/2024
48SR00860	Service Line Replacements	$0	$200,000	6/30/2025
48RM00673	New Meters	$750,000	$0	9/30/2024
48RM00673	New Meters	$0	$500,000	6/30/2025
48RM00674	Replacement Meters	$750,000	$0	9/30/2024
48RM00674	Replacement Meters	$0	$500,000	6/30/2025
48MD00678	Hydrant Replacement	$37,500	$12,500	9/30/2024
48MD00678	Hydrant Replacement	$0	$37,500	6/30/2025
48MD00675	Taps - New - BU48	$75,000	$25,000	9/30/2024
48MD00675	Taps - New - BU48	$0	$75,000	6/30/2025
Total 1269CBA - Westfield Water Distribution System		**$2,555,000**	**$3,618,413**	
1270CBA - Westfield Water Technology & Support Services				
48FL06370	FY24 WF Water Fleet Purchases	$0	$150,000	9/30/2024
48FL06371	FY25 WF Water Fleet Purchases	$0	$100,000	6/30/2025
Total 1270CBA - Westfield Water Technology & Support Services		**$0**	**$250,000**	
Total Citizens Water of Westfield		**$9,937,506**	**$5,363,413**	

citizens energy group

DETAILED PROJECT COST ESTIMATE

PROJECT NUMBER: 48SS04086
PROJECT NAME: River Road Well 17
ALTERNATIVE XXXXXXXXX
PREPARED BY: P. Johnson
DATE OF ESTIMATE: 1/20/2023
CLASS OF ESTIMATE 5 (30% to 40%)
(Refers to the Typical Contingency Used)

ACCURACY RANGE
L: -20% to -50%
H: +30% to +100%

COST SUMMARY

$	1,351,774.00	TOTAL PROJECT COST ESTIMATE ($)
$	197,434.00	ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)
$	1,154,340.00	CONSTRUCTION COST ESTIMATE TOTAL ($)

DIVISION AND DESCRIPTION	UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
DIV 1-GENERAL REQUIREMENTS						
Submittals	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Project Management and Administration	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Startup/Testing/Commisioning	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Construction Facilities and Temporary Controls	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Project Construction Engineering	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Bonds and Insurance	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
		DIV 1-GENERAL REQUIREMENTS		**SUB TOTAL**	$ 52,272.00	
DIV 2-SITE WORK						
Meter Vault and Piping	LS	$ 120,000.00	1	$ 120,000.00		
New well site and piping	LS	$ 325,000.00	1	$ 325,000.00		
				$ -		
		DIV 2-SITE WORK		**SUB TOTAL**	$ 445,000.00	
DIV 3-CONCRETE						
		DIV 3-CONCRETE		**SUB TOTAL**	$ -	
DIV 4-MASONRY						
				$ -		
		DIV 4-MASONRY		**SUB TOTAL**	$ -	
DIV 5-METALS						
				$ -		
		DIV 5-METALS		**SUB TOTAL**	$ -	
DIV 6-WOODS AND PLASTICS						
				$ -		
		DIV 6-WOODS AND PLASTICS		**SUB TOTAL**	$ -	
DIV 7-THERMAL AND MOISTURE PROTECTION						
				$ -		
		DIV 7-THERMAL AND MOISTURE PROTECTION		**SUB TOTAL**	$ -	
DIV 8-DOORS AND WINDOWS						
				$ -		
		DIV 8-DOORS AND WINDOWS		**SUB TOTAL**	$ -	
DIV 9-FINISHES						
				$ -		
		DIV 9-FINISHES		**SUB TOTAL**	$ -	
DIV 10-SPECIALTIES						
				$ -		
		DIV 10-SPECIALTIES		**SUB TOTAL**	$ -	
DIV 11-EQUIPMENT						
Flow Meter	EA	$ 12,500.00	2	$ 25,000.00		
Valves	EA	$ 11,200.00	1	$ 11,200.00		
24-inch Well	EA	$ 95,000.00	1	$ 95,000.00		
Well Pump and Motor	EA	$ 105,000.00	1	$ 105,000.00		
				$ -		
		DIV 11-EQUIPMENT		**SUB TOTAL**	$ 236,200.00	
DIV 12-FURNISHINGS						
				$ -		
		DIV 12-FURNISHINGS		**SUB TOTAL**	$ -	
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)						
Well Instrumentation	LS	$ 55,000.00	1	$ 55,000.00		
				$ -		
		DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)		**SUB TOTAL**	$ 55,000.00	
DIV 14-CONVEYING SYSTEMS						
				$ -		
		DIV 14-CONVEYING SYSTEMS		**SUB TOTAL**	$ -	
DIV 15-MECHANICAL						
				$ -		
		DIV 15-MECHANICAL		**SUB TOTAL**	$ -	
DIV 16-ELECTRICAL AND COMMUNICATIONS						
Electrical Feed/Transformer	LS	$ 35,000.00	1	$ 35,000.00		
Electrical Connections and Equipment	LS	$ 100,000.00	1	$ 100,000.00		
				$ -		
		DIV 16-ELECTRICAL AND COMMUNICATIONS		**SUB TOTAL**	$ 135,000.00	
CONSTRUCTION COST SUB TOTAL ($)					$ 923,472.00	
CONTINGENCY (% OF CONSTRUCTION COST SUB TOTAL)	%	5			$ 46,173.60	
MOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	2			$ 18,469.44	
DEMOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	1			$ 9,234.72	
CONTRACTOR MARK UP (% OF CONSTRUCTION COST SUB TOTAL)	%	7			$ 64,643.04	
CONTRACTOR PROFIT (% OF CONSTRUCTION COST SUB TOTAL)	%	10			$ 92,347.20	
CONSTRUCTION COST ESTIMATE TOTAL ($)					$ 1,154,340.00	

REAL ESTATE		**ACRE**			$ -	Includes Land+Vendor+Internal
LEGAL	0%	**LS**			$ -	
PLANNING	0%	**LS**			$ -	
ENGINEERING/DESIGN	5%	**LS**	$ 55,000.00	1	$ 55,000.00	
GEOTECHNICAL ENGINEERING	2%	**LS**	$ 27,000.00	1	$ 27,000.00	
SITE/TOPO SURVEY	0%	**LS**			$ -	
CONSTRUCTION ADMINISTRATION (ENGINEER)	0%	**LS**			$ -	
CONSTRUCTION INSPECTION (PART TIME)	0%	**LS**			$ -	
CONSTRUCTION INSPECTION (FULL TIME)	0%	**LS**			$ -	
CONSTRUCTION TESTING	0%	**LS**			$ -	
ENVIRONMENTAL NEEDS	0%	**LS**			$ -	
DIRECT COSTS (% CONSTRUCTION COST ESTIMATE TOTAL)		**%**	5		$ 57,717.00	

DIVISION AND DESCRIPTION		UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
LOADINGS (% CONSTRUCTION COST ESTIMATE TOTAL)		**%**	5		$ 57,717.00		
CLOSEOUT	0%	**LS**			$ -		
ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)						**$ 197,434.00**	
TOTAL PROJECT COST ESTIMATE ($)						**$ 1,351,774.00**	

Westfield Treatment and Supply Capacity Study

prepared for

CITIZENS WATER OF WESTFIELD LLC

June 2019

WESSLER ENGINEERING

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1.0 INTRODUCTION

Citizens Water of Westfield LLC (Citizens Westfield) owns and operates the Westfield water system. Westfield water system's source water comes from thirteen (13) groundwater wells in five (5) wellfields. Groundwater is pumped to Westfield's three (3) water treatment plants (WTPs) from the wells. At the plants, raw water is filtered, chlorine is fed as the primary oxidant and disinfectant, and fluoride is fed for dental health. Westfield has four (4) booster stations and six (6) elevated storage tanks throughout the distribution system.

The purpose of this treatment and supply capacity study is to:

- Summarize existing and future (20-year) water demands
- Identify reliable source capacity and estimated moderate drought capacity of the existing Westfield groundwater wells.
- Identify rated and operating capacities of the existing Westfield water treatment facilities
- Identify source and supply capacity deficiencies during the planning period
- Evaluate feasible options for additional water sources, groundwater supplies, treatment plant expansions, and new treatment facilities
- Develop a summary of the feasibly source and supply options, with costs and capacities.
- Compare the feasible source and supply options to the identified deficiencies and identify any remaining deficiencies.

1.1 Current Situation

The current average day demand is 4.5 MGD, the summer peak demand is 9.5 MGD, and drought peak demand is 12.8 MGD.

The majority of the groundwater wells have discharge valves throttled or VFD's turned down severely. This is due to the decreasing aquifer water levels, to prevent breaking suction and causing damage to the pumps. Throttling the wells has greatly reduced the reliable source water capacity. The estimated moderate drought capacity of the wells is 10.2 MGD. There is immediate need for additional source water capacity.

The firm system capacity of Westfield's treatment facilities is 10.6 MGD. Westfield has several interconnections from neighboring water systems. These interconnects can currently provide 2.0 MGD of potable water and are anticipated to provide 4.0 MGD of potable water in 2020. There is not an immediate need for additional treatment capacity, considering the planned interconnect capacity of the 191st St booster station in 2020.

1.2 Future Situation

The 20-year average day demand is estimated to be 16.2 MGD, the summer peak demand is estimated to be 19.5 MGD, and the 20-year drought peak demand is estimated to be 26.3 MGD. Deficiencies in source (12.2 MGD) and treatment (11.7 MGD) will occur at the end of the planning period without additional capacities for each.

1.3 Recommended Improvements

To meet current and future system demands, the feasible source water options include:

1. Westfield Road Wellfield, 6.0 MGD total capacity, estimated project cost $4.8 million.
2. Martin Marietta Wellfields, 7.4 MGD total capacity, estimated project cost $6.25 million.

To meet future system demands, feasible treatment alternatives include:

1. River Road WTP Expansion, 3.5 MGD, estimated project cost $18.0 million.
2. Cherry Tree WTP Expansion, 2.0 MGD, estimated project cost $5.8 million.
3. New Unidentified GWTP, 6.0 MGD total capacity, estimated project cost $15.6 million.
4. New Unidentified SWTP, 6.0 MGD total capacity, estimated project cost $28.0 million.

Feasible source water options are described in **Section 5.0** Groundwater Supply Alternatives and feasible treatment alternatives are described in **Section 6.0** Treatment Alternatives. Detailed cost estimated can be found in **Appendix C**.

2.0 WATER DEMANDS

The Westfield water system has experienced significant growth in recent years. This growth trend is expected to continue and planning for this growth is critical to the success of the water system. This report is based on a 20-year planning period from 2019 to 2039.

Average day demand values shown are based on historical pumping records provided by Citizens Westfield. Summer Peak demand and Drought Peak demand planning period trends have also been provided by Citizens Westfield.

Non-Revenue water was provided for the data set of April 2017 to February 2019. On average, non-revenue water accounts for 14.8% of the water pumped and treated. Water loss in excess of 25% is considered to be deficient by *Indiana Administrative Code 327 Article 8*. Based on this benchmark, Westfield's non-revenue water is well below what would be considered deficient.

2.1 Current Demands

Historic average day demands of the Westfield water system are shown in **Table 2-1** below.

Table 2-1: Average Day Demand Summary

Year	*Average Day Demand (MGD)*	*Annual Trend*
2013	3.59	--
2014	3.77	+5%
2015	4.03	+7%
2018	4.7	+6%
2019	4.5	-4%

As shown above, from 2013 to 2018, the Westfield water system has experienced an annual increase in demand of approximately 6%. The average day demand has remained relatively consistent over the past two years. For planning purposes, it is assumed the 6% annual demand increase will continue throughout the 20-year planning period.

Peak demands reflect the following scenarios:

- Summer Peak – Typical annual maximum demand day demand
- Drought Peak – Atypical maximum demand day resultant of drought conditions

The current Summer Peak Demand is 9.5 MGD. To account for drought factors, an additional 35% demand is applied to the Summer Peak Demand, giving the current Drought Peak Demand as 12.8 MGD. This current Drought Peak Demand has a peaking factor of 2.8 compared to the average day, which is significantly higher than a typical value for a water system. This high peaking factor is attributed to irrigation water loads during the summer months. It should be noted that the Summer Peak Demand was projected to increase 0.5 MGD per year and the average day demand was projected to increase 6% per year, based on historical trends. As such, the Drought Peak Demand does not have as significant of a peaking factor at the end of the planning period compared to 2019.

2.2 Future Demands

Summer Peak and Drought Peak water system demands for the 20-year planning period were provided by Citizens Westfield and are shown in **Table 2-2** below.

Table 2-2: System Demand Summary

Year	*Average Day Demand (MGD)*	*Summer Peak Demand (MGD)*	*Drought Peak Demand (MGD)*
2019	4.5	9.5	12.8
2039	16.2	19.5	26.3

3.0 EXISTING FACILITIES

The Westfield water system consists of thirteen (13) groundwater wells in five (5) wellfields, three (3) water treatment plants, four (4) booster stations, and six (6) elevated storage tanks throughout the distribution system. Major system components can be seen on the system map provided in **Figure 1** in **Appendix A.**

3.1 Existing Service Area

The Westfield water system service area is generally bounded by Mulebarn Rd to the west, 216th St to the north, Morse Reservoir to the east, and 146th St to the south.

Citizens Westfield owns and operates the Westfield water system. This system is separate from the Citizens Water system and the Harbour District of the Citizens Water system. However, these three systems have interconnects that allow for the allocation of water resources between the three systems.

The Westfield water system is bordered on the south by Carmel Utilities, and to the southeast and northeast by Citizens Water (White River North pressure zone to the southeast, Harbour Water District to the northeast).

3.2 Groundwater Wells

The Westfield water system consists of five (5) wellfields containing a total of thirteen (13) individual groundwater wells. The wellfields are: Greyhound Pass, Cherry Tree, River Road, Welcome Property, and Horseshoe Property. All well casings are above the 100-year floodplain elevation.

For the purposes of this report, the system-wide well capacity was evaluated on two parameters:

- Reliable Source Capacity – historic production of the individual wells as reported by Westfield's Hach WIMs SCADA software. The reference data set is from June 2018 to August 2018. This capacity is being considered against Normal Summer Peak Demands.
- Estimated Moderate Drought Capacity – Reliable Source Capacity for each well was reduced to 80% of its production to reflect lowered aquifer levels and resultantly reduced production. This capacity is being considered against Drought Peak Demands.

The Reliable Source Capacity and Estimated Moderate Drought Capacity of the water system are summarized in **Table 3-1.**

Table 3-1: Westfield Water System – System Wide Source Capacity Summary

Reliable Source Capacity	
Total Capacity, gpm (MGD)	8,851 gpm (12.7 MGD)
Estimated Moderate Drought Capacity	
Total Capacity, gpm (MGD)	7,081 gpm (10.2 MGD)

It should be noted that, over the past 5 to 10 years, mining operations in the vicinity of the Westfield Water System wells have increased significantly. As a result, the amount of groundwater pumped and dewatered from the mining operations and the aquifer has also increased. This has resulted in decreasing aquifer levels in recent years. **Graph 3-2** illustrates the declining aquifer level.

Graph 3-2: Aquifer Level Trend (2014-2018)

As shown above, aquifer water levels have been steadily decreasing over the past five years, starting at roughly 28' below grade in 2014 and ending at roughly 39' below grade in 2018. Water levels shown above were taken at the Cherry Tree Wellfield from Westfield's Hach WIMs SCADA software. While this aquifer level was taken at one of the five wellfields in the system, it should be noted that all of Westfield's groundwater wells are likely drawing from the same aquifer and equally impacted by the decreased aquifer levels.

Discussions with Westfield operators indicated that the majority of wells are severely throttled by either partially closing a gate valve on the pump discharge or by turning down the well's VFD. The wells are being throttled to avoid breaking suction due to the decreased water level in the aquifer. Reportedly, the pumping water level in the wells is being maintained at a minimum of 3' to 5' above the pump bowls. This confirms the findings of the 2013 Aquifer Study completed by Layne, which noted that the aquifer water levels appear to be decreasing as a result of increased mining operations. VFD's should be considered at all wells which are currently being throttled mechanically (by either a pinched valve or orifice plate). Installing VFD's will allow the wells to be turned down without, or to a lesser degree, mechanically throttled. It is recommended that VFD's are considered at these well locations. The costs for VFD installation, motor replacement, and anticipated energy savings has not been evaluated. Additional information is required on the existing motors and energy usage to understand the potential energy savings and costs associated with VFD installation and motor replacement.

In addition to a decreasing aquifer water level, deficiencies within the individual well gravel pack, screen, casing, pump and motor could contribute to decreased well production. Discussions with Citizens Westfield indicate that the wells are regularly televised to confirm the casing integrity and if deficiencies are found, they are repaired immediately. In addition, the wells are regularly cleaned and maintained.

The following wells are scheduled to be cleaned in 2019: Greyhound Pass Well No. 4, River Road Wells No. 8 and 9, and Welcome Property Wells No. 11 and 12.

Considering the stressed condition of the aquifer, and regular maintenance and inspection of the wells, it is believed that the reduction in Reliable Source Capacity is solely a result of the reduced available aquifer yield, and not reflective of poor pump or mechanical performance.

With the exception of the Greyhound Pass wellfield, all wellfields pump to a common raw water main. As such, Cherry Tree wellfield, River Road wellfield, Welcome Property wellfield, and Horseshoe Property wellfield can pump untreated water to either Cherry Tree WTP or River Road WTP. These wellfields also have the flexibility to pump raw water to the White River North groundwater WTP, which is not a Westfield asset. Flow direction from individual wellfields to WTP's is dictated by manually operated valves throughout the raw water main system. For the purpose of this report, it is assumed that all Westfield wells will be pumping to Westfield WTPs, and not to White River North WTP.

It is unknown if the flexibility exists to send raw water from the White River North raw main to Westfield WTP's. Further investigation should be completed to understand the extents of the flexibility between the two common raw water mains.

Wellfields, individual well capacities, and specific capacity trends are more particularly described in the following section.

3.2.2 Greyhound Pass Wellfield

The Greyhound Pass Wellfield consists of one well (Well No. 4) which pumps to the Greyhound Pass WTP. There is no flexibility or interconnection on the Greyhound Pass wellfield. The reliable source capacity and estimated moderate drought capacity of the wellfield is provided in **Table 3-3**.

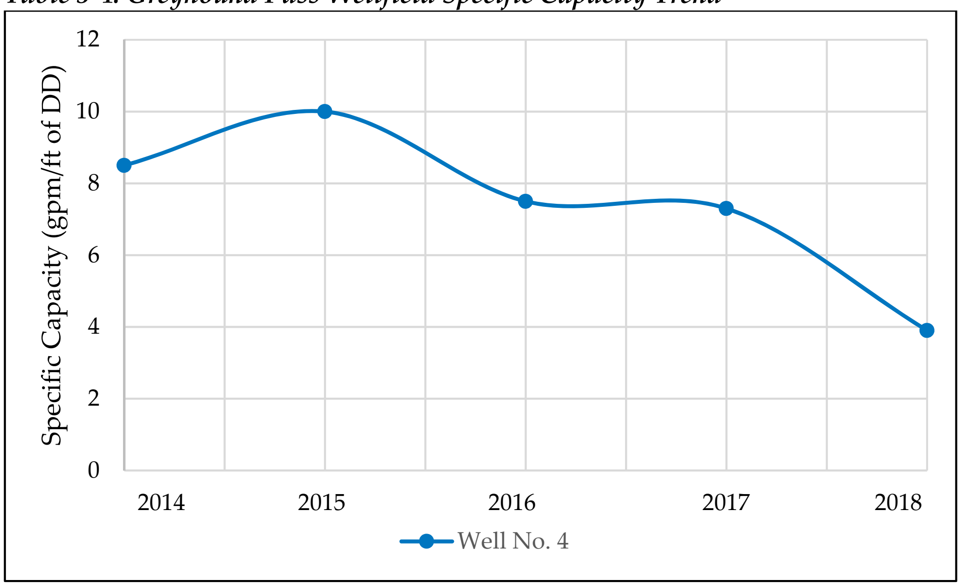
Table 3-3: Greyhound Pass Existing Wellfield Capacities

	Well No. 4	*Total Capacity*
Reliable Source Capacity	569 gpm (0.82 MGD)	569 gpm (0.82 MGD)
Estimated Moderate Drought Capacity	456 gpm (0.66 MGD)	456 gpm (0.66 MGD)

As shown in **Table 3-3,** the reliable source capacity of the wellfield is 569 gpm (0.82 MGD) and the estimated moderate drought capacity is 456 gpm (0.66 MGD).

As shown in **Table 3-4** below, specific capacity has been trending downwards in recent years at this wellfield.

Table 3-4: Greyhound Pass Wellfield Specific Capacity Trend



Well No. 4 was cleaned in 2014, DD = Drawdown

3.2.3 River Road Wellfield

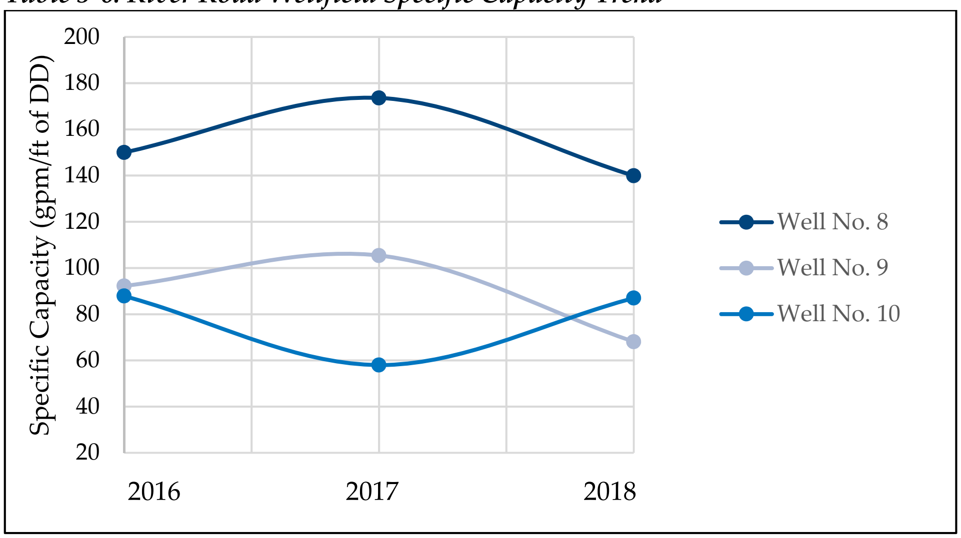
The River Road Wellfield consists of three (3) wells which typically pump to the River Road WTP. This wellfield has the flexibility to also pump to either Cherry Tree WTP or the White River North WTP. For the purpose of this report, it is assumed that this wellfield pumps to the River Road WTP. Further investigations are required to understand the flexibility of the raw water mains and how the flow could be split between WTP's. The reliable source capacity and estimated moderate drought capacity of the wellfield is provided in **Table 3-5.**

Table 3-5: River Road Existing Wellfield Capacities

	Well No. 8	*Well No. 9*	*Well No. 10*	*Total Capacity*
Reliable Source Capacity	1,292 gpm (1.86 MGD)	1,250 gpm (1.8 MGD)	1,153 gpm (1.66 MGD)	3,694 gpm (5.32 MGD)
Estimated Moderate Drought Capacity	1,033 gpm (1.49 MGD)	1,000 gpm (1.44 MGD)	922 gpm (1.33 MGD)	2,956 gpm (4.26 MGD)

As shown in **Table 3-6** below, specific capacity has generally been maintaining in recent years at this wellfield.

Table 3-6: River Road Wellfield Specific Capacity Trend



Wells No. 8 and 9 were cleaned in 2017 and Well No. 10 was cleaned in 2018.

Wells No. 9 and 10 have gate valves on the pump discharge throttled severely. This is allowing the pumps to operate without breaking suction in the well, however results in unnecessary and excess energy use by pumping against a mostly closed valve. Well 8 appears to be operating at its rated design point and is not throttled.

According to Westfield operators, Wells No. 9 and 10 significantly impact the pumping water level in each other and cannot be operated at the same time without significant and prohibitive drawdowns.

3.2.5 Cherry Tree Wellfield

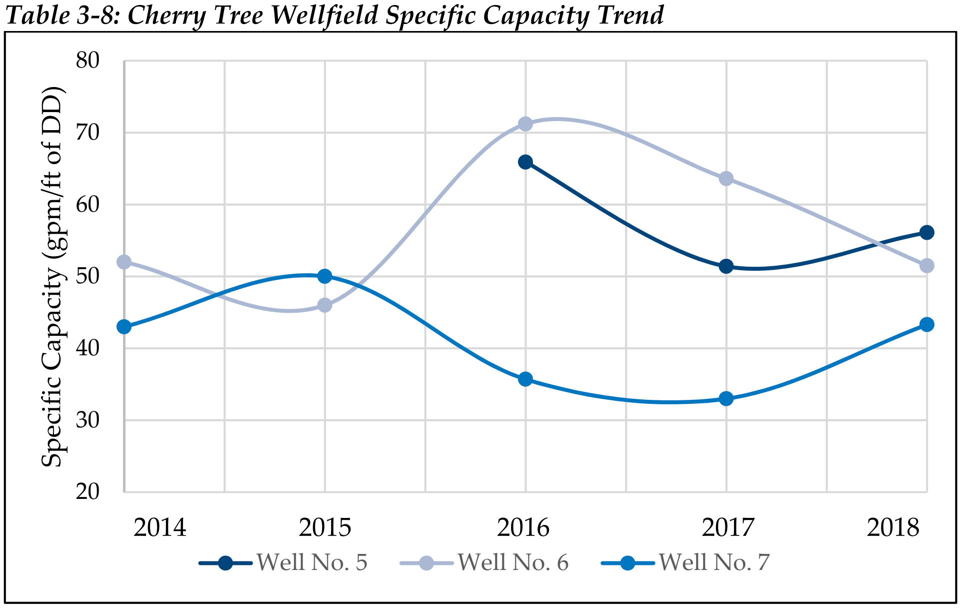
The Cherry Tree Wellfield consists of three (3) wells which typically pump to the Cherry Tree WTP. This wellfield has the flexibility to also pump to either the River Road WTP or the White River North WTP. For the purpose of this report, it is assumed that this wellfield pumps to the Cherry Tree WTP. Further investigations are required to understand the flexibility of the raw water mains and how the flow could be split between WTP's. The reliable source capacity and estimated moderate drought capacity of the wellfield is provided in **Table 3-7**.

Table 3-7: Cherry Tree Existing Wellfield Capacities

	Well No. 5	Well No. 6	Well No. 7	Total Capacity
Reliable Source Capacity	486 gpm (0.70 MGD)	518 gpm (0.75 MGD)	792 gpm (1.14 MGD)	1,796 gpm (2.60 MGD)
Estimated Moderate Drought Capacity	389 gpm (0.56 MGD)	415 gpm (0.60 MGD)	633 gpm (0.91 MGD)	1,437 gpm (2.1 MGD)

As shown in **Table 3-8** below, specific capacity has generally been maintaining in recent years at this wellfield.

Table 3-8: Cherry Tree Wellfield Specific Capacity Trend



Wells No. 6 and 7 were cleaned in 2015. Wells No. 5 and 7 were cleaned in 2018.

All wells in this wellfield have gate valves on the pump discharge throttled severely. This is allowing the pumps to operate without breaking suction in the well, however results in unnecessary and excess energy use by pumping against a mostly closed valve.

3.2.7 Welcome Property Wellfield

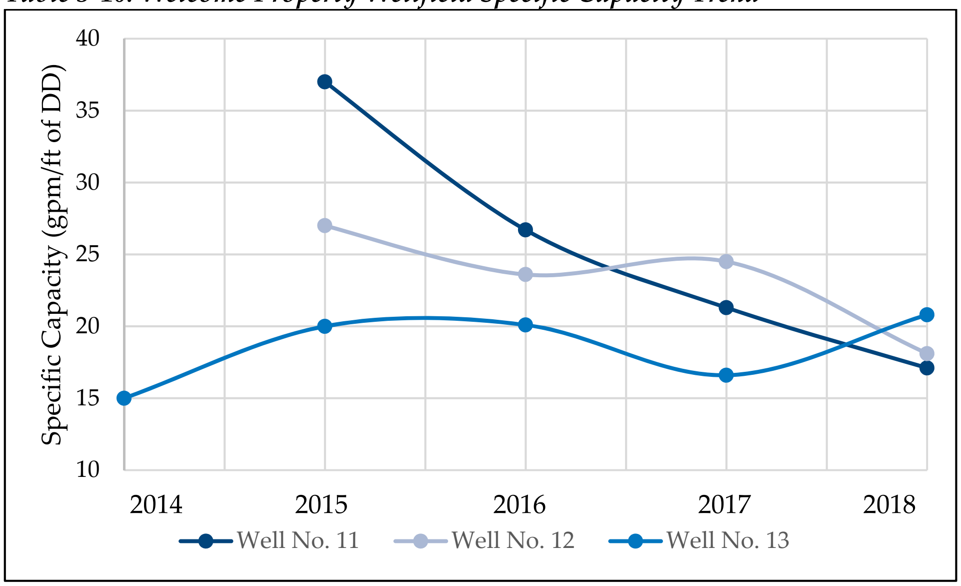
The Welcome Property Wellfield consists of three (3) wells which typically pump to the River Road WTP. In the past, these wells have pumped to the White River North WTP. This wellfield also has the flexibility to pump to Cherry Tree WTP. For the purpose of this report, it is assumed that this wellfield pumps to the River Road WTP. Further investigations are required to understand the flexibility of the raw water mains and how the flow could be split between WTP's. The reliable source capacity and estimated moderate drought capacity of the wellfield is provided in **Table 3-9**.

Table 3-9: Welcome Property Existing Wellfield Capacities

	Well No. 11	*Well No. 12*	*Well No. 13*	*Total Capacity*
Reliable Source Capacity	351 gpm (0.51 MGD)	306 gpm (0.44 MGD)	351 gpm (0.51 MGD)	1,008 gpm (1.45 MGD)
Estimated Moderate Drought Capacity	281 gpm (0.40 MGD)	245 gpm (0.35 MGD)	281 gpm (0.40 MGD)	806 gpm (1.16 MGD)

As shown in **Table 3-10** below, specific capacity has generally been trending downwards in recent years at this wellfield.

Table 3-10: Welcome Property Wellfield Specific Capacity Trend



Wells No. 11, 12 and 13 were cleaned in 2014. Well No. 12 was cleaned in 2016 and Well No. 13 was cleaned in 2018.

All wells in this wellfield have gate valves on the pump discharge throttled severely. This is allowing the pumps to operate without breaking suction in the well, however results in unnecessary and excess energy use by pumping against a mostly closed valve. In addition to operating against a throttled valve, Well No. 13 had an orifice plate installed in the discharge piping only 8 months after the well was brought online, indicative that the well is significantly underperforming.

According to Westfield operators, Wells No. 12 and 13 significantly impact the pumping water level in each other and cannot be operated at the same time without significant and prohibitive drawdowns.

3.2.8 Horseshoe Property Wellfield

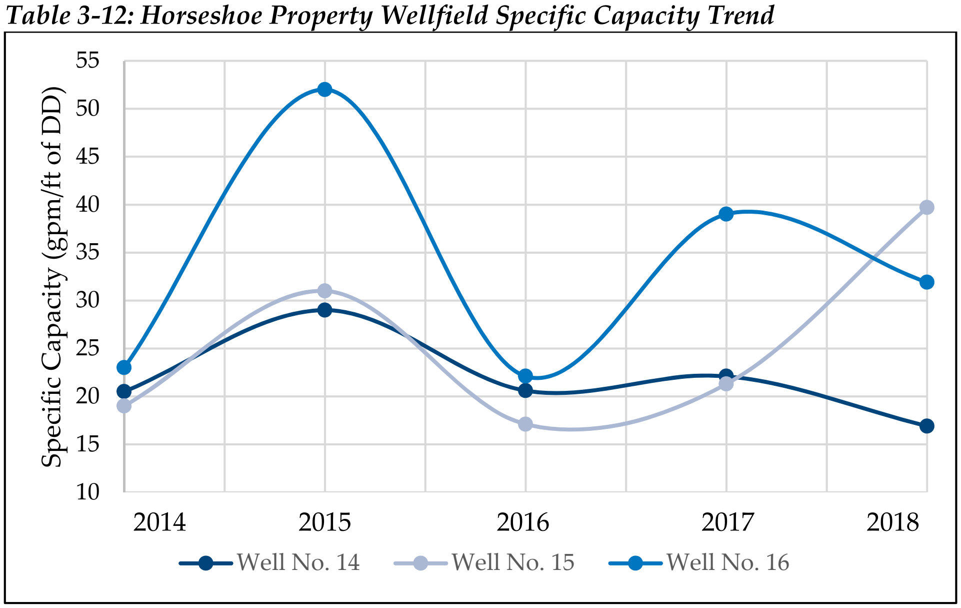
The Horseshoe Property Wellfield consists of three (3) wells which typically pump to the River Road WTP. In the past, these wells have pumped to the White River North WTP. This wellfield also has the flexibility to pump to Cherry Tree WTP. For the purpose of this report, it is assumed that this wellfield pumps to the River Road WTP. Further investigations are required to understand the flexibility of the raw water mains and how the flow could be split between WTP's. The reliable source capacity and estimated moderate drought capacity of the wellfield is provided in **Table 3-11**.

Table 3-11: Horseshoe Property Existing Wellfield Capacities

	Well No. 14	*Well No. 15*	*Well No. 16*	*Total Capacity*
Reliable Source Capacity	479 gpm (0.69 MGD)	850 gpm (1.22 MGD)	455 gpm (0.66 MGD)	1,784 gpm (2.57 MGD)
Estimated Moderate Drought Capacity	383 gpm (0.55 MGD)	680 gpm (0.98 MGD)	364 gpm (0.52 MGD)	1,427 gpm (2.06 MGD)

As shown in **Table 3-12** below, specific capacity has generally been maintaining in recent years at this wellfield. Historically, after aggressive cleaning, the capacity of these wells has fallen off quickly.

Table 3-12: Horseshoe Property Wellfield Specific Capacity Trend



Wells No. 14, 15, and 16 were cleaned in 2015. Well No. 16 was cleaned in 2017. Well No. 15 was cleaned in 2018.

All wells in the wellfield are equipped with VFDs, which are turned down significantly. This is allowing the pumps to operate without breaking suction in the well while operating as efficiently as possible with the existing pumps and motors.

According to Westfield operators, Wells No. 15 and 16 have high iron and manganese and are only operated as backups, on an as needed basis. The elevated levels of iron and manganese in these two wells reportedly triple chlorine use at the River Road WTP. This should be considered when evaluating the capacity of the River Road WTP. In addition to significantly increasing the chlorine demand at the plant, elevated iron and manganese levels will likely contribute to more frequent backwashes, thus reducing the effective capacity of the plant.

Due to the high levels of iron and manganese in Wells No. 15 and 16, and their implications on treatment operations, it is recommended that additional groundwater investigations be completed at this wellfield to potentially identify desirable locations to develop new wells with lower raw water constituents.

3.3 Treatment Facilities

Westfield owns and operates three (3) water treatment facilities including Greyhound Pass WTP, River Road WTP and Cherry Tree WTP. The capacity of each facility is summarized in **Table 3-12**. Facility capacities are reflective of the limiting unit process in the treatment train, which in all cases is the filtration capacity. Refer to **Figure 2** in **Appendix A** for a process diagram depicting the treatment facilities and capacities of the Westfield system.

A *true* firm rated treatment capacity should also be evaluated. A "firm capacity" typically constitutes taking the largest unit of a process out of service. This is overly conservative on systems with multiple redundant processes in place (i.e. multiple plants each with multiple filters). The following "system wide firm treatment capacity" was considered for this report, which is the resultant of all filters in operation, minus one filter at River Road WTP.

Table 3-13: Westfield Water System - Existing Treatment Capacities

	Process							
Water Treatment Plant	**Aerator (MGD)**	**Detention (min)**	**Filtration (MGD)**	**High Service Pumps (MGD)**	**Clearwell (min)**	**Backwash Pond (MGD)**	**Limiting Process**	**Operation Capacity**
Greyhound Pass	0.65	30	0.65	1.0	595	0.65	Filtration	0.65
River Road	9.0	23	8.75	10.26	70	8.75	Filtration	8.75
Cherry Tree	4.5	22	3.0	6.4	6.0	3.0	Filtration	3.0
Total System Operating Capacity (MGD)								**12.3**
System Wide Firm Capacity (MGD)								**10.6**

Considering the aforementioned items, it is assumed that the firm treatment capacity of the Westfield water system is 7,360 gpm (10.6 MGD) for the purpose of this report.

While the above capacities are reflective of each facilities' current ability to produce and treat water, it should be noted that all facilities typical operating capacities are restricted by reduced groundwater supply.

Individual treatment facilities are discussed more particularly below.

3.3.1 Greyhound Pass WTP

The Greyhound Pass Water Treatment Plant was expanded to its current capacity and configuration in 2007. It consists of a single packaged treatment unit (aeration, detention, filtration), two (2) finish water clearwells, three (3) high service pumps, backwash provisions, and a chlorine gas feed system. The treatment capacity of this facility is 400 gpm (0.65 MGD). A single well pumps to the aerator inlet on the packaged unit. Refer to **Figure 3** in **Appendix A** for a process schematic depicting this facility's processes and capacities.

3.3.1.1 Package Unit

The packaged treatment unit is a Unilator consisting of aeration, detention, and filtration. The nameplate capacity on the packaged unit is 400 gpm. It is assumed that aeration and detention have been sized appropriately by the manufacturer. The packaged unit is 12' in diameter, resulting in an approximate effective filter area of 113 ft^2 and a filter loading rate of 3.5 gpm/ft^2. Due to the nature of the packaged unit's construction, the filters operate as gravity filters allowing the level of the detention portion to dictate the flowrate and filter loading rate.

After oxidation and filtration, treated water flows to the onsite finish water clearwells.

3.3.1.2 Clearwell Storage

Two (2) below grade concrete tanks provide finished water storage at this facility. Prior to 2007, there was only a single 150,000-gallon tank providing finished water storage. In 2007, a 300,000-gallon tank was added, which floats off the level in the original clearwell tank.

In addition to receiving treated water from the packaged unit, the clearwells at this facility also have a provision to receive treated water from the Westfield low pressure distribution zone. This connection can add up to 400 gpm to the clearwells. While this flexibility is operationally advantageous, it does not result in a net gain in treated water being pumped into the distribution system. As such, this added capacity is not included when considering the facility's capacity.

3.3.1.3 High Service Pumps

This facility has three (3) high service pumps which draw water from the finish water clearwells and pump to the distribution system. The operational capacity of the pumps are provided in **Table 3-14**.

Table 3-14: Greyhound Pass High Service Pumps Capacities

	HSP No. 1	*HSP No. 2*	*HSP No. 3*	*Total*
Operating Capacity	410 gpm (0.6 MGD)	260 gpm (0.38 MGD)	206 gpm (0.3 MGD)	756 gpm (1.1 MGD)

While the operating pump capacity is 756 gpm (1.1 MGD), this is not reflective of the actual net gain of treated water added to the distribution system. However, considering the large storage volume in the clearwells, additional capacity could be considered on a short-term basis. If the packaged unit was providing 400 gpm, an operating pumping rate of 756 gpm could be maintained for approximately 21 hours before emptying the finish water clearwells.

3.3.1.4 Chemical Feed Systems

Chlorine gas is fed as the primary oxidant and disinfectant at this facility. Gas is stored in 150lb cylinders in a separate isolated chlorine room.

3.3.3 River Road WTP

The River Road Water Treatment Plant was expanded to its current capacity and configuration in 2007. It consists of two (2) aerators, four (4) detention tanks, five (5) pressure filters, a single finish water clearwell, four (4) high service pumps, backwash provisions, and chemical feed systems. The treatment capacity of this facility is 6,075 gpm (8.75 MGD). Supply wells pump to either aerator inlet, located on top of the elevated steel detention tanks. Refer to **Figure 5** in **Appendix A** for a process schematic depicting this facilities processes and capacities.

3.3.3.1 Aeration

There are two (2) 3,150 gpm induced draft, aluminum bodied aerators on site which receive water from the supply wells and then distributes flow to the four (4) elevated steel detention tanks. Each aerator has a footprint of 11 ft^2, which results in a loading rate of 26 gpm/ft^2.

3.3.3.2 Detention

A total of four (4)-35,000 gallon steel detention tanks provide residence time for complete oxidation to occur. The total storage volume is 138,000 gallons. The total storage volume provides 23 minutes of detention at the facility flowrate of 6,075 gpm (8.75 MGD).

3.3.3.3 Filtration

This facility has five (5) horizontal pressure filters, which receive water from the elevated detention tanks prior to entering the finish water clearwell. Each filter is a two celled, end piped unit with an effective filter area of 395 ft^2. The total effective filter area is 1,975 ft^2. A filter loading rate of approximately 3.1 gpm/ft^2 results in a filtration capacity of 6,075 gpm (8.75 MGD).

Due to the configuration of the facility, the flowrate through the filters is dictated by the high-water level in the detention tanks.

3.3.3.4 Clearwell Storage

One (1) below grade concrete tank provides 500,000 gallons of finished water storage at this facility. It receives filtered water from the filters and is pumped to the distribution system by the high service pumps. The clearwell has approximately 70 minutes of storage at the total high service capacity of 7,130 gpm (10.26 MGD).

In addition to receiving treated water from the filters, the clearwell at this facility has provision to receive treated water from Citizens Energy Group through an 8-inch main connection with White River North GWTP. This connection has the hydraulic capacity to add up to 1,800 gpm into the clearwell. Discussions with Citizens Westfield indicate that this connection will typically be utilized to provide 700 gpm (1.0 MGD) of potable water to Westfield.

3.3.3.6 High Service Pumps

This facility has four (4) high service pumps, two on VFD's (HSP 4 & 5), which draw water from the below grade finish water clearwell and pump to the distribution system. The operational capacity of the pumps is provided in **Table 3-15**.

Table 3-15: River Road High Service Pumps Capacities

	HSP No. 4	*HSP No. 5*	*HSP No. 6*	*HSP No. 7*	*Total*
Operating Capacity	2,164 gpm (3.12 MGD)	2,160 gpm (3.12 MGD)	2,700 gpm (3.89 MGD)	2,200 gpm (3.17 MGD)	7,130 gpm (10.27 MGD)

Individual operating capacities are not additive to obtain the total operating capacity. Performance testing was completed to determine the pumps' actual output at various flow scenarios, including the total operating capacity listed above.

3.3.3.7 Chemical Feed Systems

Chlorine gas is fed as the primary oxidant and disinfectant at this facility. Gas is stored in ton containers in a separate isolated chlorine building. Typically, two (2) 1-ton cylinders are kept on-site, however provisions exist to store up to five (5) 1-ton cylinders. Discussion with Westfield operators indicate that chlorine usage at this facility is typically around 85-100 pounds per day (ppd); however, during summer months it increases to around 150-175 ppd. Considering two 1-ton cylinders and chlorine usage of around 150 ppd, this provides for approximately 27 days of storage.

It should also be noted that Wells No. 15 and 16 have high iron and manganese and, if operated, could cause the chlorine demand at this plant to increase even further. Review of MRO's indicate that, with Wells No. 15 and 16 in operation, chlorine usage could peak at 275 ppd. This is an increase of about 3 times the typical chlorine usage. Should these wells be operated on a daily basis, it is expected that chlorine usage could easily triple. At this rate, if five 1 ton cylinders were kept on-site, it would be expected to last 36 days. Should only two 1 ton cylinders be kept on-site, the increased chlorine usage of 275 ppd would only be expected to last 14 days. As the chlorine storage facility is designed to house (5) 1-ton cylinders, it is assumed that this location's Risk Management Plan was structured to consider all 5 cylinders.

Fluoride is injected at this facility to promote dental health. Fluoride equipment is located in a separate fluoride room in the main WTP building. Fluoride is stored in two 2,000 gallon bulk tanks, allowing for well above the 30 day storage as suggested by the *Recommended Standards for Water Works*.

3.3.3.8 Backwash Pond

Spent backwash water is sent to the on-site backwash pond. Backwash frequency varies greatly at this facility. Discussions with Westfield operators indicate that the filters are backwashed back to back, on an as needed basis. Backwashes may take place every other week or multiple times a week, as dictated by filter head-loss. While the depth of the backwash pond is not known, the water level is typically 6' to 7' from the top banks of the pond. After a full facility backwash, the water level in the pond reportedly changes very little. While backwash water percolates in the pond, as does Cherry Tree's backwash pond, the pond is typically wet and does not completely dry out. However, this should be evaluated further before assigning a capacity to the pond or assuming it is sufficient to receive additional backwash flow.

3.3.4 Cherry Tree WTP

The Cherry Tree Water Treatment Plant was expanded to its current capacity and configuration is 1994. It consists of a single aerator, two (2) detention tanks, three (3) pressure filters, backwash provisions, one finished water clearwell, three (3) high service pumps, and chemical feed systems. The treatment capacity of this facility is 2,100 gpm (3.0 MGD). Supply wells pump to the aerator inlet, located on top of the elevated steel detention tanks. Refer to **Figure 4** in **Appendix A** for a process schematic depicting this facilities processes and capacities.

3.3.4.1 Aeration

There is a single 3,150 gpm inducted draft aluminum bodied aerator on site which receives water from the supply wells and then distributes flow to the two (2) elevated steel detention tanks. The aerator has a footprint of 11 ft^2, which results in a loading rate of 26 gpm/ft^2. While the aerator is equipped with dual blowers, there is no redundancy in the unit itself and it cannot be bypassed. This lack of redundancy presents a weakness in the treatment train and bypass provisions or redundant aerators should be considered in the event that it has to be taken down to service trays or for regular inspection.

3.3.4.2 Detention

A total of two (2) detention tanks provide residence time for complete oxidation to occur. They consist of two (2)-23,000 gallon elevated steel tanks, for a total storage volume of 46,000 gallons. The total storage volume provides 22 minutes of detention at the facility capacity of 2,500 gpm (3.6 MGD).

3.3.4.3 Filtration

This facility has three (3) horizontal pressure filters, which receive water from the steel detention tanks prior to entering the finish water clearwell. Each filter is a two celled, end piped unit with an effective filter area of 278 ft^2. The total effective filter area is 834 ft^2. A filter loading rate of 3.0 gpm/ft^2 results in a design filtration capacity of 2,500 gpm (3.6 MGD). While this facility was designed to operate each filter at 1.2 MGD, historically this has not been feasible. As such, each of the pressure filters is typically operated at 1.0 MGD. Operating the filters above this flowrate results in iron and manganese breakthrough.

3.3.4.4 Finish Water Clearwell

During the 1994 plant improvements, the existing below-grade raw water clearwell was converted to a finished water clearwell by means of piping modifications. This allows for a single below-grade, cast in place finish water clearwell with a volume of 30,000 gallons. At the high service pump total capacity of 4,450 gpm (6.4 MGD), this provides 6 minutes of finished water storage.

3.3.4.5 High Service Pumps

This facility has three (3) high service pumps which draw water from the below grade finish water clearwell and pump into the distribution system. The rated and operational capacity of the pumps are provided in **Table 3-16.**

Table 3-16: Cherry Tree High Service Pumps Capacities

	HSP No. 1	*HSP No. 2*	*HSP No. 3*	*Total*
Operating Capacity	1,550 gpm (2.24 MGD)	1,650 gpm (2.38 MGD)	1,250 gpm (1.8 MGD)	4,450 gpm (6.41 MGD)

It should be noted that only individual operating capacities were able to be obtained during performance testing. The combined operating capacity was unable to be obtained due to limited water supply to the detention tanks. Operating three (3) or even two (2) high service pumps would draw down the detention tank level severely and quickly enough to risk damaging the pumps.

High Service Pump No. 1 is equipped with a VFD which is controlled to throttle the pump speed to maintain a constant level in the finished water clearwell. As such, this facility can currently only produce water at the severely reduced flowrate of the supply wells.

3.3.4.6 Chemical Feed Systems

Chlorine gas is fed as the primary oxidant and disinfectant at this facility. Gas is stored in 150 lb cylinders in a separate isolated chlorine building. Discussion with Westfield operators indicate that on average between five (5) and ten (10) gas cylinders are kept onsite and chlorine usage can vary between 50 and 100 pounds per day. Storing ten (10) gas cylinders on-site could provide up to 30 days of chemical storage should the usage be around 50 ppd.

Fluoride is injected at this facility to promote dental health. Fluoride equipment is located in a separate generator/fluoride building. Discussion with Westfield operators indicates that, on average, five (5) to seven (7) 55-gallon drums of fluoride is kept onsite which typically lasts 3 to 4 weeks.

3.3.4.7 Backwash Pond

Spent backwash water is sent to the on-site backwash pond. All three filters are typically backwashed back to back at midnight. Reportedly, the water level in the backwash pond typically recedes by the next morning. Typically, the pond is dry as backwash water quickly percolates. As such, it is believed there is ample capacity in the backwash pond. However, this should be evaluated further before assigning a capacity to the pond or assuming it is sufficient to receive additional backwash flow.

3.4 Interconnections

In addition to providing potable water from the treatment facilities previously discussed, Westfield relies on several external water sources as regular potable water contributors to meet peak summer and peak drought summer demands. These interconnections are: Moontown Booster Station, 191st Street Booster Station, and White River North WTP. All of these interconnections pull water from Citizens Water and must be purchased. The rated capacities of the interconnections are provided in **Table 3-17**.

Table 3-17: Westfield Water System - Existing Interconnections

	Moontown Booster Station	*191st Street Booster Station*	*White River North Clearwell Connection*	*Total Interconnect Supply*
2019	700 gpm (1.0 MGD)	--	700 gpm (1.0 MGD)	1,400 gpm (2.0 MGD)
2020	700 gpm (1.0 MGD)	1,400 gpm (2.0 MGD)	700 gpm (1.0 MGD)	2,800 gpm (4.0 MGD)

Interconnections are described more particularly on the following page.

3.4.1 Moontown Booster Station

The Moontown Booster Station is located within the Westfield Service Area and is a Westfield asset, however, does not draw from a Westfield water source. The water source for this station is Citizens Water. This station is used during typical summer peaks and drought summer peaks to provide 700 gpm (1 MGD) of additional potable water to Westfield.

3.4.2 191st Street Booster Station

The 191st Street Booster Station and feeder main is under construction and therefore does not currently provide any additional potable water to the Westfield water system. This project is anticipated to be completed in 2020, at which time it will provide 1,400 gpm (2.0 MGD) of potable water to Westfield.

3.4.3 White River North Clearwell Connection

This interconnection with the River Road clearwell will typically be utilized to provide 700 gpm (1.0 MGD) of potable water to Westfield as discussed in **Section 3.3.3.4.**

4.0 DEMAND & CAPACITY ANALYSIS

This section evaluates the projected demands throughout the 20-year planning period compared to the capacities of existing Westfield water system components.

Table 4-1 compares existing water system capacities to the anticipated drought peak demand. Non-significant years have been removed from the table below for clarity. See **Table B-1** and **B-2** in **Appendix B** for a complete demand and capacity analysis of both normal summer peak and drought peak demands.

Table 4-1: Drought Peak Demand Forecast vs Existing Capacities

	2019	2020	2021	2022	2038	2039
Source Capacity						
Drought Peak Demand	**12.8**	**13.5**	**14.2**	**14.9**	**25.7**	**26.3**
Estimated Moderate Drought Capacity	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0
Total Source Capacity (Wells & Interconnections)	**12.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**
Source Water Deficit (Surplus)	**0.7**	**(0.7)**	**0.0**	**0.7**	**11.5**	**12.2**
Treatment Capacity						
Drought Peak Demand	**12.8**	**13.5**	**14.2**	**14.9**	**25.7**	**26.3**
Firm System Treatment Capacity	10.6	10.6	10.6	10.6	10.6	10.6
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0
Total Potable Water Production Capacity	**12.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**
Potable Water Supply Deficit (Surplus)	**0.2**	**(1.1)**	**(0.4)**	**0.3**	**11.1**	**11.7**
System Capacity						
Limiting Capacity (Minimum of Source and Production)	12.2	14.2	14.2	14.2	14.2	14.2

Notes: 1. All demands/capacities are shown in MGD
2. Source Capacities are reduced to 80% of Reliable Source Capacity to reflect reduced production during a moderate drought scenario and shown as Estimated Moderate Drought Capacity.

4.1 Source Water Capacity Needs

There is an immediate need for additional groundwater supply under the drought peak scenario. At the end of the planning period there is a need for approximately 12.2 MGD of additional source water capacity under drought peak conditions.

While the typical summer peak demand scenario is not included in the above table, it can be found on **Table B-1** in **Appendix B**. Under normal summer peak demand conditions, there is a need for 3.0 MGD of additional source water capacity at the end of the planning period. It should be noted that this analysis considers all existing wells in service which could greatly impact the wells' influence on each other, aquifer water levels, the WTP's chlorine demand, and backwash frequency. For these reasons, all wells are not usually operated at the same time to meet typical demands. As such, this operation scheme is not considered sustainable, making the need for additional source water capacity more immediate, however unquantified, under normal summer peak demand conditions.

As shown on **Table 4-1** the source capacity is restricting the treatment capacity. Including interconnections, the total source capacity will be 14.2 MGD and the total potable water production capacity will be 14.6 MGD, both after the 191st St booster station is in service. The source water capacity is restricting the potable water production capacity by 0.4 MGD throughout the planning period.

4.2 Treatment Capacity Needs

There is an immediate need for additional treatment capacity under the drought peak scenario. The upcoming addition of the 191st St booster station appears to satisfy this need until the end of 2021, for the next two years. Ultimately, at the end of the planning period there is a need for approximately 11.7 MGD of additional treatment capacity under drought peak conditions. While the typical summer peak demand scenario is not included in the above table, it can be found on **Table B-1** in **Appendix B**. Under normal summer peak demand conditions, there is a need for 4.9 MGD of additional treatment capacity at the end of the planning period.

Additional treatment capacity will be needed to meet the normal summer peak demand within the next ten years, this will be needed in the next two years to meet the drought peak demand.

It should be noted that increasing the treatment capacity alone is not sufficient to meet the anticipated demands. Source water capacity improvements are also required as to not restrict treatment capacity.

4.3 Distribution System Needs

Distribution system and raw water main hydraulics, interconnections between pressure zones, and booster station capacities were not evaluated in the scope of this report. It is recommended that hydraulic modeling is completed to understand the impact of increased demands on the system. It is recommended that Citizens Energy Group's hydraulics group confirm the limitations and flexibility of the existing raw water and distribution system.

For the purpose of this report, it was assumed that the distribution system is at capacity in its current configuration. Any additional treatment capacity was assumed to require distribution system improvements of equal capacity to convey the additional flow into the system.

4.4 Storage Needs

Finish water distribution storage was not evaluated in the scope of this report. It is likely that additional elevated storage tanks or ground storage tanks will be required to maintain pressure and adequate reserves in the event of a fire.

5.0 GROUNDWATER SUPPLY ALTERNATIVES

Prior to this report, Citizens Westfield had compiled a list of 15 potential water supply options. Water supply options are summarized in **Table 5-1** below. See **Table B-3**, in **Appendix B** for a complete list of these supply options.

Table 5-1: Potential Water Supply & Treatment Alternatives

Option	*Viability*	*Description*	*Source/ Treatment (MGD)*	*Cost to Implement*	*$MM/MGD*
S1	10	Westfield Road Wellfield	6.0	$4,800,000	$0.80
S2	10	Pilgrim Church*	4.0	$5,000,000	$1.25
S3	10	Martin Marietta Surface Water	6.0	$7,000,000	$1.17
S4	10	Mini Morse Surface Supply*	10.0	$11,000,000	$1.10
S5c	8	Martin Marietta Location 3 (Cherry Tree Wellfield B)	4.6	$3,000,000	$0.65
S5b	5	Martin Marietta Location 2 (161st St Property)	4.6	$3,250,000	$0.71
S6	4	Legacy Wells/Carmel	2.0	--	--
S7	4	Oakmont*	4.0	$5,000,000	$1.25
S8	4	NE Hamilton County (Cicero)*	5.0	$6,000,000	$1.20
S9	3	Winding Way Mobile Home Park	0.0	--	--
S10	2	Chapman Electric Area*	4.0	$5,000,000	$1.25
S5a	1	Martin Marietta Location 1 (River Road Wellfield)	4.6	--	--
S11	1	Spartz Property*	1.0	$2,000,000	$2.00
S12	1	Grand Park/Chatham Wells*	2.0	$5,000,000	$2.50
S13	1	Mini Morse GW Supply	2.0	--	--
S14	1	White River North Wells	0.0	--	--
T1	10	River Road WTP & Clearwell	3.5	$18,000,000	$5.11
T2	8	Cherry Tree WTP Expansion	2.0	$5,800,000	$2.90
T3	5	Unidentified GWTP	6.0	$15,600,000	$2.60
T4	5	Unidentified SWTP	6.0	$28,000,000	$4.67

**Denotes options that are not detailed in this report. Capacity and costs a provided by Citizens Westfield.*

After discussions with Citizens Westfield, the list of 15 supply options was prioritized, sorted, and regrouped into the list above. The following water supply alternatives can be seen on **Figure 7** in **Appendix A**. Treatment options have been included on the above table for convenience and are discussed in detail in **Section 6.0**. A more detailed version of **Table 5-1** has been included as **Table B-4**, in **Appendix B**.

Each option has been assigned a viability score; from 1, being the least viable to 10, being the most viable. It should be noted that the above options are in various stages of evaluation, and as such, viability scores, anticipated capacity, and costs are subjective to the level of investigation completed at this point. For the purpose of this report, the viability of an option is reflective of its potential to produce additional capacity.

It should be noted that Options S1, S2, S7, and S10 would convey raw water to either the River Road or Cherry Tree WTP by means of the Citizens Water well collection main. As such, a separate raw water meter would be required at each WTP to monitor flows coming from the aforementioned supply options through the Citizens Water collection main.

5.1 Westfield Road Wellfield Alternative

CEG Westfield contracted with another consulting firm to assess the potential capacity of new wells on the Westfield Road property, based on the regional geology and hydrogeology of the vicinity that these new wells will be installed, and the capacity of test wells drilled at these locations.

Conceptual site plans have been created, and are shown on **Figure 8** in **Appendix A**. It is anticipated that the three (3) production wells would likely be drilled near the corners of the property. This would likely be more appealing to the property owner, as it would allow them to continue to farm a large portion of the land. As discussed earlier in this report, reliance on water well production to meet system demand poses some risks. To account for this, the projected maximum production expected from wells assumes that the largest of these well sites non-operational. The anticipated capacity of the Westfield Road wells is summarized in **Table 5-2**.

Table 5-2 Capacity of Westfield Road Wells

Test Well Location	Well Capacity (gpm)
16-TW-1	1,800
16-TB-2	1,800
16-TB-7	1,200
16-TB-4	1,400
Assumed Production Capacity	1,400 gpm (2.0 MGD) EA
Total Capacity (3 wells)	**4,200 gpm (6.0 MGD)**
Firm Capacity (2 wells)	2,800 gpm (4.0 MGD)

Note: Test Well Capacity as reported by Hydrogeological Report

As shown in **Table 5-2**, it is anticipated that the Westfield Road wellfield will yield 2,800 gpm (4.0 MGD) of firm source water capacity provided by two (2) new wells. A total of three (3) wells are anticipated for this location, providing a total capacity of 4,200 gpm (6.0 MGD).

It is anticipated that this wellfield will pump into the existing 16-inch raw water main installed along Westfield Rd (176th St). This raw water main passes directly in front of the Westfield Road wellfield property, greatly reducing the amount of pipe work required. It should be noted, however, that the 16-inch raw water main is not a common Westfield main. The raw water main ties into one of the White River North Wellfields (WRN 4 through 7). As such, the raw water would be pumped to the White River North groundwater treatment facility. Improvements will be required to allow the White River North common raw main to pump to Westfield facilities. This connection would likely take place along River Road, where the two common raw water mains are physically close to each other. The connection point would likely consist of a control valve, restricting and monitoring the amount of flow that is sent to Westfield treatment facilities. As previously mentioned, the extents of the flexibility and interconnection of the common raw water mains must be evaluated further.

The estimated total cost of this alternative is $4,648,000**.** Refer to **Table C-1** in **Appendix C** for a more detailed cost estimate.

It should be noted that easement and water rights acquisition is anticipated to be difficult for this alternative. Discussions with Citizens Westfield indicate that there is considerable resistance from the current land owner. As such, 120% of the current property value has been considered for easement and water rights acquisition costs. It is assumed that that 1 acre will be purchased per well by Westfield, with a 30' utility easement between well locations.

5.2 Martin Marietta Locations Alternatives

This alternative evaluates properties owned by Marin Marietta as potential wellfield locations. There are a total of three areas evaluated with this alternative. Potential wellfield locations can be seen on **Figure 9** in **Appendix A**. Unlike the Westfield Road well locations, there are no test wells located in the Martin Marietta locations, and as such there is not as much certainty in the expected well production in this area. However, well production can be estimated with the Indiana Department of Natural Resources (DNR) has published a map showing the unconsolidated aquifer systems of Hamilton County, Indiana (June 2010). The referenced unconsolidated aquifer map is included as **Table B-5** in **Appendix B**.

The DNR map identifies the different aquifer systems in Hamilton County, and the expected yield from wells drilled in those respective aquifers. The approximate location of the Martin Marietta wellfields places them in the White River and Tributaries Outwash Aquifer System. Expected production from wells drilled in this aquifer ranges from 75-2,100 gpm. As such, it was assumed that a production well in this aquifer may likely produce flows in the order of 1,080 gpm (1.5 MGD), the average of expected production. It should be noted that, compared to existing production wells in the area, this estimation is optimistic. It was assumed that each of the three potential wellfield locations in this alternative would be equipped with a total of 3 wells, providing a firm capacity with two wells. The resultant total wellfield capacity of each Martin Marietta wellfield location is therefore assumed to be 3,240 gpm (4.6 MGD).

The estimated total cost for drilling 3 test wells at each of the 3 wellfield locations is $150,000. The estimated total cost for this alternative $6,250,000, including well test drilling. Refer to **Table C-2** in **Appendix C** for a more detailed cost estimate.

Discussions on individual wellfield locations are provided below.

5.2.1 Location 1 – River Road Wellfield

This property is located behind, west of, the River Road WTP, River Road Wellfield, and White River North Wellfield (WRN 1-3). This location is desirable given its close proximity to the River Road WTP and associated raw water mains. The properties owned by Martin Marietta at this location total approximately 150 acres, but much of the land is open quarry and not suitable for drilling wells. Any new wells drilled at this location may impact the existing River Road wells or White River North wells and may likely be under the influence of surface water. Considering the limited space available, proximity of existing wells, and proximity to quarries, it was assumed that this location would not result in a successful and productive wellfield.

5.2.2 Location 2 – 161st St Property

This property is located on the north side of 161st street, approximately 2/3 of a mile directly north of the Cherry Tree WTP. This location is desirable given the amount of land owned by Martin Marietta in this area, which totals over 160 acres of what appears to be open farmland. Given the amount of land at this location, it is assumed that this wellfield will produce sufficient flows to be put into production.

The three wells at this location will pump to a common raw water main which would likely run a considerable distance before tying into the existing Cherry Tree raw water main between the WTP and wells. As such, this location requires significant pipe work to get untreated water to existing raw water mains. It is estimated that approximately 6 acres will be purchased at this location.

Recent test drilling at this location indicates that sufficient sand and gravel formations are not available due to adjacent mining operations. Bedrock wells are being evaluated at this location.

The estimated construction cost of this wellfield location is $2,600,000**.** Refer to **Table C-2** in **Appendix C** for a more detailed cost estimate.

5.2.3 Location 3 – Cherry Tree Wellfield B

This property is located directly between the Cherry Tree WTP and the Cherry Tree wellfield, making it very desirable. The property owned by Martin Marietta in this location total approximately 130 acres, but about 50 acres is unusable open quarry space. Given the amount of land at this location, it is assumed that this wellfield will produce sufficient flows to be put into production. Three wells at this location will pump to a common raw water main near the existing Cherry Tree WTP. It is estimated that approximately 6 acres will be purchased at this location.

The estimated construction cost of this wellfield location is $2,200,000**.** Refer to **Table C-2** in **Appendix C** for a more detailed cost estimate.

5.3 Winding Way Mobile Home Park

This property is located south of the White River North wellfield (WRN 1-3) and east of the Winding Way Mobile Home Park. The parcel is owned by Citizens Westfield and is approximately 1 acre. This location is desirable given that it is already owned by Citizens Westfield and its close proximity to the River Road WTP. As this well is closest the White River wells, it would likely pump to the White River North WTP. If it was to pump to the Westfield system, a control valve or additional length of raw water main would be required.

Recent test drilling indicates that good sand and gravel formation is present at this location, however given its close proximity to the White River North wellfield, will likely impact water levels in these existing wells. Given this, more investigation is required to understand how this well could be utilized. Discussions with Citizens Westfield indicate that this well would likely be used in rotation, and/or pumped at a much lower rate than the surrounding wells. As this well is closer to the White River North common raw water main, it would likely be connected to this system and pump to the White River North WTP. As such, it was assumed that should this well be put into production, it would not result in added source capacity for the Westfield System and was eliminated from further consideration.

5.4 Mini Morse Wellfield Expansion Alternative

The Mini Morse Wellfield is an existing wellfield located approximately 1.5 miles north of the River Road WTP, along River Road. The wellfield contains three (3) existing wells (WRN-4, WRN-5, WRN-6) which all pump to the White River North WTP.

This location was identified as having potential to produce excess groundwater, which could potentially be sent to the Westfield system for treatment. Recently, a new well (WRN-7) was drilled at this location and put into service. WRN-7 is rated at 2.0 MGD and pumps to the common raw water main which conveys untreated water to the White River North WTP. This new well increases the firm well capacity of White River North WTP to 6,300 gpm (9.0 MGD), which is still below the WTP's rated firm capacity of 10 MGD.

Since WRN-7 is needed to maintain sufficient firm well capacity at the White River North WTP, this location cannot be considered as an additional raw water source to Westfield. For this reason, this alternative was eliminated from further consideration.

5.5 White River North Wells Alternative

This alternative was considered given the close proximity of the White River North raw water main to the Westfield common raw water main and their existing interconnection. As previously discussed, Westfield wells can send untreated water to White River North WTP, but White River wells cannot send to Westfield directly. However, finished water can be sent to the River Road clearwell as noted in Chapter 3. This nature of this connection was considered as a potential improvement to allow White River wells to supply Westfield WTP's. However, due to the limited existing groundwater supply at White River North, this alternative was eliminated from further consideration.

5.6 Legacy Wells Alternative

The City of Carmel owns two (2) groundwater wells colloquially referred to as the Legacy Wells. These wells are located between the River Road WTP and White River North WTP, immediately southwest of the intersection of East 146th St and River Road. These wells are drilled and cased, but are not currently in production. Their reported capacity is 2 MGD each, however has not been verified in recent years. For the purpose of this report, it is assumed that each well will yield 2 MGD.

Recent discussions with the City of Carmel Utilities indicate that the City is considering selling raw water from one of the Legacy wells to Westfield. As such, up to 2.0 MGD could be available for Westfield to treat and provide to the distribution system. It is recommended that further discussions take place with the City of Carmel prior to developing this alternative further.

5.7 Martin Marietta Surface Water Alternative

Preliminary discussions suggest that up to 6.0 MGD of mining dewatering runoff could be captured and treated via a surface water treatment plant located on, or near the mining operations. Costs for the runoff water pumping station and associated surface water treatment plant are considered in **Section 6.0.** Further evaluation of this alternative is required by means of an additional study prior to proceeding, however the alternative should remain in consideration until the additional study has been completed.

5.8 Summary of Feasible Source Alternatives

As noted in Chapter 4, the Westfield water system has an immediate need for additional source water capacity under a peak drought scenario. Ultimately, at the end of the planning period there is a need for approximately 12.2 MGD of additional source water capacity under drought peak conditions. A summary of feasible options, along with their estimated cost to implement and source capacities are shown in **Table 5-3.**

Table 5-3 Summary of Recommended Alternatives

Option	*Viability*	*Description*	*Source (MGD)*	*Cost to Implement*	*$MM/MGD*
S1	10	Westfield Road Wellfield	6.0	$4,800,000	$0.80
S5c	8	Martin Marietta Location 3 (Cherry Tree Wellfield B)	4.6	$3,000,000	$0.65
S5b	5	Martin Marietta Location 2 (161st St Property)	4.6	$3,250,000	$0.71

Based on the above summary, no individual source alternative will meet the future capacity need. Therefore, implementation of multiple options will be necessary in the planning period.

Should the Westfield Road Wellfield be the first to be implemented, it is expected that this additional source capacity will meet the system's needs for the next 7 years, buying the water system valuable time in developing the plan for additional water sources.

6.0 TREATMENT ALTERNATIVES

This section evaluates various alternatives for increasing the system firm treatment capacity of the Westfield Water System.

6.1 Greyhound Pass WTP Expansion Alternative

This facility was evaluated for potential expansion opportunities. However, considering the limited wellfield capacity, little prospect of expanding the existing wellfield, and nature of the treatment facility construction (package plant), expansion at this facility was eliminated from consideration.

6.2 River Road WTP Expansion Alternative

This facility was evaluated for potential expansion opportunities. It appears that two pressure filters could be readily added to the facility, increasing the treatment capacity of the facility by 2,430 gpm (3.5 MGD). The improvements to the facility would consist of:

- 3,150 gpm aerator
- (2) 60,000-gallon steel detention tanks
- 2-1.75 MGD horizontal pressure filters
- Replace/Upsize all four (4) existing high service pumps (2,500 gpm EA)
- Building Demolition and Expansion to relocate storage area and accommodate filters
- Pavement Demolition and Improvements
- Relocating an existing ditchline
- 500,000-gallon finish water clearwell expansion
- Electrical/SCADA improvements
- Process & Site piping modifications

High level improvements can be seen graphically on **Figure 10**, in **Appendix A** and process schematics of the improvements can been seen on **Figure 11.**

The new aerator and detention tanks would receive untreated water from the common existing 12-inch raw water main onsite. From the new detention tanks, aerated water will be piped through a new filter building addition, in the location of the existing storage room, before entering the existing clearwell. The new filter building expansion will be sized to accommodate two filter ends, process piping, and supporting equipment. The existing storage room would be relocated to south of the new filter addition.

Additional evaluation on process hydraulics are required before this alternative should be pursued.

An additional 500,000-gallon finished water clearwell is also being considered with this alternative, to help better match peak demands. This clearwell expansion would likely be constructed directly north of the existing clearwell and would float off of the level in the existing clearwell.

Various site improvements would have to take place to accommodate the facility's expansion to the south, most notably relocating an existing ditchline, and pavement improvements.

It is anticipated that all four (4) of the existing high service pumps would be replaced and upsized to handle the additional flow. Modifications to the existing site piping, process piping, and site fencing will also be required. Improvements to the existing electrical and SCADA systems will also be required to accommodate the new equipment and electrical loads.

Based on the current operations and understanding of the existing backwash pond, it is believed that no improvements would be required to accommodate additional filter backwashes, whether they are done back to back or on alternating days. However, additional investigations are recommended to confirm this belief and as such, expansion of the existing pond has been planned for in the anticipated costs.

Minor improvements to the existing chlorination and fluoridation equipment will be required, and at this point are anticipated to consist of rate tube, injector, and feed pump replacements. It appears that there is ample existing bulk fluoride storage on-site to accommodate the increased flowrate and chemical demand of the plant. As previously mentioned, the bulk chlorine storage on-site can accommodate 5 one-ton containers. This may be sufficient to provide 30 days' worth of storage, provided the chlorine demand of the raw water is low.

However, considering the current chlorine demands, and potential to utilize Wells No. 15 and 16, it is anticipated that the raw water chlorine demand will be on the higher end. As mentioned in **Section 3.3.2.6**, chlorine usage can peak at 275 ppd at a plant flowrate of 5.5 MGD, when Wells No. 15 and 16 are in operation. Should River Road be expanded and operated at its full capacity of 12.2 MGD, daily chlorine usage could be expected to be on the order of 600 ppd with Wells No. 15 and 16 in operation. Given this, five (5) 1-ton cylinders would be expected to last approximately 16 days. That said, it is likely that the chlorine bulk storage room will need to be expanded. However, this has not been evaluated in detail at this point. It is believed that this facility's Risk Management Plan is structured to consider over 2,500 lbs of chlorine stored on site, which is the threshold for Risk Management Plans as required by 40 CFR part 68 of the Clean Air Act. If the facility's chlorine storage increases, the Risk Management would likely need to be updated, however additional permitting is not anticipated at this time.

The estimated cost of the treatment plant and clearwell expansion is $8,300,000.

However, as mentioned in **Section 4.3**, it is assumed that the distribution system is at capacity and would require improvements to convey additional flows from the WTP's. For the purpose of this report it was assumed that the River Road WTP would be expanded before the Cherry Tree WTP. As such, this alternative considers additional distribution system work to convey treated water from River Road WTP to the intersection of Westfield Road and Moontown Road. The end point in the distribution system and anticipated water main alignment was provided by Citizens Westfield. Preliminary evaluations suggest that approximately 4,200 LFT of 12" DI water main would be required to convey the additional 3.5 MGD from this WTP to where the proposed Cherry Tree transmission main intersects River Road. From this point, approximately 24,000 LFT of 16" DI water main would be required to convey the combined additional flow from both WTP's to the intersection of Westfield Road and Moontown Road. The anticipated construction costs were estimated as $250 and $275 per linear foot for 12" and 16" main, respectively. The estimated construction cost of this distribution work is expected to be $7,700,000. Including engineering and soft costs, the total estimated cost for the distribution system improvements required with this alternative is $9,700,000. It should be noted that, should the Cherry Tree WTP be expanded prior to the River Road WTP, the Cherry Tree WTP expansion project would likely include the 16" distribution system work previously described.

The total probable overall project cost of this alternative is 18,000,000. Refer to **Table C-3** in **Appendix C** for a more detailed cost estimate.

6.3 Cherry Tree WTP Expansion Alternative

This facility was evaluated for potential expansion opportunities. It appears that two pressure filters could be readily added to the facility, increasing the treatment capacity of the facility by 1,400 gpm (2.0 MGD). The improvements to the facility would consist of:

- 3,150 gpm Aerator
- 2-30,000-gallon steel detention tank
- 2-700 gpm horizontal pressure filters
- CMU building expansion
- Electrical/SCADA improvements
- Process & Site piping modifications

High level improvements can be seen graphically on **Figure 12**, in **Appendix A** and process schematics of the improvements can been seen on **Figure 13.**

The new aerator and detention tanks would receive untreated water from the common existing 16-inch raw water main on site. From the new detention tank, aerated water will be piped into the existing 16-inch site piping, and through the existing and new pressure filters.

The existing pump and filter building would require expansion to accommodate the new pressure filters. This expansion would likely take place on the north side of the existing building and would be large enough to accommodate two new filters and associated supporting devices. Due to the configuration of the facility, it is believed that the existing high service pumps have sufficient capacity.

Additional evaluation on process hydraulics are required before this alternative should be pursued.

Modifications to the existing site piping, process piping, and site fencing would be required. Improvements to the existing electrical and SCADA systems will also be required to accommodate the new equipment. Minor improvements to the existing chlorination and fluoridation equipment will be required, and at this point are anticipated to consist of rate tube, injector, and feed pump replacements. Additional chlorine cylinders and 55-gallon fluoride drums will have to be stored on-site to ensure a 30-day supply is available. It should be noted that this facility typically stores a maximum of 1,500 lbs of chlorine on-site (ten 150lb cylinders). Increasing the plant's capacity by 2.0 MGD would likely require 2,500 lbs of chlorine to be stored on-site to provide a 30-day supply. Storing 2,500 lbs of chlorine or more would require that a Risk Management Plan is completed for this facility as required by 40 CFR part 68 of the Clean Air Act.

It is believed that the existing generator is sized sufficiently to accommodate the plant expansion, as no high load equipment is being added with this alternative.

Based on the current operations and understanding of the existing backwash pond, it is believed that no improvements would be required to accommodate additional filter backwashes, whether they are done back to back or on alternating days. However, additional investigations are recommended to confirm this belief and as such, expansion of the existing pond has been planned for in the anticipated costs.

The estimated cost of the treatment plant expansion is $4,000,000**.**

However, as mentioned in **Section 4.3,** it is assumed that the distribution system is at capacity and would require improvements to convey additional flows from the WTP's. Discussions with Citizens Westfield indicate that the River Road WTP is likely to be expanded before Cherry Tree WTP. As such, this alternative considers additional distribution system work to convey treated water to the new transmission main discussed in **Section 6.2**. Preliminary evaluations suggest that approximately 5,700

LFT of 12" DI water main would be required to convey the additional 2.0 MGD from the Cherry Tree WTP to the new transmission main along River Road. The anticipated construction costs were estimated as $250 per linear foot, for an estimated construction cost of $1,500,000. Including engineering and soft costs, the total estimated cost for the distribution system improvements required with this alternative is $1,800,000. Should this facility expansion be implemented prior to the River Road WTP expansion, additional distribution system work would be required. See **Section 6.2** for a summary of distribution work that would be required.

The total probable overall project cost of this alternative is $5,800,000. Refer to **Table C-4** in **Appendix C** for a more detailed cost estimate.

6.4 New Groundwater Treatment Plant Alternative

A new treatment facility was evaluated in the event that expansion of the existing treatment facilities would not produce sufficient capacity to meet the 20-year peak drought demands. Based on projected drought demands, there is a need for at least 6.0 MGD of treatment capacity. For the purpose of this report, it is assumed that this facility will be supplied with excess remaining source capacity of previously discussed new water sources. As such, it will share wellfields with Cherry Tree and River Road facilities.

The new treatment facility is anticipated to have a total treatment capacity of 6.0 MGD. The facility will be a typical groundwater filtration treatment plant consisting of aeration, detention, filtration. It is anticipated that the process layout will be similar to the River Road facility, utilizing a finish water clearwell, and allowing for future expansions as needed. Individual facility process components are described more particularly as:

- Two (2) aerators
- Four (4) steel detention tanks
- Four (4) horizontal pressure filters
- One finish water clearwell
- Four (4) high service pumps

As this facility will share source water with Cherry Tree and River road, it is anticipated that the facility will be located near the River Road corridor, north of 146th St and south of 176th St.

Site specific costs have not been evaluated at this point; however, have been evaluated on a dollar per gallon of treatment basis. Considering a 6.0 MGD groundwater treatment facility, the estimated total cost of this alternative is $15,600,000.

Distribution system improvements and associated costs have not been evaluated at this point.

6.5 New Surface Water Treatment Plant Alternative

This alternative evaluated the addition of a surface water treatment plant to treat 6.0 MGD of dewatering runoff water from Martin Marietta.

Site specific costs have not been evaluated at this point, however, have been evaluated on a dollar per gallon of treatment basis. Considering a 6.0 MGD surface water treatment facility, the estimated total cost of this alternative is $28,000,000.

Distribution system improvements and associated costs have not been evaluated at this point.

6.6 Increasing Filter Loading Rates Alternative

This alternative was evaluated to see what additional treatment capacity could be obtained by loading the filters above the design loading rate of 3 gpm/ft^2. This strategy is considered as a temporary means to increase treatment capacity and not a permanent operational strategy.

All existing facilities' filters cannot be high rated due to the nature of the facility construction. Flow through the filters is dictated by the high-water level in the detention tanks and water levels in finished water clearwells. As such, the only way to increase flow through the filters is to raise the height of the detention tanks, which is not practical for a temporary strategy.

There are several unknowns with this alternative including: impact on oxidation as a result of reduced detention time, iron breakthrough, and how many high service pumps would need replaced or impellors trimmed. For these reasons, this alternative was not further evaluated.

6.7 Summary of Feasible Treatment Alternatives

As noted in **Section 4**, the Westfield water system does not currently have a treatment capacity deficiency. However, it is anticipated that there will be a need for additional treatment capacity in 2021. At the end of the planning period, the treatment capacity deficiency is anticipated to be 11.7 MGD. A summary of feasible alternatives, along with their estimated cost and treatment capacities are shown in **Table 6-1**.

Table 6-1 Summary of Treatment Alternatives

Option	*Viability*	*Description*	*Treatment (MGD)*	*Cost to Implement*	*$MM/MGD*
T1	10	River Road WTP & Clearwell	3.5	$18,000,000	$5.11
T2	8	Cherry Tree WTP Expansion	2.0	$5,800,000	$2.90
T3	5	Unidentified GWTP	6.0	$15,600,000	$2.60
T4	5	Unidentified SWTP	6.0	$28,000,000	$4.67

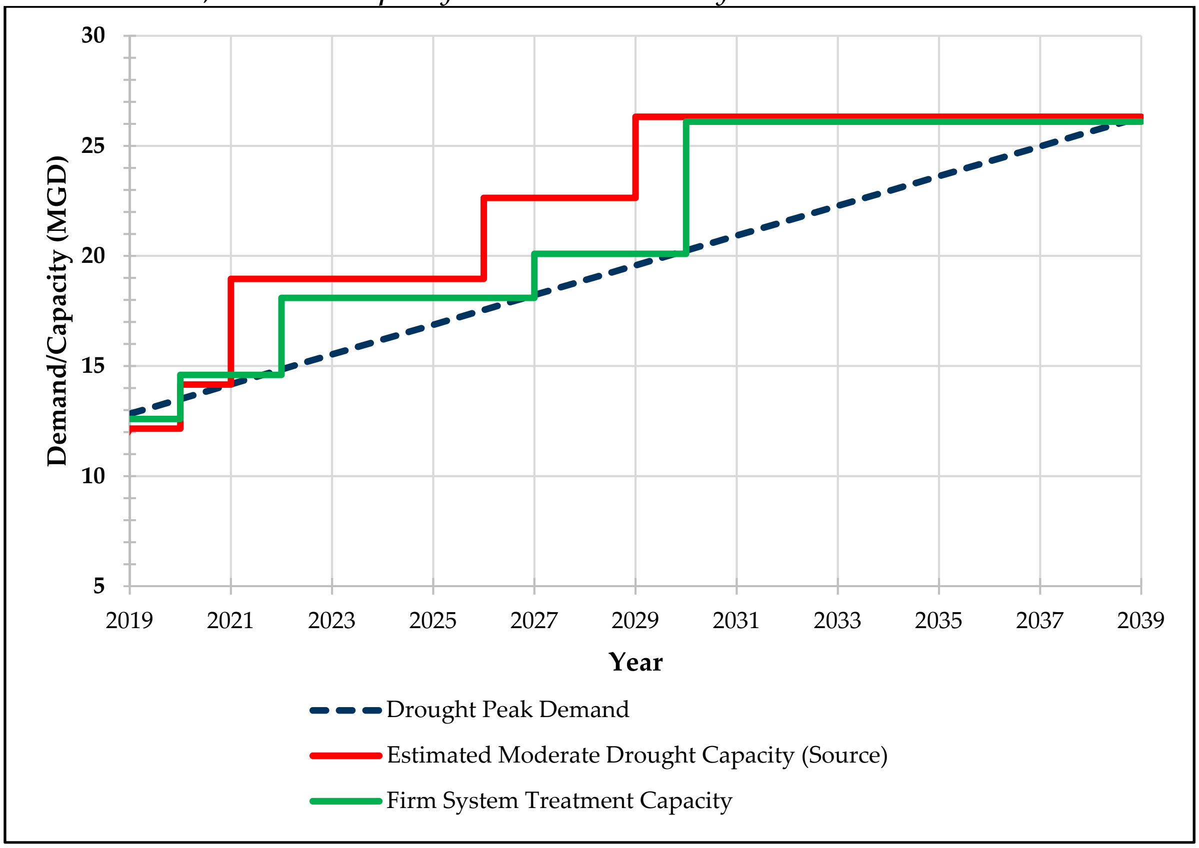
It appears that, should additional groundwater sources be obtained and put into service, expansion of the Cherry Tree and River Road treatment plants can feasibly add 5.5 MGD in treatment capacity, leaving a 6.0 MGD deficit. It is anticipated that a new GWTP or SWTP could be constructed to satisfy this 6.0 MGD deficit.

7.0 DEMAND AND CAPACITY ANTICIPATED TIMELINE

This section evaluates the projected demands throughout the 20-year planning period compared to the firm system capacities of existing Westfield water system components and anticipated source and treatment capacity expansion alternatives. Between summer peak demands and drought peak demands, the latter is the driving factor necessitating both source and treatment capacity expansions. As such, the tables below are reflective of drought peak demand conditions and capacities.

Projected demands, anticipated source water capacities and treatment capacities are summarized in **Table 7-1** below.

Table 7-1: Source, Treatment Capacity and Demand Summary



Notes:

***1.** Source Capacities shown include interconnections and 80% of the reliable source capacity (moderate drought yield)*

See **Table B-6** through **B-9** in **Appendix B** for a complete demand and capacity forecast.

7.1 Source Water Capacity

As shown on **Table 7-1** above, the current drought peak demand is 12.8 MGD and the 20-year drought peak demand is anticipated to be 26.3 MGD. The existing estimated moderate drought capacity is 10.2 MGD. This results in an immediate need for additional source water capacity in 2019. The estimated moderate drought capacity plus interconnections capacity is 12.2 MGD currently and is anticipated to be 26.3 MGD at the end of the planning period. This is considering the addition of the Westfield Road Wellfield and Martin Marietta Wellfields.

The Westfield Road Wellfield alternative is planned to be put into production in 2021, adding a total of 4.8 MGD to the source capacity under moderate drought conditions. This date is targeted as it is the earliest feasible date anticipated that the wellfield will be put into production based on current negotiations with the property owner. The addition of this water source appears to provide sufficient capacity until 2028.

One Martin Marietta wellfield is anticipated to be brought online in 2026, as needed from a demand basis, and another location brought online in 2029. The combined capacity of this water source will add 7.4 MGD to the waters systems source capacity under moderate drought conditions, bringing the total source capacity to 26.3 MGD under moderate drought conditions, considering interconnections.

There will be a need for additional water sources towards the end of the planning period. At the end of the planning period, it is projected that the total source capacity will equal the estimated moderate drought demand.

7.2 Treatment Capacity

As shown on **Table 7-1**, the current drought peak demand is 12.8 MGD and the 20-year drought peak demand is anticipated to be 26.3 MGD. The existing system firm treatment capacity is 10.6 MGD. There is not an immediate need for additional treatment capacity until 2021 to meet drought peak demands. The firm treatment capacity plus the interconnections capacity will be 14.6 MGD in 2021 and is anticipated to be 26.1 at the end of the planning period. This is considering the addition of Cherry Tree WTP Expansion, River Road WTP Expansion, and an unidentified GWTP or SWTP with 6.0 MGD capacity.

The River Road WTP expansion is planned for 2022, as needed from a demand basis, adding 3.5 MGD to the treatment capacity. The Cherry Tree WTP expansion is planned for in 2027, as needed from a demand basis, adding 2.0 MGD to the treatment capacity. The addition of this treatment source appears to provide sufficient treatment capacity until 2030.

At this time, there will be a need for additional treatment capacity, which is anticipated to be provided by the unidentified GWTP or SWTP. The addition of this 6.0 MGD facility will meet moderate drought peak demands until 2038, one year short of the end of the planning period.

7.3 System Capacity

As mentioned in **Section 7.1**, the reliable source capacity of the Westfield system is 10.2 MGD, presenting an immediate need for additional groundwater supply. The system firm treatment capacity is 10.6 MGD (as mentioned in **Section 7.2**) and the total treatment capacity is 12.4 MGD. The difference between the system firm capacity and system treatment capacity is equivalent to one filter out of service at River Road. Should the total treatment capacity (12.4 MGD) be required from a demand basis, the WTP's would be unable to produce their entire capacity. This is due to the limiting capacity of the existing groundwater wells (10.6 MGD). Having an additional 2.0 MGD of reliable source capacity would optimize the existing source and treatment facilities. Having this additional source capacity would ensure treatment facilities could operate at their full design capacity, if needed, or allow wells to be operated in rotation or rested.

APPENDIX A

FIGURES

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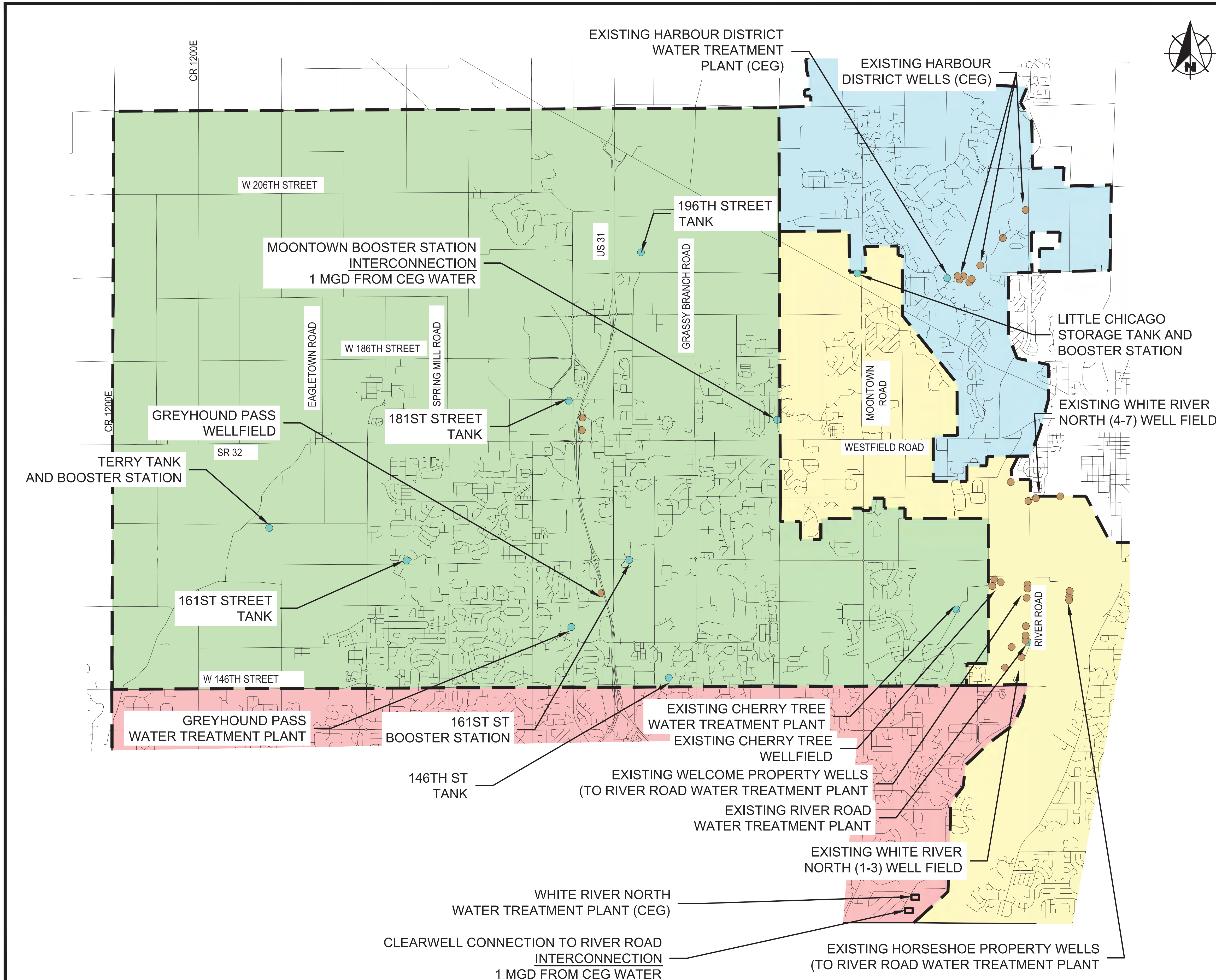

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LEGEND:

- SERVICE AREA BOUNDARY
- WESTFIELD SERVICE AREA
- INDIANAPOLIS SERVICE AREA (HARBOUR DISTRICT
- INDIANAPOLIS SERVICE AREA
- CARMEL SERVICE AREA

0 3,000 6,000 12,000 FT

FIGURE 1
Existing Westfield Water System

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
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PG. 1

Cause No.: 46020
OUCC DR 7-9
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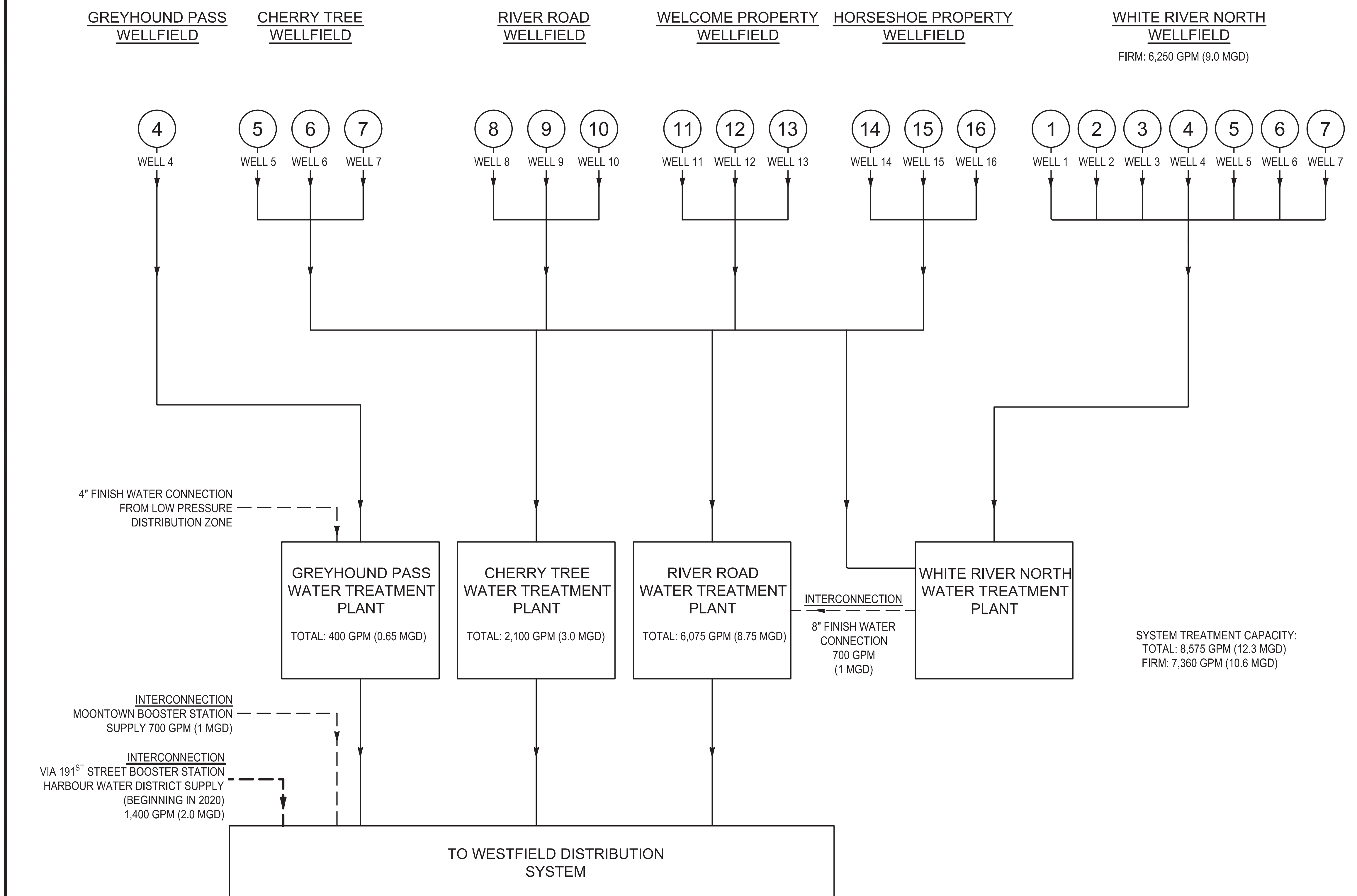

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LEGEND:

Westfield Well Capacity
(WELLS 4-16)

Reliable Source Capacity:
8,851 gpm (12.7 MGD)

Estimated Moderate Drought Capacity:
7,081 gpm (10.2 MGD)

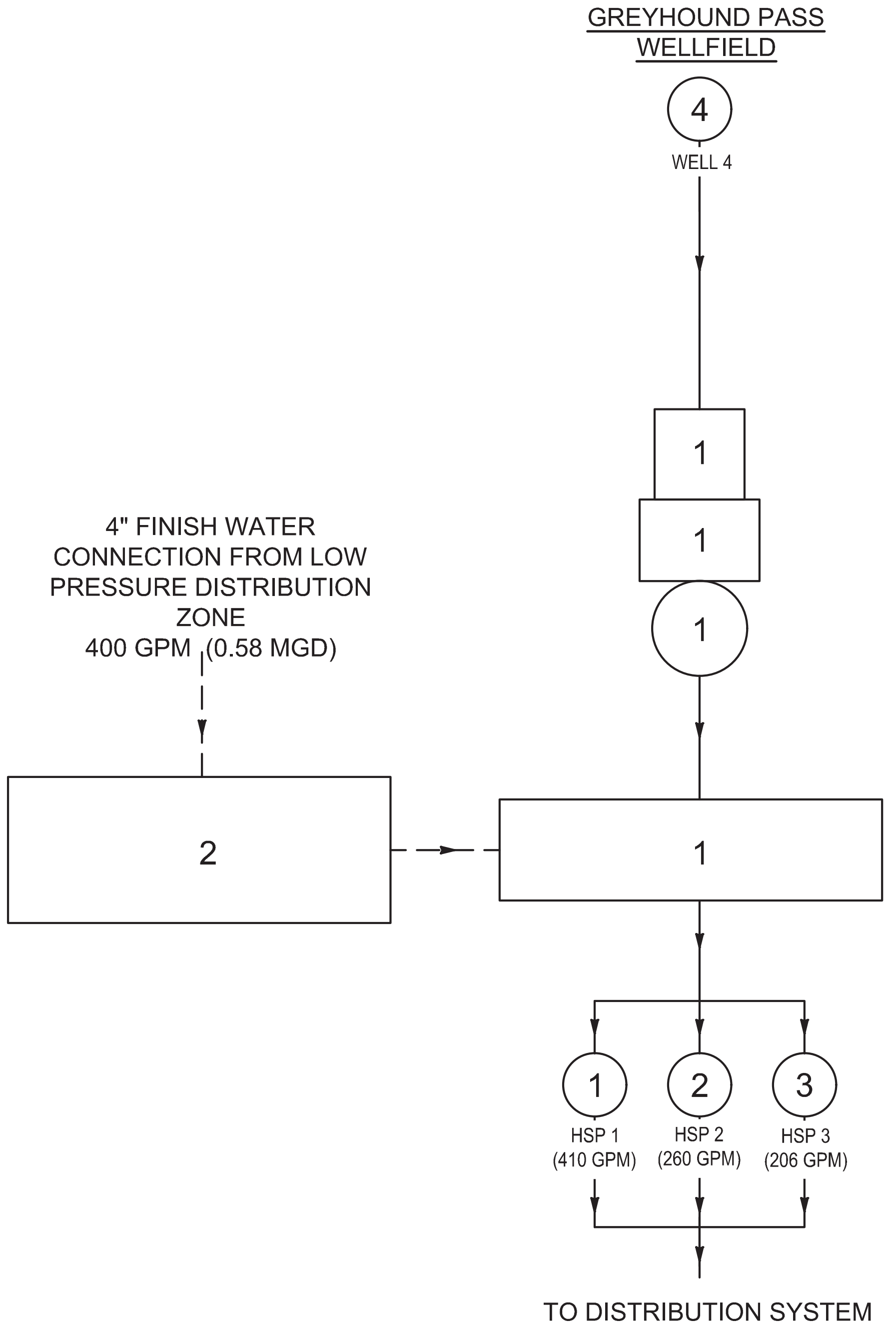
NOTE:
1. SYSTEM FIRM TREATMENT CAPACITY IS REFLECTIVE OF ONE (1.75 MGD) FILTER OUT OF SERVICE AT RIVER ROAD WATER TREATMENT PLANT.
2. WHITE RIVER NORTH WATER TREATMENT PLANT CAPACITY NOT CONSIDERED IN SYSTEM TREATMENT CAPACITY.

FIGURE 2
Westfield Existing Water System Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 2

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH.dwg | Layout: FIG-2 | Plotted: 06/12/19 @ 11:05:35 | LastSavedBy: CurtisG



Wellfield Capacity Summary

Reliable Source Capacity:
569 gpm (0.82 MGD)

Estimated Moderate Drought Capacity:
465 gpm (0.66 MGD)

PACKAGE TREATMENT UNIT
(AERATION, DETENTION,FILTRATION)
BACKWASH SYSTEM OMITTED FOR CLARITY

Rated Capacity (filters): 400 GPM (0.65 MGD)
1 @ 113 sq.ft Filter Area

FINISH WATER CLEARWELLS
Total Storage = 450,000 gallons

Residence Time @ Operating HSP Capacity = 10 hours

HIGH SERVICE PUMPS
Total Operating Capacity = 756 gpm (1.0 MGD)

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LEGEND:

WTP Rated Capacity
Total: 400 gpm (0.65 MGD)

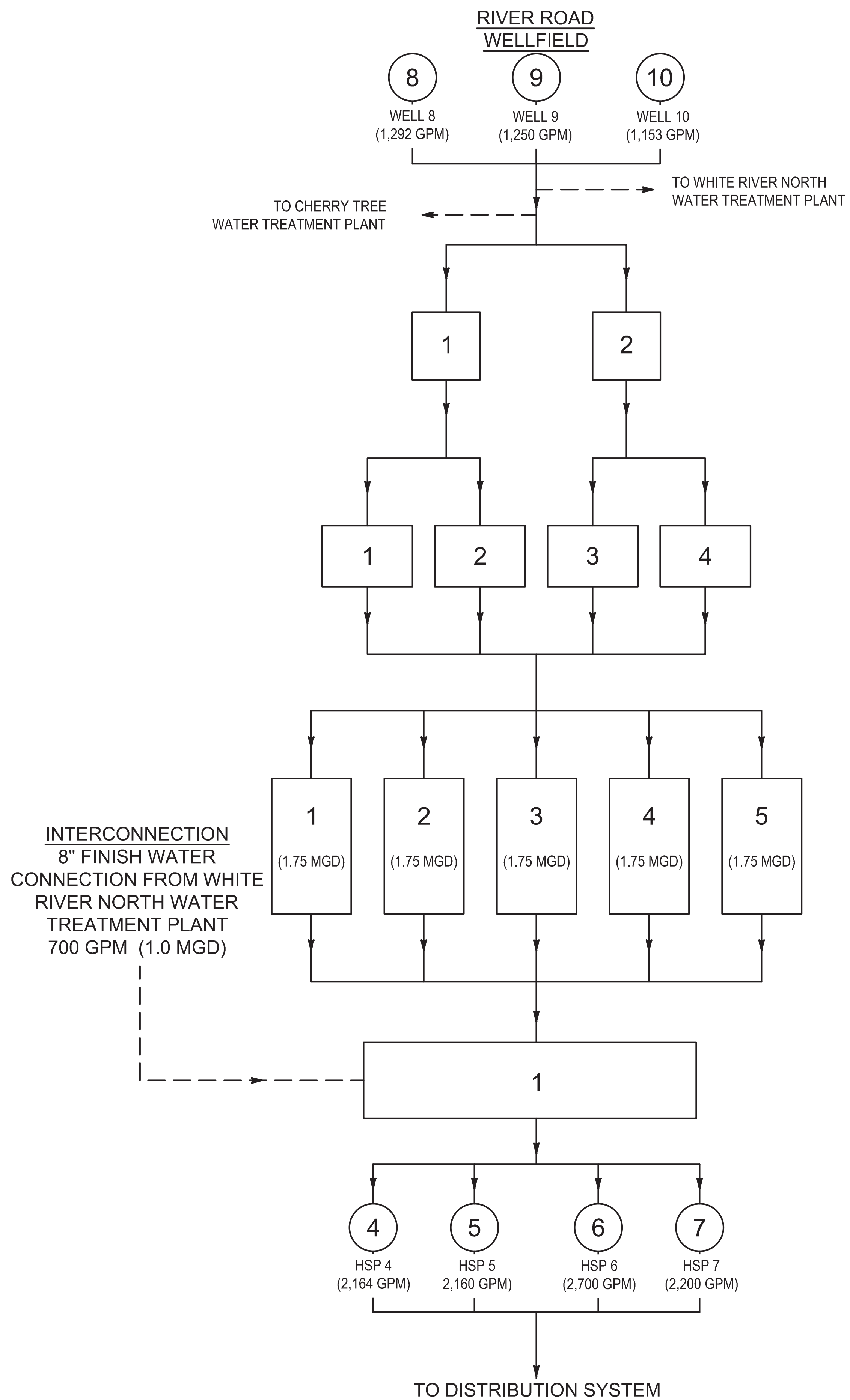
Limiting Process

NOTE:
1. INDIVIDUAL HIGH SERVICE PUMP CAPACITIES ARE BASED ON OBSERVED FLOWRATES WHEN PUMPS OPERATED INDIVIDUALLY.

FIGURE 3
Greyhound Pass Water Treatment Plant Existing Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 3



Wellfield Capacity Summary

Reliable Source Capacity:
3,694 gpm (5.32 MGD)

Estimated Moderate Drought Capacity:
2,956 gpm (4.26 MGD)

AERATION
Rated Capacity
Total: 6,300 gpm (9.0 MGD)

DETENTION TANKS
4 @ 34,500 gallons ea.
Total Detention Volume = 138,000 gallons
Residence Time @ Filter Capacity = 23 minutes

FILTERS
Total Rated Capacity: 6,075 gpm (8.75 MGD)

FINISH WATER CLEARWELL
Total Storage = 500,000 gallons
Residence Time @ Observed HSP Capacity = 70 minutes

HIGH SERVICE PUMPS
(DEDICATED BACKWASH PUMP OMITTED FOR CLARITY)

Operating Capacity
Total 7,130 gpm (10.26 MGD)

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LEGEND:

WTP Rated Capacity
Total: 6,075 gpm (8.75 MGD)

Limiting Process

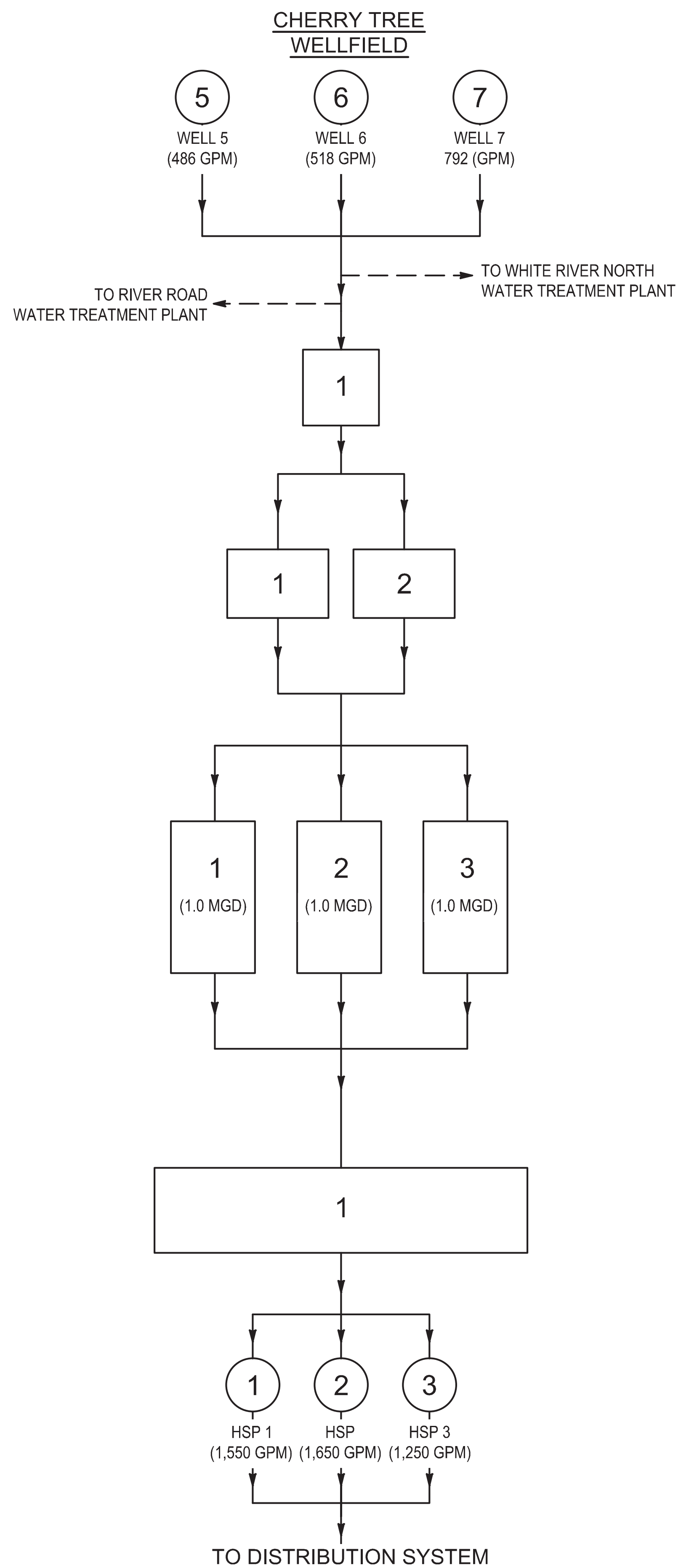
NOTES:
1. INDIVIDUAL WELL CAPACITIES SHOWN ARE RELIABLE SOURCE CAPACITY.
2. INDIVIDUAL HIGH SERVICE PUMP CAPACITIES ARE BASED ON OBSERVED FLOWRATES WHEN PUMPS OPERATED INDIVIDUALLY.

FIGURE 4
River Road Water Treatment Plant Existing Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 4

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH.dwg | Layout: FIG-4 | Plotted: 06/12/19 @ 10:34:31 | LastSavedBy: CurtisG



Wellfield Capacity Summary

Reliable Source Capacity:
1,796 gpm (2.60 MGD)

Estimated Moderate Drought Capacity:
1,437 gpm (2.1 MGD)

AERATION
Rated Capacity
Total: 3,150 gpm (4.5 MGD)
Firm: N\A

DETENTION TANKS
2 Detention Tanks @ 23,000 gallons ea.
Total Detention Volume = 46,000 gallons

Residence Time @ Filter Capacity = 22 minutes

FILTERS
Rated Capacity 2,100 gpm (3.0 MGD)

FINISH WATER CLEARWELL
Total Storage = 30,000 gallons
Residence Time @ Observed HSP
Capacity = 6 minutes

HIGH SERVICE PUMPS
Operating Capacity
Total 4,450 gpm (6.4 MGD)

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LEGEND:

WTP Rated Capacity
Total: 2,100 gpm (3.0 MGD)

Limiting Process

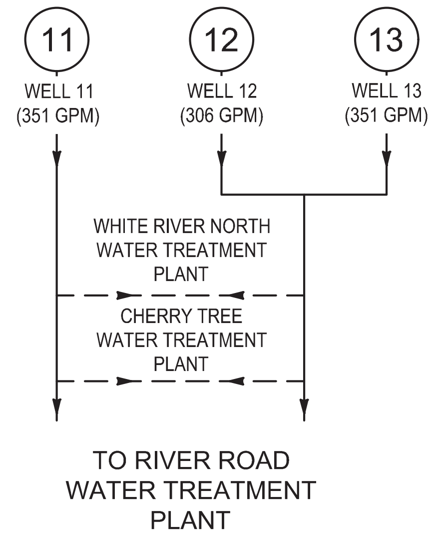
NOTES:
1. INDIVIDUAL WELL CAPACITIES SHOWN ARE RELIABLE SOURCE CAPACITY.
2. INDIVIDUAL HIGH SERVICE PUMP CAPACITIES ARE BASED ON OBSERVED FLOW RATES WHEN PUMPS OPERATED INDIVIDUALLY.

FIGURE 5
Cherry Tree Water Treatment Plant Existing Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 5

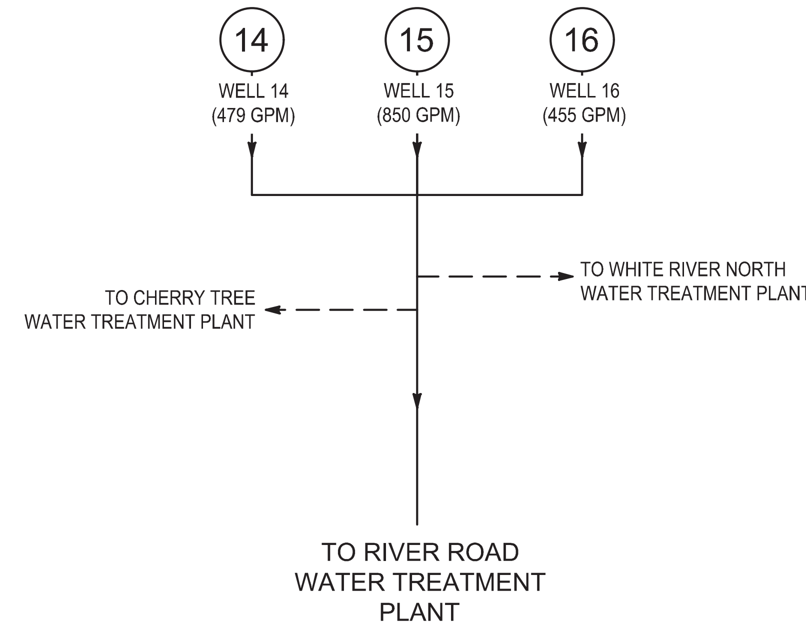
WELCOME PROPERTY
WELLFIELD



Wellfield Capacity Summary

Reliable Source Capacity: 1,008 gpm (1.45 MGD)
Estimated Moderate Drought Capacity: 806 gpm (1.16 MGD)

HORSESHOE PROPERTY
WELLFIELD



Wellfield Capacity Summary

Reliable Source Capacity: 1,784 gpm (2.57 MGD)
Estimated Moderate Drought Capacity: 1,427 gpm (2.06 MGD)

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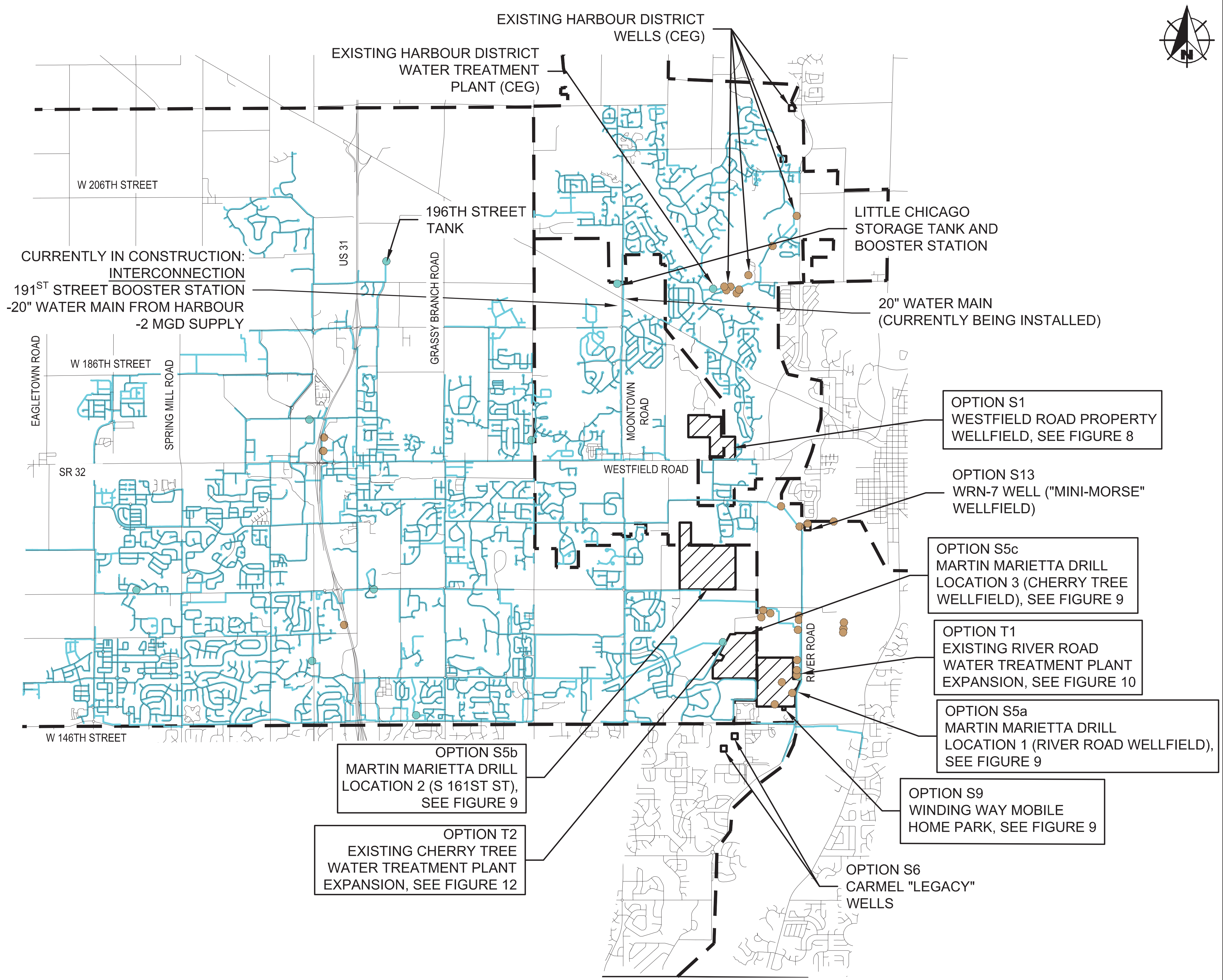
LEGEND:

NOTE:
1. INDIVIDUAL WELL CAPACITIES SHOWN ARE RELIABLE SOURCE CAPACITY.

FIGURE 6
Welcome Property and Horseshoe Property Wellfields Existing System Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG.6



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LEGEND:

SERVICE AREA BOUNDARY (dashed line)

NOTE:
LOCATION OF PROPOSED NEW WATER TREATMENT PLANT NOT SHOWN.

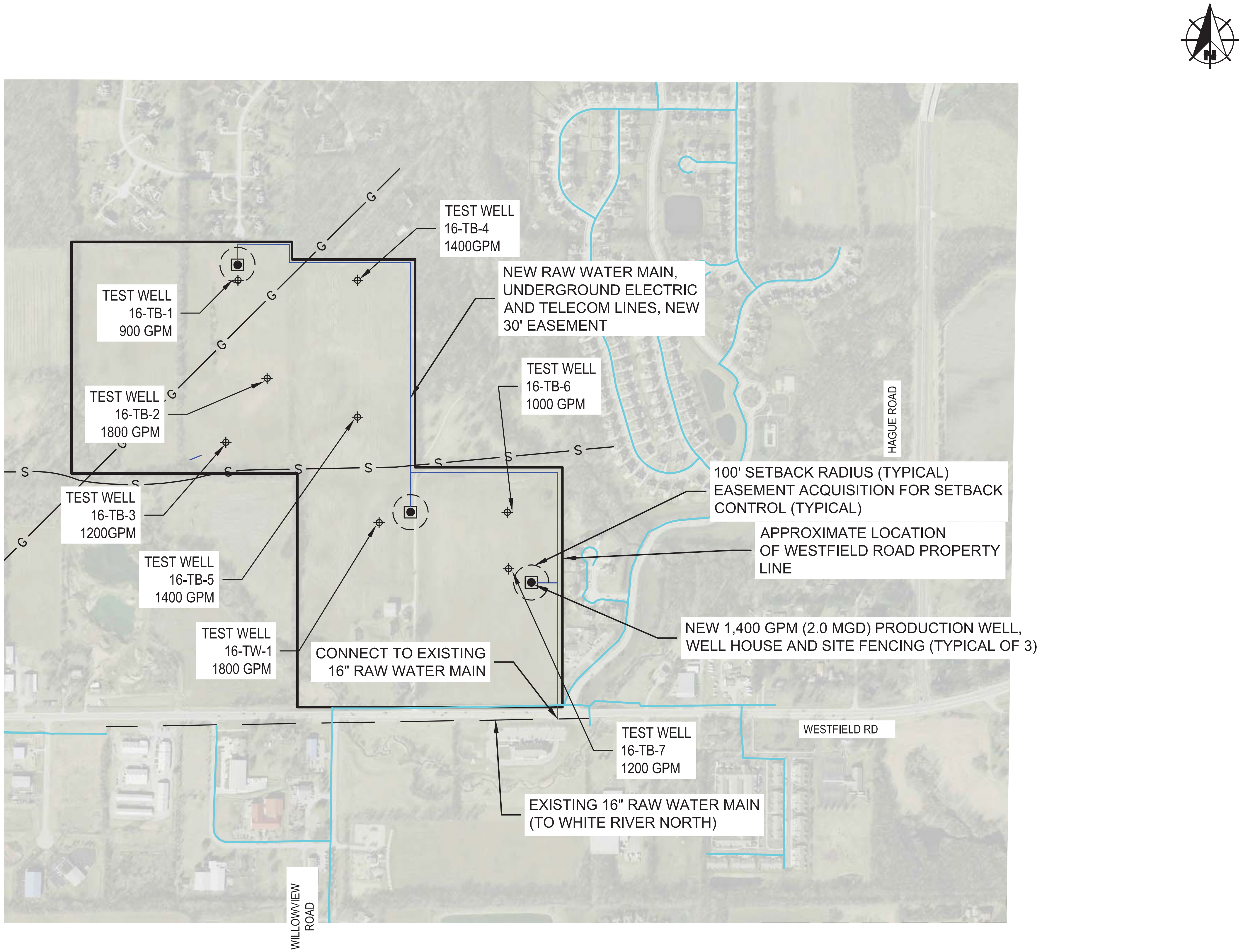
0 3000 6,000 12,000 FT

FIGURE 7
Proposed Water System Improvements

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 7

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH-AERIALS.dwg | Layout: FIG-7 | Plotted: 06/12/19 @ 11:19:28 | LastSavedBy: CurtisG



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LEGEND:

SERVICE AREA BOUNDARY

Westfield Road Wellfield Capacity
Total: 4,200 gpm (6.0 MGD)

NOTES:
1. RAW WATER MAIN TIE OVER AND CONTROL VALVE NOT SHOWN.
2. PROPOSED GROUND WATER TREATMENT PLANT NOT SHOWN.

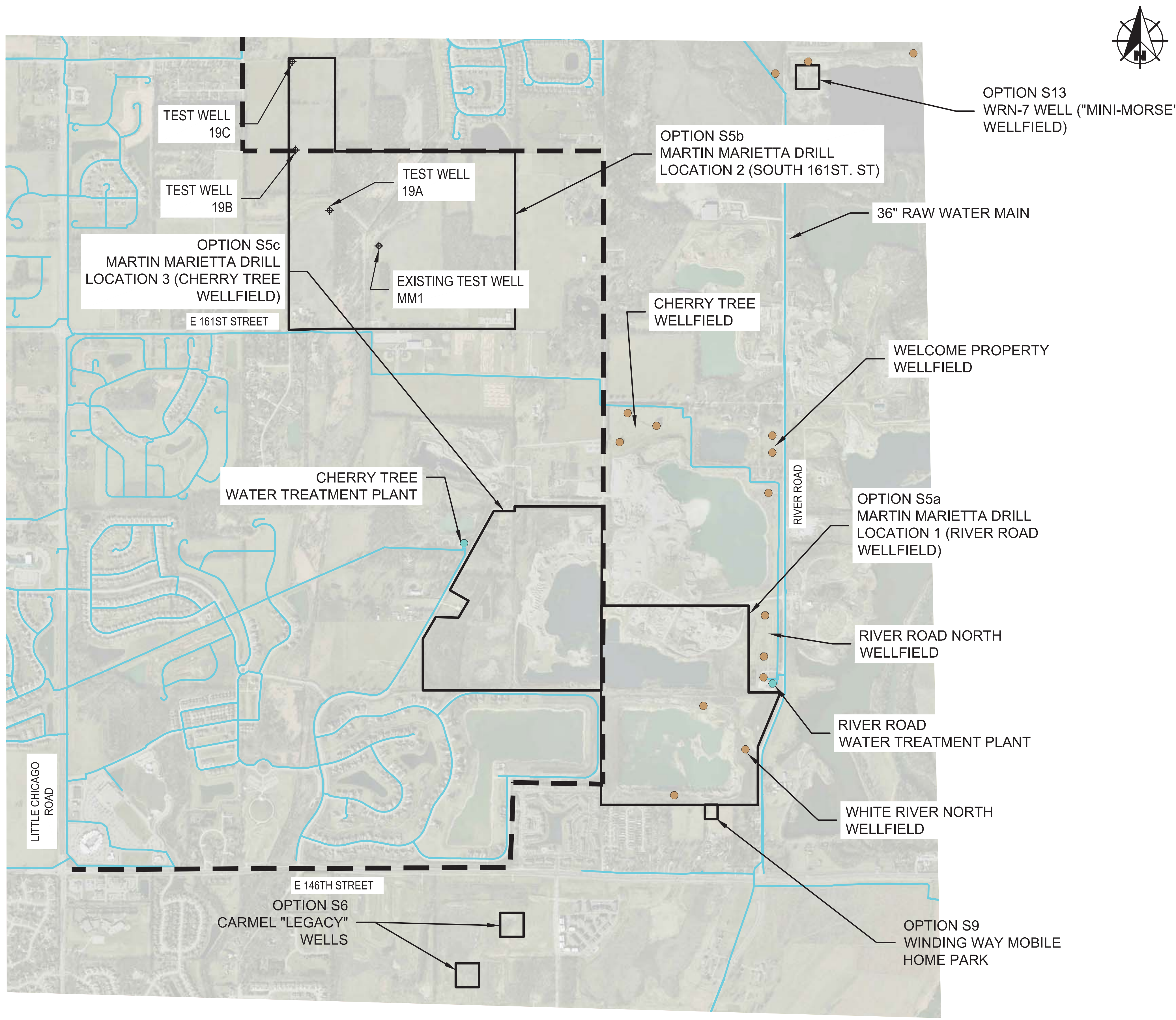
0 300 600 1,200 FT

FIGURE 8
OPTION S1
Proposed Westfield Road Wellfield

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 8

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH-AERIALS.dwg | Layout: FIG-8 | Plotted: 06/12/19 @ 09:31:22 | LastSavedBy: CurtisG



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LEGEND:

SERVICE AREA BOUNDARY

NOTES:
1. PROPOSED GROUND WATER TREATMENT PLANT/SURFACE WATER TREATMENT PLANT NOT SHOWN.

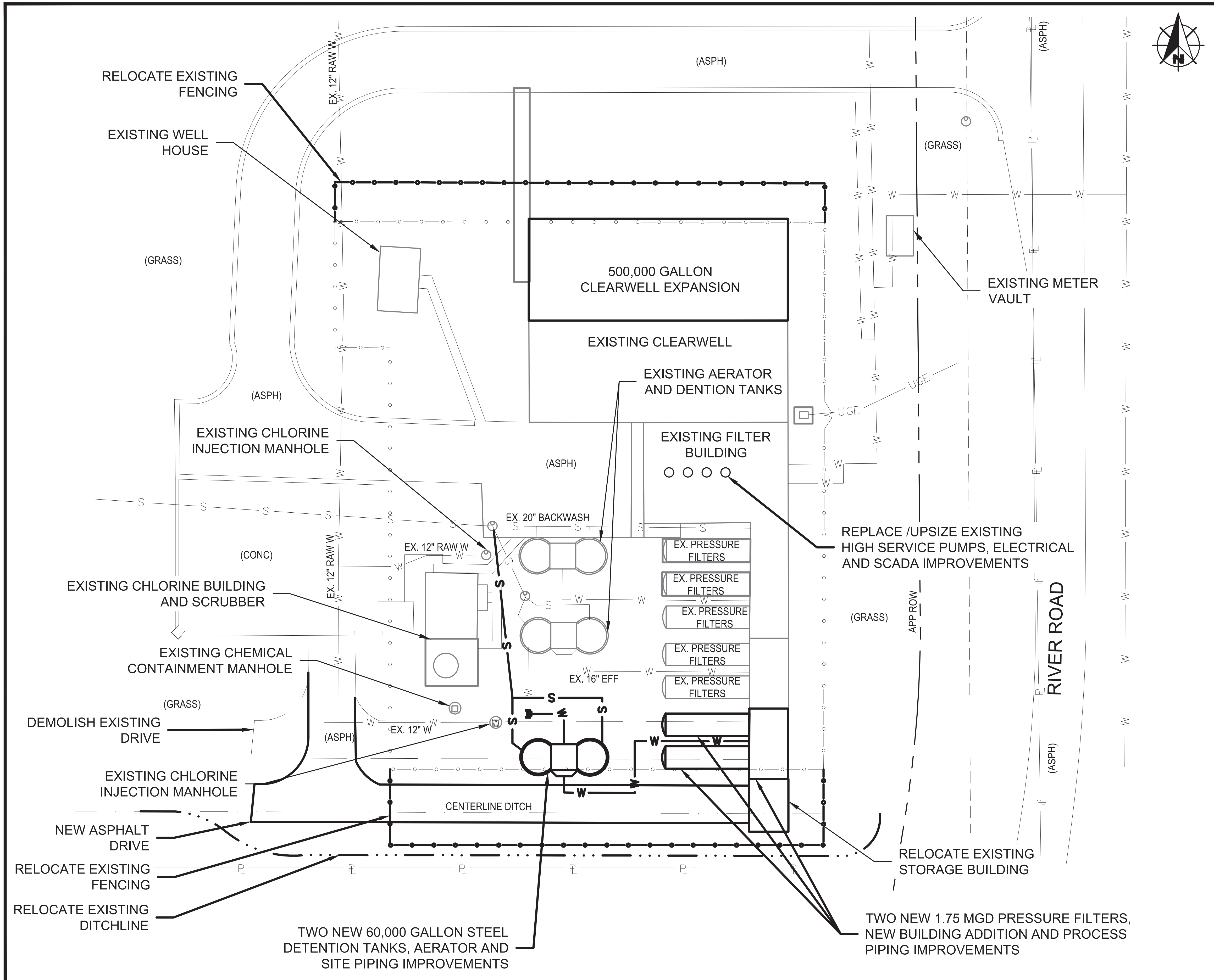
0 750 1,500 3,000 FT

FIGURE 9
Proposed Martin Marietta Property Wellfields

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 9

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH-AERIALS.dwg | Layout: FIG-9 | Plotted: 06/12/19 @ 09:31:49 | LastSavedBy: CurtisG



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LEGEND:

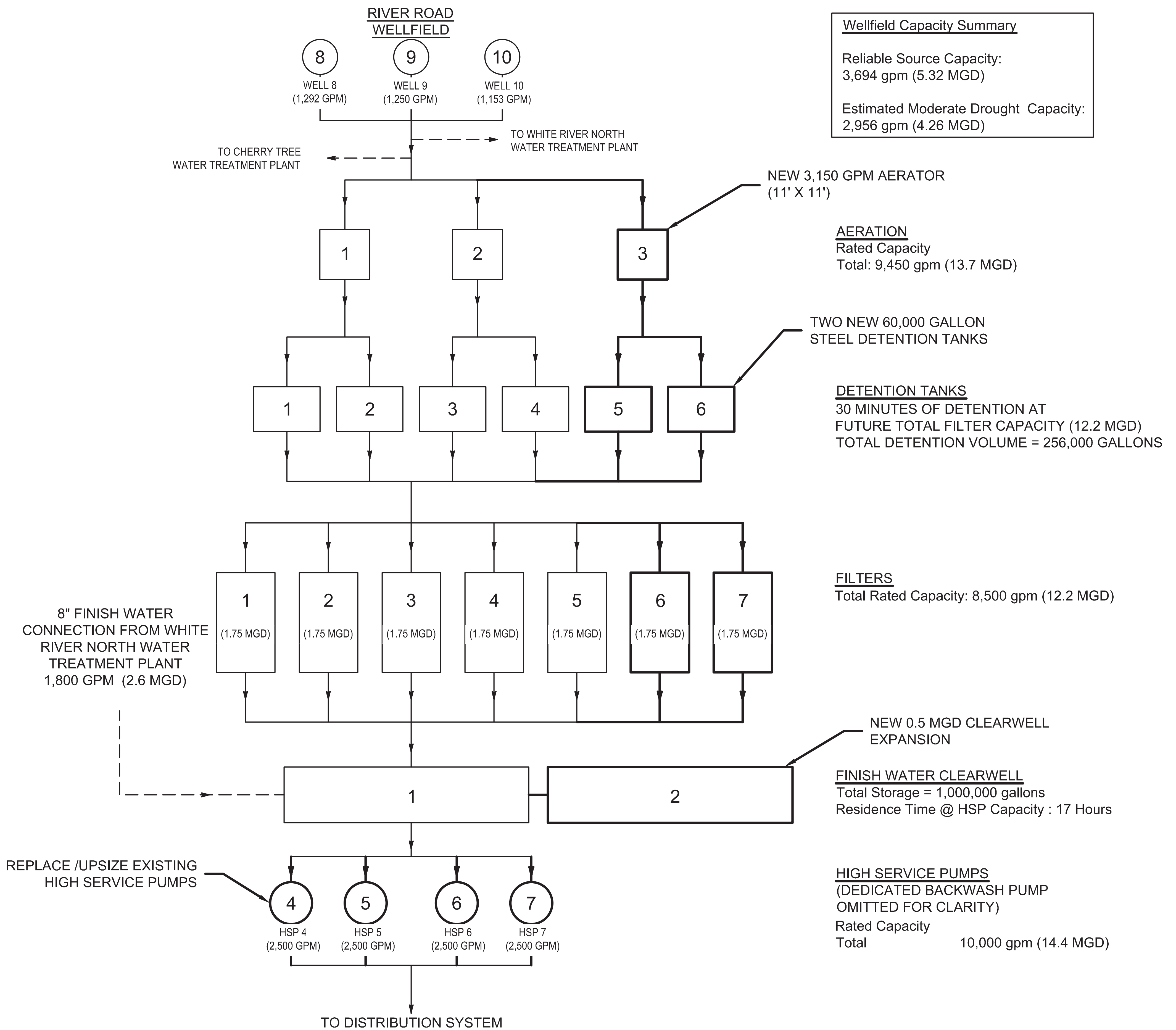
NOTE:
1. EXPANSION ADDS 3.5 MGD TO RIVER ROAD WATER TREATMENT PLANT CAPACITY

0 10 20 40 FT

FIGURE 10
River Road Water Treatment Plant Expansion

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 10



WESSLER ENGINEERING
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LEGEND:

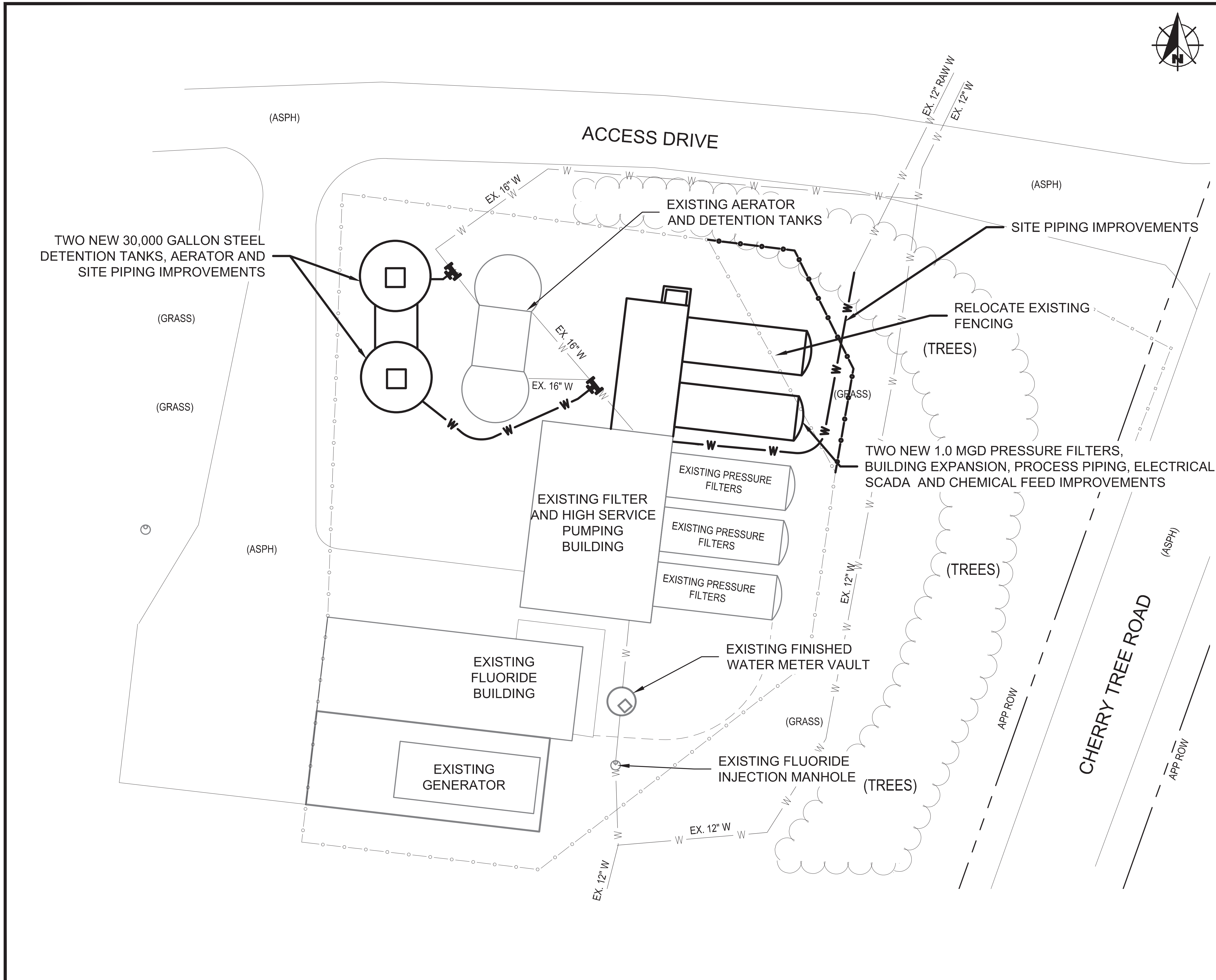
WTP Rated Capacity
Total: 8,500 gpm (12.2 MGD)

NOTE:
1. EXPANSION ADDS 3.5 MGD TO RIVER ROAD WATER TREATMENT PLANT CAPACITY.
2. CHEMICAL FEED IMPROVEMENTS NOT SHOWN.
3. BACKWASH POND IMPROVEMENTS NOT SHOWN.

FIGURE 11
River Road Water Treatment Plant Expansion Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 11



Wessler Engineering
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LEGEND:

NOTE:
1. EXPANSION ADDS 2.0 MGD TO CHERRY TREE WATER TREATMENT PLANT CAPACITY

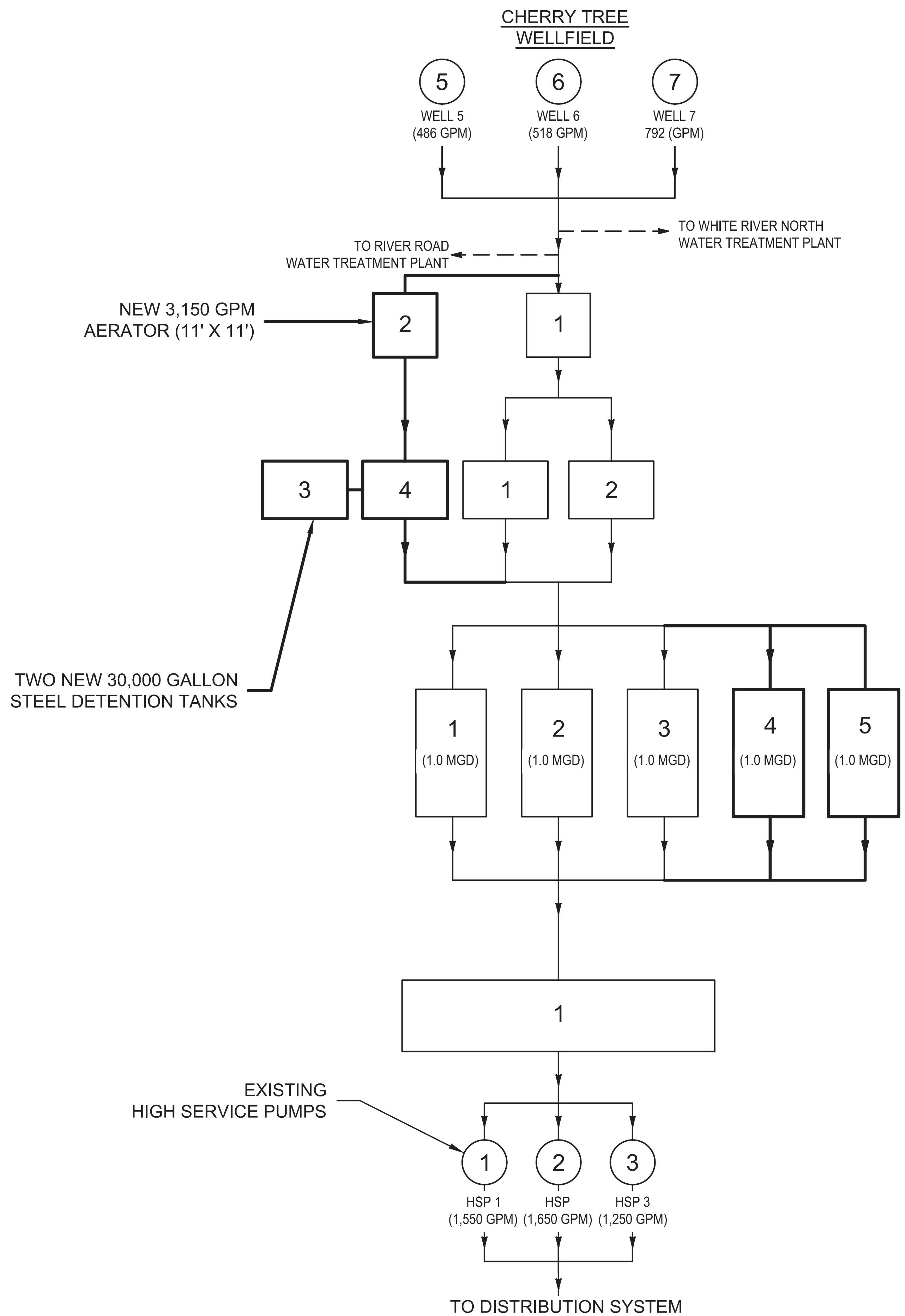
0 10 20 40 FT

EXHIBIT 12
Cherry Tree Water Treatment Plant Expansion

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG.12

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH.dwg | Layout: FIG-12 | Plotted: 06/12/19 @ 10:44:30 | LastSavedBy: CurtisG



Wellfield Capacity Summary

Reliable Source Capacity:
1,796 gpm (2.60 MGD)

Estimated Moderate Drought Capacity:
1,437 gpm (2.1 MGD)

AERATION
Rated Capacity
Total: 6,300 gpm (9.0 MGD)

DETENTION TANKS
30 MINUTES OF DETENTION AT
FUTURE TOTAL FILTER CAPACITY (5.0 MGD)
TOTAL DETENTION VOLUME = 106,000 GALLONS

FILTERS
Total Rated Capacity 3,500 gpm (5.0 MGD)

FINISH WATER CLEARWELL
Total Storage = 30,000 gallons
Residence Time @ Observed HSP Capacity = 6 minutes

HIGH SERVICE PUMPS
Operating Capacity
Total 4,450 gpm (6.4 MGD)

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LEGEND:

WTP Rated Capacity
Total: 3,500 gpm (5.0 MGD)

NOTES:
1. EXPANSION ADDS 2.0 MGD TO CHERRY TREE PLANT CAPACITY.
2. CHEMICAL FEED IMPROVEMENTS NOT SHOWN.
3. BACKWASH POND IMPROVEMENTS NOT SHOWN.

FIGURE 13
Cherry Tree Water Treatment Plant Expansion Process Schematic

CEG Westfield WMP
Westfield, Indiana
Westfield Water System

June 2019
210618-01-001
PG. 13

Drawing: J:\Citizens Energy Group - CEG Westfield\Projects\210618 CEG Westfield Water Master Plan\CAD 01-001\DWG\Exhibit\210618-01-001-EXH.dwg | Layout: FIG-13 | Plotted: 06/12/19 @ 10:45:25 | LastSavedBy: CurtisG

APPENDIX B

TABLES

Table of Contents

Table B-1
Summer Peak Demand vs Existing Capacity Analysis

Westfield Treatment and Supply Capacity Study

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Source Capacity																					
Normal Summer Peak (est.)	**9.5**	**10.0**	**10.5**	**11.0**	**11.5**	**12.0**	**12.5**	**13.0**	**13.5**	**14.0**	**14.5**	**15.0**	**15.5**	**16.0**	**16.5**	**17.0**	**17.5**	**18.0**	**18.5**	**19.0**	**19.5**
Reliable Source Capacity	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**	**12.7**
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Source Capacity (Wells & Interconnections)	**14.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**	**16.7**
Source Water Deficit (Surplus)	**(5.2)**	**(6.7)**	**(6.2)**	**(5.7)**	**(5.2)**	**(4.7)**	**(4.2)**	**(3.7)**	**(3.2)**	**(2.7)**	**(2.2)**	**(1.7)**	**(1.2)**	**(0.7)**	**(0.2)**	**0.3**	**0.8**	**1.3**	**1.8**	**2.3**	**2.8**
Treatment Capacity																					
Normal Summer Peak (est.)	**9.5**	**10.0**	**10.5**	**11.0**	**11.5**	**12.0**	**12.5**	**13.0**	**13.5**	**14.0**	**14.5**	**15.0**	**15.5**	**16.0**	**16.5**	**17.0**	**17.5**	**18.0**	**18.5**	**19.0**	**19.5**
Firm System Treatment Capacity	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Potable Water Production Capacity	**12.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**
Potable Water Supply Deficit (Surplus)	**(3.1)**	**(4.6)**	**(4.1)**	**(3.6)**	**(3.1)**	**(2.6)**	**(2.1)**	**(1.6)**	**(1.1)**	**(0.6)**	**(0.1)**	**0.4**	**0.9**	**1.4**	**1.9**	**2.4**	**2.9**	**3.4**	**3.9**	**4.4**	**4.9**

Table B-2
Drought Peak Demand vs Existing Capacity Analysis

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Source Capacity																					
Drought Peak Demand (est.)	**12.8**	**13.5**	**14.2**	**14.9**	**15.5**	**16.2**	**16.9**	**17.6**	**18.2**	**18.9**	**19.6**	**20.3**	**20.9**	**21.6**	**22.3**	**23.0**	**23.6**	**24.3**	**25.0**	**25.7**	**26.3**
Estimated Moderate Drought Capacity	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**	**10.2**
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Source Capacity (Wells & Interconnections)	**12.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**
Source Water Deficit (Surplus)	**0.7**	**(0.7)**	**0.0**	**0.7**	**1.4**	**2.0**	**2.7**	**3.4**	**4.1**	**4.7**	**5.4**	**6.1**	**6.8**	**7.4**	**8.1**	**8.8**	**9.5**	**10.1**	**10.8**	**11.5**	**12.2**
Treatment Capacity																					
Drought Peak (est.)	**12.8**	**13.5**	**14.2**	**14.9**	**15.5**	**16.2**	**16.9**	**17.6**	**18.2**	**18.9**	**19.6**	**20.3**	**20.9**	**21.6**	**22.3**	**23.0**	**23.6**	**24.3**	**25.0**	**25.7**	**26.3**
Firm System Treatment Capacity	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Potable Water Production Capacity	**12.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**	**14.6**
Potable Water Supply Deficit (Surplus)	**0.2**	**(1.1)**	**(0.4)**	**0.3**	**0.9**	**1.6**	**2.3**	**3.0**	**3.6**	**4.3**	**5.0**	**5.7**	**6.3**	**7.0**	**7.7**	**8.4**	**9.0**	**9.7**	**10.4**	**11.1**	**11.7**
System Capacity																					
Limiting Capacity / Expected System Yield	12.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2

All source capacities reduced to 80% of Reliable Source Capacity to reflect reduced production during a moderate drought scenario.

General Note: All demands and capacities are shown in MGD

Table B-3
Water Supply Scenarios as provided by Citizens Water

Water Master Plan
Westfield Water System

New Treatment Plant Options for Westfield

Scenario	Description	Filter MGD	Source MGD	Filter Cost	Source Cost	Distribution Cost	Total Cost	$/MGD	Source	Source Options
1	River Road Plant Expansion - GW	3	3	$ 6,000,000	$ 3,000,000	$ 1,000,000	$ 10,000,000	$ 3,333,333	GW	Martin Marietta, Mini-Morse, Spartz, 146th Trailer Park, Legacy
2	River Cherry Tree Plant Expansion - GW	2	2	$ 4,000,000	$ 2,000,000	$ 1,000,000	$ 7,000,000	$ 3,500,000	GW	Martin Marietta, Mini-Morse, Spartz, 146th Trailer Park, Martin Marietta "Area B"
3	Mini Morse Plant - with Current GW	5	5	$ 10,000,000	$ 5,000,000	$ 2,000,000	$ 17,000,000	$ 3,400,000	GW	Mini Morse well + TBD New Wells
4	Mini Morse Plant - with Current GW+Surface	15	15	$ 30,000,000	$ 5,000,000	$ 3,000,000	$ 38,000,000	$ 2,533,333	GW+ Surface	Mini Morse well + Morse Flow to Quarry
5	Martin Marietta Plant - GW	5	5	$ 10,000,000	$ 5,000,000	$ 2,000,000	$ 17,000,000	$ 3,400,000	GW	New Martin Marietta Wells, Spartz, 146th
6	Martin Marietta Plant - GWI	10	10	$ 20,000,000	$ 2,000,000	$ 3,000,000	$ 25,000,000	$ 2,500,000	GWI	New Martin Marietta Wells, Spartz, 146th, Martin Marietta Dewatering
7	Sid Davis Plant - GW	4	4	$ 8,000,000	$ 4,000,000	$ 1,000,000	$ 13,000,000	$ 3,250,000	GW	Sid Davis Wells, Oakmont, Chapman Electric Area
8	Chatham Hills/Grand Park Plant - GW	2	2	$ 4,000,000	$ 2,000,000	$ 1,000,000	$ 7,000,000	$ 3,500,000	GW	Multiple New Wells in northern area. See Structurepoint Report.
9	Allisonville Road XXX Street)	5	5	$ 10,000,000	$ 5,000,000	$ 2,000,000	$ 17,000,000	$ 3,400,000	GW	NE Hamilton County Wells
10	Cicero Plant - GW	5	5	$ 10,000,000	$ 5,000,000	$ 2,000,000	$ 17,000,000	$ 3,400,000	GW	Existing/New NE Hamilton County Wells Purchase system
11	Expand Harbour Plant	2	2	$ 4,000,000	$ 2,000,000	$ -	$ 6,000,000	$ 3,000,000	GW	Spartz, New Harbour Well Field expansion
12	Executive Airport/Joliet Road	2	2	$ 4,000,000	$ 2,000,000	$ 1,000,000	$ 7,000,000	$ 3,500,000	GW	Evaluate water
13	Sheridan Wholesale	0	2	$ -	$ 2,000,000	$ 2,000,000	$ 4,000,000	$ 2,000,000	GW	

New Supply Options for Westfield

Scenario	Description	Filter MGD	Source MGD	Filter Cost	Source Cost	Distribution Cost	Total Cost	$/MGD	Source	Source
1	Ranny Collector Wells for WRN		6		$ 6,000,000	$ 1,000,000	$ 7,000,000	$ 1,166,667	GW	Along White River
2	Sid Davis		5		$ 5,000,000	$ 1,000,000	$ 6,000,000	$ 1,200,000	GW	
3	Harbour Well Field Expansion		2		$ 2,000,000	$ 1,000,000	$ 3,000,000	$ 1,500,000	GW	
4	Legacy Wells/Carmel		4		$ 4,000,000	$ 1,000,000	$ 5,000,000	$ 1,250,000	GW	
5	Pilgrim Church		4		$ 4,000,000	$ 1,000,000	$ 5,000,000	$ 1,250,000	GW	
6	Oakmont		4		$ 4,000,000	$ 1,000,000	$ 5,000,000	$ 1,250,000	GW	
7	Chapman Electric Area		4		$ 4,000,000	$ 1,000,000	$ 5,000,000	$ 1,250,000	GW	Other properties near Davis/Oakmont
8	Martin Marietta		15		$ 15,000,000	$ 2,000,000	$ 17,000,000	$ 1,133,333	Quarrie	Surface/GWI
9	Mini Morse Surface Supply		10		$ 10,000,000	$ 1,000,000	$ 11,000,000	$ 1,100,000	Surface	
10	Mini Morse GW Supply		2		$ 2,000,000	$ 1,000,000	$ 3,000,000	$ 1,500,000	Surface	
11	Spartz Property		1		$ 1,000,000	$ 1,000,000	$ 2,000,000	$ 2,000,000	GW	
12	Martin Marietta "Area B" Cherry Tree		2		$ 2,000,000	$ 1,000,000	$ 3,000,000	$ 1,500,000	GW	Easement area obtained already? See Itrust Site
13	NE Hamilton County Lane Study (Cicero)		5		$ 5,000,000	$ 1,000,000	$ 6,000,000	$ 1,200,000	GW	East of Morse (206th Street North) See Itrust Site
14	146th Trailer Park		2		$ 2,000,000	$ 1,000,000	$ 3,000,000	$ 1,500,000	GW	East of Morse (206th Street North) See Itrust Site
15	Grand Park/Chatham Wells		2		$ 2,000,000	$ 1,000,000	$ 3,000,000	$ 1,500,000	GW	See Itrust for Structurepoint (Chatham Study)

Table B-4
Source and Treatment Option Summary

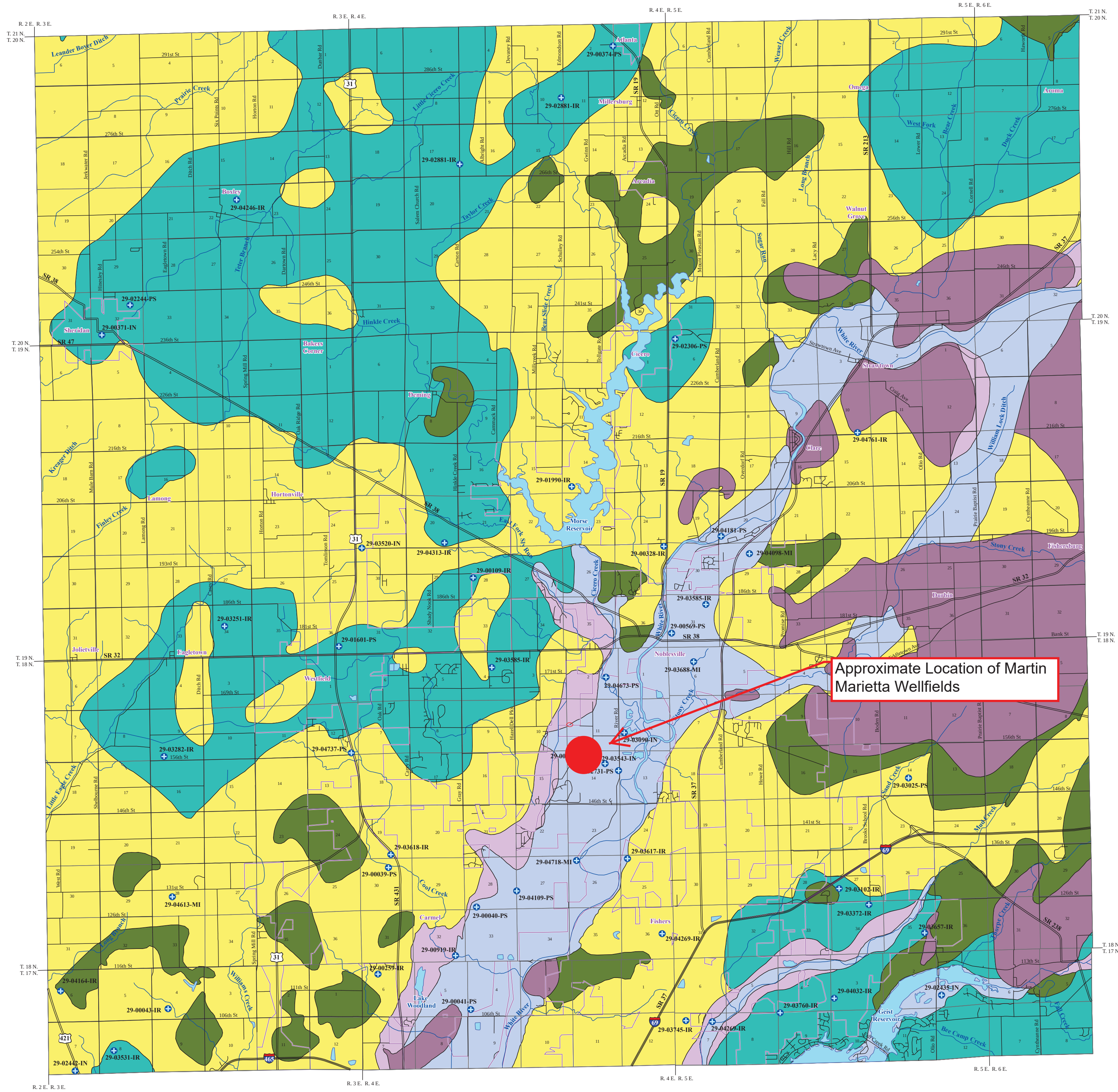
Westfield Treatment and Supply Capacity Study

Option	*Viability*	*Description*	*Source/ Treatment (MGD)*	*Source Cost*	*Treatment Cost*	*Distribution Cost*	*Cost to Implement*	*$MM/MGD*
S1	10	Westfield Road Wellfield	6.0	$4,800,000	--	--	$4,800,000	$0.80
S2	10	Pilgrim Church*	4.0	$4,000,000	--	$1,000,000	$5,000,000	$1.25
S3	10	Martin Marietta Surface Water	6.0	$6,000,000	--	$1,000,000	$7,000,000	$1.17
S4	10	Mini Morse Surface Supply*	10.0	$10,000,000	--	$1,000,000	$11,000,000	$1.10
S5c	8	Martin Marietta Location 3 (Cherry Tree Wellfield B)	4.6	$3,000,000	--	--	$3,000,000	$0.65
S5b	5	Martin Marietta Location 2 (161st St Property)	4.6	$3,250,000	--	--	$3,250,000	$0.71
S6	4	Legacy Wells/Carmel	2.0	--	--	--	--	--
S7	4	Oakmont*	4.0	$4,000,000	--	$1,000,000	$5,000,000	$1.25
S8	4	NE Hamilton County (Cicero)*	5.0	$5,000,000	--	$1,000,000	$6,000,000	$1.20
S9	3	Winding Way Mobile Home Park	0.0	--	--	--	--	--
S10	2	Chapman Electric Area*	4.0	$4,000,000	--	$1,000,000	$5,000,000	$1.25
S5a	1	Martin Marietta Location 1 (River Road Wellfield)	4.6	--	--	--	--	--
S11	1	Spartz Property*	1.0	$1,000,000	--	$1,000,000	$2,000,000	$2.00
S12	1	Grand Park/Chatham Wells*	2.0	$2,000,000	$2,000,000	$1,000,000	$5,000,000	$2.50
S13	1	Mini Morse GW Supply	2.0	--	--	--	--	--
S14	1	White River North Wells	0.0	--	--	--	--	--
T1	10	River Road WTP & Clearwell	3.5	--	$8,200,000	$9,700,000	$17,900,000	$5.11
T2	8	Cherry Tree WTP Expansion	2.0	--	$4,000,000	$1,800,000	$5,800,000	$2.90
T3	5	Unidentified GWTP	6.0	--	$15,600,000	--	$15,600,000	$2.60
T4	5	Unidentified SWTP	6.0	--	$28,000,000	--	$28,000,000	$4.67

**Options are not discussed in Study. Capacity and Source costs as provided by CEG*

Mitchell E. Daniels, Jr., Governor
Department of Natural Resources
Robert E. Carter, Jr., Director

UNCONSOLIDATED AQUIFER SYSTEMS OF HAMILTON COUNTY, INDIANA



The unconsolidated aquifer systems of Hamilton County are composed of sediments deposited by, or resulting from, a complex sequence of glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Hamilton County: the Till Veneer; the New Castle / Tipton Till; the New Castle / Tipton Till Subsystem; the New Castle / Tipton Complex; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subs ystem. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries. Approximately 75 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Hamilton County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits in the county range from less than 5 feet to about 300 feet thick.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to a wide range of variation within geologic environments. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

Till Veneer Aquifer System

In Hamilton County, the Till Veneer Aquifer System occurs in areas where the unconsolidated material is predominantly thin till overlying bedrock. This system is chiefly the product of the deposition of glacial till over an uneven, eroded bedrock surface, and is generally less than 50 feet thick. Small areas of eastern and southeastern Hamilton County are mapped as Till Veneer.

The Till Veneer Aquifer System has the most limited groundwater resources of the unconsolidated aquifer systems. Potential aquifers within this system include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. However, there is little potential for groundwater production in this system in Hamilton County with 96 percent of the wells being completed in the underlying bedrock. The wells utilizing this aquifer system are completed at depths ranging from 30 to 40 feet. Most of the wells in this system have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as “dry”. Static water levels range between 8 and 20 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, areas where protective clay layers are thin or absent are very susceptible to contamination.

New Castle / Tipton Till Aquifer System

The New Castle / Tipton Till Aquifer System is mapped throughout a large portion of Hamilton County. This aquifer system is up to about 170 feet in thickness, and consists primarily of glacial till with intertill sand and gravel layers. However, the sand and gravel aquifers in this system tend to be relatively thin and discontinuous.

This aquifer system is capable of meeting the needs of most domestic and some high - capacity users in Hamilton County. The wells utilizing this aquifer system are completed at depths ranging from 65 to 135 feet with saturated sand and gravel aquifer materials commonly 4 to 18 feet thick. Domestic well yields are typically 10 to 40 gpm and static water levels range from flowing to 44 feet below the land surface. There are 17 registered significant groundwater withdrawal facilities (32 wells) using the Tipton Till Aquifer System. The reported yields for the high-capacity wells range from 70 to 777 gpm.

The New Castle / Tipton Till Aquifer System typically has a low susceptibility to surface contamination because intertill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

New Castle / Tipton Till Aquifer Subsystem

The New Castle / Tipton Till Aquifer Subsystem is mapped in several isolated areas of Hamilton County. The subsystem is mapped similar to the New Castle / Tipton Till Aquifer System. However, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

About 84 percent of wells started in this subsystem in Hamilton County are completed in the underlying bedrock aquifer system. However, the New Castle / Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. Potential aquifer materials include relatively thin, discontinuous intertill sand and gravel deposits. These intertill sand and gravel aquifer materials are commonly less than 10 feet thick. The wells producing from th is subsystem are typically completed at depths ranging from about 50 to 110 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range from 12 to 40 feet below the surface. There are no registered significant groundwater withdrawal facilities using the New Castle / Tipton Till Aquifer Subsystem.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

New Castle / Tipton Complex Aquifer System

The New Castle / Tipton Complex Aquifer System is mapped throughout much of Hamilton County. Multiple glacial advances resulted in sequences of intertill sand and gravel layers, typically overlain by thick clay, resulting in aquifers that are highly variable in depth, thickness, and lateral extent. The total thickness of the combined unconsolidated deposits is up to about 300 feet.

The deeper more prolific aquifers of this system are capable of meeting the needs of domestic and some high-capacity users in Hamilton County. Saturated aquifer materials in the New Castle / Tipton Complex Aquifer System range from about 5 to 20 feet thick, and wells in this system are generally completed at depths from about 75 to 150 feet. Domestic well yields range up to 50 gpm and static water levels are about 15 to 50 feet below the surface. There are 18 registered significant groundwater withdrawal facilities (38 wells) using this system. The reported yields for the high-capacity wells range from 70 to 1500 gpm.

The New Castle / Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are relatively thin, the shallow aquifer, if present, is at moderate to high risk.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is mapped in the southeastern and east-central portions of Hamilton County along the White River, Stony Creek, William Lock Ditch, Mud Creek, and Fall Creek. The system includes thick glacial outwash sands and gravels that are generally capped by a layer of clay and silt deposits.

The White River and Tributaries Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Hamilton County. The wells utilizing this aquifer system are completed at depths ranging from 45 to 85 feet with saturated sand and gravel aquifer materials commonly 10 to 45 feet thick. Domestic well yields are typically 10 to 50 gpm with static water levels ranging from 12 to 30 feet below the surface. In the White River and Tributaries Outwash Aquifer System there are 20 registered significant groundwater withdrawal facilities (55 wells). Reported production for these high-capacity wells range from 75 to 2100 gpm.

The White River and Tributaries Outwash Aquifer System is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no clay deposits. However, areas having relatively thick clays overlying the sand and gravel deposits are moderately susceptible to contamination.

White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer Subsystem is mapped in southeastern and east-central Hamilton County along portions of the White River, William Lock Ditch, Mud Creek, and Fall Creek . This subsystem is mapped similar to the White River and Tributaries Outwash Aquifer System; however, aquifer materials in the White River and Tributaries Outwash Aquifer Subsystem are generally thinner, overlying silt and/or clay materials are thicker, and potential yields are less in the subsystem.

The White River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths commonly ranging from 45 to 95 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 5 to 30 feet thick. Domestic well yields are generally 10 gpm with static water levels ranging from 15 to 40 feet below the surface. There are no registered significant groundwater withdrawal facilities in the White River and Tributaries Outwash Aquifer Subsystem.

Areas within the White River and Tributaries Outwash Aquifer Subsystem that have overlying clay deposits are moderately susceptible to surface contamination; however, areas lacking overlying clay deposits are highly susceptible to contamination.

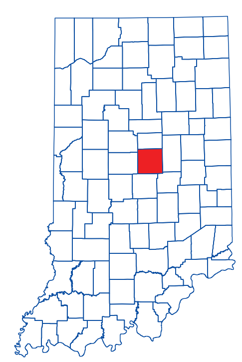
1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- Lake & River

Location Map



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Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621), and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (pol ygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Unconsolidated aquifer systems coverage (Scott, 2010) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Hamilton County, Indiana

by
Robert A. Scott
Division of Water, Resource Assessment Section

June 2010

Table B-6
Summer Peak Demand vs Projected Capacity Forecast

Westfield Treatment and Supply Capacity Study

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Source Capacity																					
Average Day Demand	4.5	4.8	5.1	5.4	5.7	6.0	6.4	6.7	7.1	7.6	8.0	8.5	9.0	9.5	10.1	10.7	11.4	12.0	12.7	13.5	14.3
Normal Summer Peak Demand (est.)	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5
Reliable Source Capacity	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Westfield Road Wellfield Capacity	--	--	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Martin Marietta (1 Location) Capacity	--										4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Martin Marietta (1 Location) Capacity								4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Total Source Capacity (Wells & Interconnections)	14.7	16.7	22.7	22.7	22.7	22.7	22.7	27.3	27.3	27.3	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Source Water Deficit (Surplus)	(5.2)	(6.7)	(12.2)	(11.7)	(11.2)	(10.7)	(10.2)	(14.3)	(13.8)	(13.3)	(17.4)	(16.9)	(16.4)	(15.9)	(15.4)	(14.9)	(14.4)	(13.9)	(13.4)	(12.9)	(12.4)
Treatment Capacity																					
Normal Summer Peak (est.)	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5
Firm System Treatment Capacity	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Cherry Tree WTP Expansion	--	--	--	--	--	--	--	--	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
River Road WTP Expansion	--	--	--	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Future GWTP/SWTP (6 MGD Total) Capacity	--	--	--	--	--	--	--	--	--	--	--	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total Potable Water Production Capacity	12.6	14.6	14.6	18.1	18.1	18.1	18.1	18.1	20.1	20.1	20.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1
Potable Water Supply Deficit (Surplus)	(3.1)	(4.6)	(4.1)	(7.1)	(6.6)	(6.1)	(5.6)	(5.1)	(6.6)	(6.1)	(5.6)	(11.1)	(10.6)	(10.1)	(9.6)	(9.1)	(8.6)	(8.1)	(7.6)	(7.1)	(6.6)

Table B-7
Drought Peak Demand vs Projected Capacity Forecast

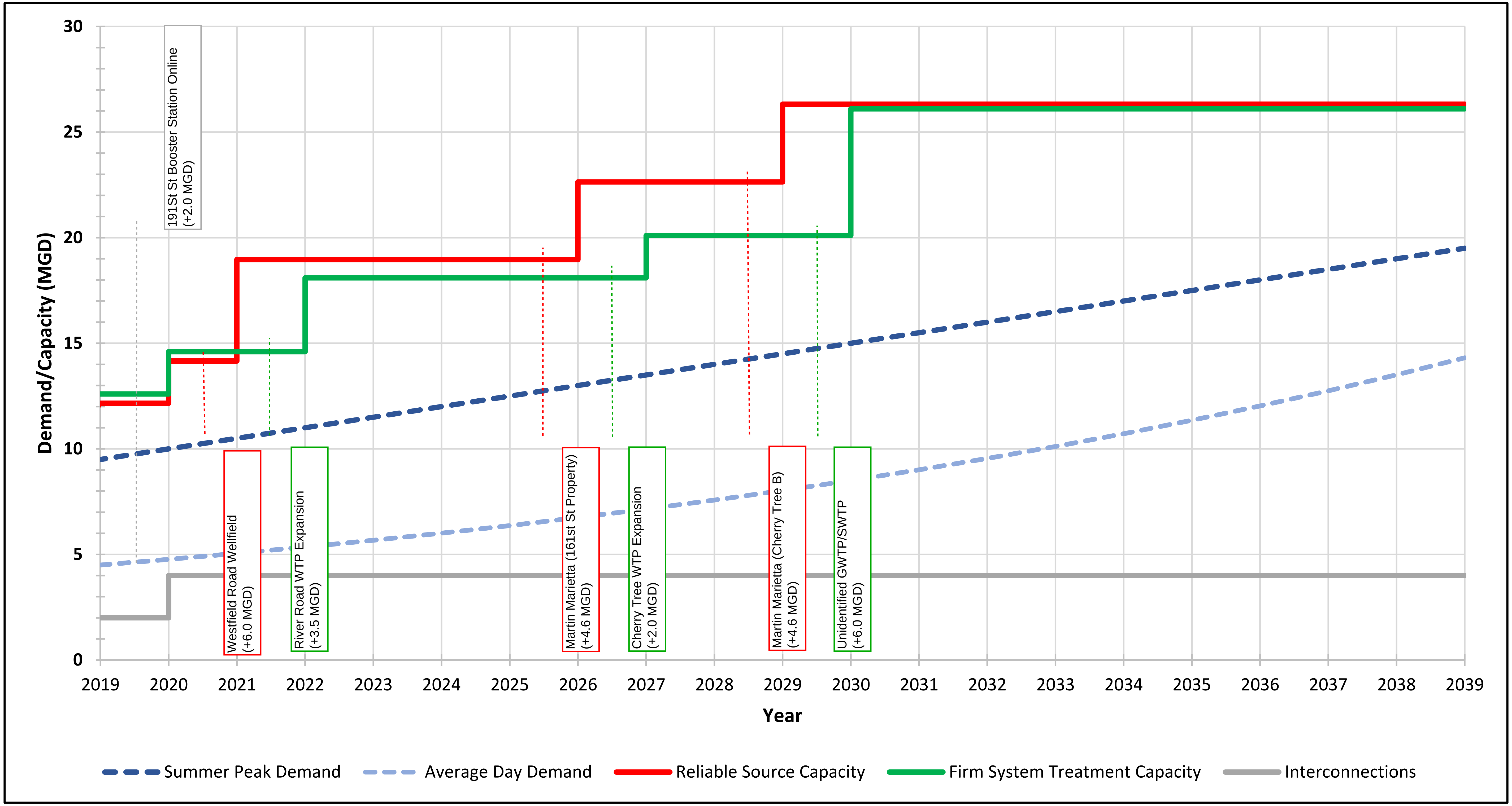
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Source Capacity																					
Average Day Demand	4.5	4.8	5.1	5.4	5.7	6.0	6.4	6.7	7.1	7.6	8.0	8.5	9.0	9.5	10.1	10.7	11.4	12.0	12.7	13.5	14.3
Drought Peak Demand (est.)	12.8	13.5	14.2	14.9	15.5	16.2	16.9	17.6	18.2	18.9	19.6	20.3	20.9	21.6	22.3	23.0	23.6	24.3	25.0	25.7	26.3
Estimated Moderate Drought Capacity	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Westfield Road Wellfield Firm Capacity	--	--	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Martin Marietta (1 Location) Capacity	--										3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Martin Marietta (1 Location) Capacity								3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Total Source Capacity (Wells & Interconnections)	12.2	14.2	19.0	19.0	19.0	19.0	19.0	22.6	22.6	22.6	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
Source Water Deficit (Surplus)	0.7	(0.7)	(4.8)	(4.1)	(3.4)	(2.8)	(2.1)	(5.1)	(4.4)	(3.7)	(6.7)	(6.1)	(5.4)	(4.7)	(4.0)	(3.4)	(2.7)	(2.0)	(1.3)	(0.7)	(0.0)
Treatment Capacity																					
Drought Peak (est.)	12.8	13.5	14.2	14.9	15.5	16.2	16.9	17.6	18.2	18.9	19.6	20.3	20.9	21.6	22.3	23.0	23.6	24.3	25.0	25.7	26.3
Firm System Treatment Capacity	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Total Interconnections Capacity	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Cherry Tree WTP Expansion	--	--	--	--	--	--	--	--	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
River Road WTP Expansion	--	--	--	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Future GWTP/SWTP (6 MGD Total) Capacity	--	--	--	--	--	--	--	--	--	--	--	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total Potable Water Production Capacity	12.6	14.6	14.6	18.1	18.1	18.1	18.1	18.1	20.1	20.1	20.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1
Potable Water Supply Deficit (Surplus)	0.2	(1.1)	(0.4)	(3.2)	(2.6)	(1.9)	(1.2)	(0.5)	(1.9)	(1.2)	(0.5)	(5.8)	(5.2)	(4.5)	(3.8)	(3.1)	(2.5)	(1.8)	(1.1)	(0.4)	0.2
System Capacity																					
Limiting Capacity (Source / Treatment)	12.2	14.2	14.6	18.1	18.1	18.1	18.1	18.1	20.1	20.1	20.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1

All source capacities reduced to 80% of Reliable Source Capacity to reflect reduced production during a moderate drought scenario.

General Note: All demands and capacities are shown in MGD

Citizens Water of Westfield
Table B-8 Capacity Forecast

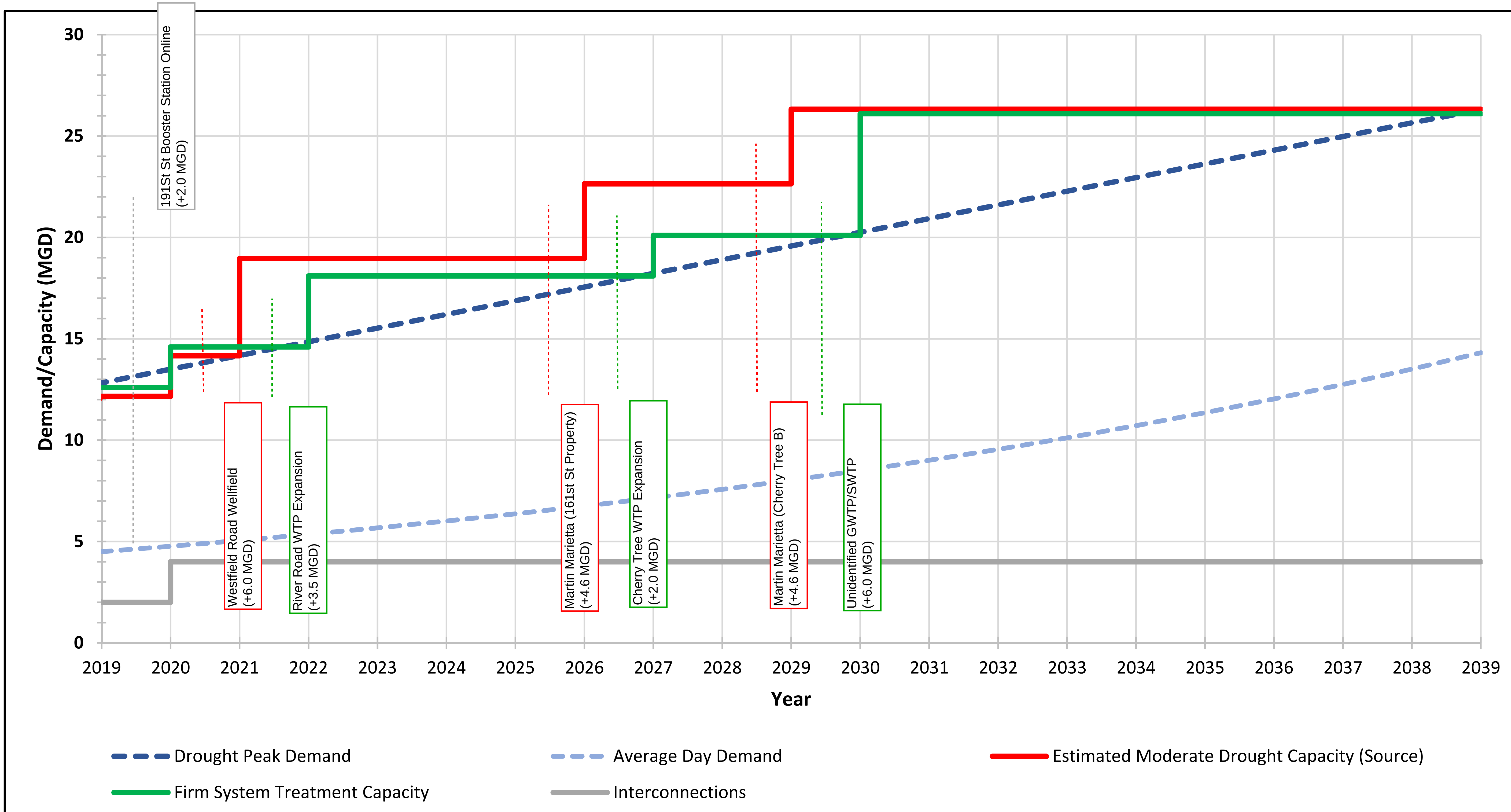
Westfield Treatment and Supply Capacity Study
Summer Peak Demand



Notes:
1. Source and Treatment Capacities shown include interconnections

Citizens Water of Westfield
Table B-9 Capacity Forecast

Westfield Treatment and Supply Capacity Study
Drought Peak Demand



Notes:

1. *Source and Treatment Capacities shown include interconnections*

APPENDIX C

COST ESTIMATES

Table of Contents

Table C-1: Westfield Road Wellfield

Engineer's Preliminary Opinion of Probable Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Well Drilling, Casing, Testing, and Appurtenances	3	EA	$ 175,000	$ 525,000
2	Well Pump & Motors	3	EA	$ 100,000	$ 300,000
3	Well Motor VFD's	3	EA	$ 50,000	$ 150,000
4	CMU Wellhouse Building & Mechanical (25' x 15')	3	EA	$ 60,000	$ 180,000
5	Raw Water Site Piping	5,000	LF	$ 135	$ 675,000
6	Raw Water Main Tie-over & Control Valve	1	LS	$ 150,000	$ 150,000
7	Electrical Distribution	5,000	LF	$ 50	$ 250,000
8	Electrical Site	3	EA	$ 25,000	$ 75,000
9	SCADA	1	LS	$ 80,000	$ 80,000
10	Site Work (grading, site drives, fencing, etc)	1	LS	$ 225,000	$ 225,000
11	Mobilization, Demobilization, Bonds, & Insurance	1	LS	$ 131,000	$ 131,000
12	Erosion & Sediment Control	1	LS	$ 40,000	$ 40,000
13	Maintenance of Traffic	1	LS	$ 27,000	$ 27,000
14	Final Cleanup & Restoration	1	LS	$ 79,000	$ 79,000
				Subtotal	$ 2,900,000
				20% Contingency	$ 580,000
				Total Probable Construction Cost	**$ 3,500,000**

Engineer's Preliminary Opinion of Probable Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, CA, Observation)* 25%	1	LS	$ 875,000	$ 875,000
2	Land Acquisition (Easements & Water Rights)	6	Acre	$ 60,000	$ 360,000
				Total Probable Non-Construction Cost	**$ 1,300,000**

Total Probable Overall Project Cost	**$**	**4,800,000**

Notes:

1 *All probable construction costs are based upon 2019 dollars, and estimated project costs will likely increase with time. Construction costs are volatile and have increased significantly in recent years, due primarily to costs of fuel and raw materials. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, and materials, or the contractors' methods of pricing. The cost estimates were made without the benefit of design plans and specifications and are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

2 *The cost estimates are based on past similar projects and were made without the benefit of field survey, design plans and specifications. These estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

Table C-2: Martin Marietta Property Wellfield

Engineer's Preliminary Opinion of Probable Construction Costs

Martin Marietta Test Well Drilling (all four locations)

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Test Well Drilling, Water Quality & Production Testing	9	EA	$ 16,000	$ 144,000
				Probable Construction Cost	$ 150,000

Martin Marietta Drill Location 2 (161st St)

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Well Drilling, Casing, Testing and Appurtenances	3	EA	$ 120,000	$ 360,000
2	Well Pump & Motors	3	EA	$ 65,000	$ 195,000
3	Well Motor VFD's	3	EA	$ 35,000	$ 105,000
4	CMU Wellhouse Building & Mechanical (25' x 15')	3	EA	$ 60,000	$ 180,000
5	Raw Water Site Piping	5,500	LF	$ 135	$ 743,000
6	Electrical Distribution	3,000	LF	$ 50	$ 150,000
7	Electrical Site	3	EA	$ 20,000	$ 60,000
8	SCADA	1	LS	$ 60,000	$ 60,000
9	Site Work (grading, drives, fencing, etc)	1	LS	$ 100,000	$ 100,000
10	Mobilization, Demobilization, Bonds, & Insurance	1	LS	$ 98,000	$ 98,000
11	Erosion & Sediment Control	1	LS	$ 30,000	$ 30,000
12	Maintenance of Traffic	1	LS	$ 20,000	$ 20,000
13	Final Cleanup & Restoration	1	LS	$ 59,000	$ 59,000
				Subtotal	$ 2,160,000
				20% Contingency	$ 432,000
				Probable Construction Cost	$ 2,600,000

Martin Marietta Drill Location 3 (Cherry Tree Wellfield B)

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Well Drilling, Casing, Testing and Appurtenances	3	EA	$ 120,000	$ 360,000
2	Well Pump & Motors	3	EA	$ 65,000	$ 195,000
3	Well Motor VFD's	3	EA	$ 35,000	$ 105,000
4	CMU Wellhouse Building & Mechanical (25' x 15')	3	EA	$ 60,000	$ 180,000
5	Raw Water Site Piping	3,000	LF	$ 135	$ 405,000
6	Electrical Distribution	3,000	LF	$ 50	$ 150,000
7	Electrical Site	3	EA	$ 20,000	$ 60,000
8	SCADA	1	LS	$ 60,000	$ 60,000
9	Site Work (grading, drives, fencing, etc)	1	LS	$ 100,000	$ 100,000
10	Mobilization, Demobilization, Bonds, & Insurance	1	LS	$ 81,000	$ 81,000
11	Erosion & Sediment Control	1	LS	$ 25,000	$ 25,000
12	Maintenance of Traffic	1	LS	$ 17,000	$ 17,000
13	Final Cleanup & Restoration	1	LS	$ 49,000	$ 49,000
				Subtotal	$ 1,787,000
				20% Contingency	$ 357,000
				Probable Construction Cost	$ 2,200,000

Total Probable Construction Cost	**$ 4,950,000**

Engineer's Preliminary Opinion of Probable Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, CA, Observation)* 25%	1	LS	$ 1,238,000	$ 1,238,000
2	Land Acquisition (Easements & Water Rights)	12	Acre	$ 5,000	$ 60,000
				Total Probable Non-Construction Cost	$ 1,300,000

Total Probable Overall Project Costs	**$**	**6,250,000**

Notes:

1 *All probable construction costs are based upon 2019 dollars, and estimated project costs will likely increase with time. Construction costs are volatile and have increased significantly in recent years, due primarily to costs of fuel and raw materials. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, and materials, or the contractors' methods of pricing. The cost estimates were made without the benefit of design plans and specifications and are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

2 *The cost estimates are based on past similar projects and were made without the benefit of field survey, design plans and specifications. These estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

Table C-3: River Road WTP Expansion

Engineer's Preliminary Opinion of Probable Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	1.75 MGD Horizontal Pressure Filter	2	EA	$ 350,000	$ 700,000
2	Upsize/Replace Existing High Service Pump (2,500 gpm)	4	EA	$ 100,000	$ 400,000
3	60,000 Gallon Steel Detention Tank & Foundations	2	EA	$ 500,000	$ 1,000,000
4	Aerator (3,150 gpm)	1	EA	$ 175,000	$ 175,000
5	Filter Building Addition (CMU) & Storage Demo	1	LS	$ 250,000	$ 250,000
6	Storage Building Addition (CMU)	1	LS	$ 125,000	$ 125,000
7	Process Piping Improvements	1	LS	$ 175,000	$ 175,000
8	Site Piping Improvements	1	LS	$ 175,000	$ 175,000
9	Electrical Improvements	1	LS	$ 450,000	$ 450,000
10	SCADA Improvements	1	LS	$ 60,000	$ 60,000
11	Excavation/ Backfill	1	LS	$ 200,000	$ 200,000
12	Relocate Existing Fence	1	LS	$ 30,000	$ 30,000
13	Relocate Existing Ditchline	400	LF	$ 150	$ 60,000
14	Pavement Demo & Improvements	1	LS	$ 50,000	$ 50,000
15	Clearwell Expansion (500,000 gallons)	1	LS	$1,000,000	$ 1,000,000
16	Miscellaneous Chemical Feed Improvements	1	LS	$ 50,000	$ 50,000
17	Chlorine Building Expansion	1	LS	$ 100,000	$ 100,000
18	Backwash Pond Expansion	1	LS	$ 50,000	$ 50,000
19	Mobilization, Demob,, Bonds, & Insurance	1	LS	$ 240,000	$ 240,000
20	Erosion & Sediment Control	1	LS	$ 60,000	$ 60,000
21	Final Cleanup & Restoration	1	LS	$ 150,000	$ 150,000
				Subtotal	$ 5,500,000
				20% Contingency	$ 1,100,000
				Total Probable Construction Cost	**$ 6,600,000**

Engineer's Preliminary Opinion of Probable Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, CA, Observation)* 25	1	LS	$1,650,000	$ 1,700,000
				Total Probable Non-Construction Cost	**$ 1,700,000**

Estimated Distribution System Improvements Cost

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	12" & 16" DI Transmission Main (4,200 LFT & 24,000 LFT)	1	LS	$9,700,000	$ 9,700,000

Total Probable Overall Project Costs	**$**	**18,000,000**

Notes:

1 *All probable construction costs are based upon 2019 dollars, and estimated project costs will likely increase with time. Construction costs are volatile and have increased significantly in recent years, due primarily to costs of fuel and raw materials. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, and materials, or the contractors' methods of pricing. The cost estimates were made without the benefit of design plans and specifications and are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

2 *The cost estimates are based on past similar projects and were made without the benefit of field survey, design plans and specifications. These estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied,*

Table C-4: Cherry Tree WTP Expansion

Engineer's Preliminary Opinion of Probable Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	1.0 MGD Horizontal Pressure Filter	2	EA	$ 250,000	$ 500,000
2	30,000 Gallon Steel Detention Tank & Foundations	2	EA	$ 400,000	$ 800,000
3	Aerator (3,150 gpm)	1	LS	$ 175,000	$ 175,000
4	CMU Building Expansion	1	LS	$ 150,000	$ 150,000
5	Process Piping Improvements	1	LS	$ 175,000	$ 175,000
6	Site Piping Improvements	1	LS	$ 150,000	$ 150,000
7	Electrical Improvements	1	LS	$ 200,000	$ 200,000
8	SCADA Improvements	1	LS	$ 60,000	$ 60,000
9	Relocate Existing Site Fencing	1	LS	$ 15,000	$ 15,000
10	Excavation/ Backfill	1	LS	$ 150,000	$ 150,000
11	Miscellaneous Chemical Feed Improvements	1	LS	$ 40,000	$ 40,000
12	Backwash Pond Expansion	1	LS	$ 50,000	$ 50,000
13	Mobilization, Demob,, Bonds, & Insurance	1	LS	$ 120,000	$ 120,000
14	Erosion & Sediment Control	1	LS	$ 36,000	$ 36,000
15	Final Cleanup & Restoration	1	LS	$ 72,000	$ 72,000
				Subtotal	$ 2,700,000
				20% Contingency	$ 500,000
				Total Probable Construction Cost	**$ 3,200,000**

Engineer's Preliminary Opinion of Probable Non-Construction Costs

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	Engineering Fees *(Survey, Design, Bid, CA, Observation)* 25%	1	LS	$ 798,000	$ 800,000
				Total Probable Non-Construction Cost	**$ 800,000**

Estimated Distribution System Improvements Cost

Item	Description	Est Qty	Unit	Unit Price	Total Price
1	12" DI Transmission Main (5,700 LFT)	1	LS	$ 1,800,000	$ 1,800,000

Total Probable Overall Project Costs	**$**	**5,800,000**

Notes:

1 *All probable construction costs are based upon 2019 dollars, and estimated project costs will likely increase with time. Construction costs are volatile and have increased significantly in recent years, due primarily to costs of fuel and raw materials. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, and materials, or the contractors' methods of pricing. The cost estimates were made without the benefit of design plans and specifications and are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.*

2 *The cost estimates are based on past similar projects and were made without the benefit of field survey, design plans and specifications. These estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the*

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PEERLESS MIDWEST INC.

886 W Jefferson Street / Tipton, IN 46072 / (317) 896-2987 / Fax (317) 896-3748

WELL & PUMP SERVICE INSPECTION REPORT

Owner: CEG - Westfield City: Westfield State: IN

Location: River Road WTP **40.01069 / -86.03358**

Well No. **RR 8** Date Drilled: 1997 Dia.: 24" Depth: 107.5' TOC Type Well: GW

Screen ID.: 24" Screen Length: 50' Depth to Top of Screen: 54.83' Type Screen: ssww

Dates of Cleaning: 2011, 2017, 2019, 2021

Phone: Randy Cell - (317) 339-8249; Kraig Cell - (317) 432-5220 Person to Contact: Randy Higginbotham, Supervisor of Water Operations; Kraig Cummings, Network & Well Technician

	DATE	STATIC (ft)	GPM	PUMPING LEVEL (ft)	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1997	10.9	1810	25.8	--	120.7
AFTER LAST CLEANING	2021	42.46'	1208	49.3'	55#	176.6
LAST MAINTENANCE	2021	49.69'	1202	65.64'	43#	75.4
AT PUMP'S RATED FLOW	2022	57.04'	1202	65.43'	29#	143.3
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ___ Flange or Thread Size: 6" Confined Space Entry?: No

Motor HP: 100 Make: U.S. Volts: 460 RPM: 1785 Phase: 3

Gear Drive: None HP: - Ratio: - RPM Meter Required: No

Pump Heac: Layne Pump Bowls: National J11HC-3 Airline Length: ___

Rated Capacity: 1200 GPM 152' TDH Operating Pressure: ___

Total Setting: 83.5' Size of Packing: 5/16" Date Installed: 2021

Dates of Overhaul: 2017 (new B; rebuilt M), 2021

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking?: No Change Motor Oil & Grease: X Repack Pump: X Grease Pump: ___

Pump is Presently Developing 1202 **GPM** 132' **TDH** **Projected Curve Capacity** 1200 **GPM** 132' **TDH**

Shut Off Pressure: 85 PSI Rated Shut Off Head: 250 ft. Calculated Shut Off Head: 253 ft.

Electrical Data (With Pump in Operation): 465 V 73 / 72 / 70 Amps 114 @ 460 v Full Load Amps

Location of Power Lines: ___ Can Electrical Box be Locked Out?: ___

Distance from top of pump pedestal to grade: ___ Materials Needed to Clean Well: ___

Need a Smeal to Raise Pump?: ___ Remarks: ___

Maintenance: 8" x 6" flange reducer; 6" butterfly valve; (2) 10' of 6" hard hose; 30' of 6" soft hose; 8" x 6" orifice

Inspected By: Tony Rouhier Date Inspected: 10/12/2022

PEERLESS MIDWEST INC

886 W Jefferson Street / Tipton, IN 46072 / (317) 896-2987 / Fax (317) 896-3748

WELL & PUMP SERVICE INSPECTION REPORT

Owner: CEG - Westfield City: Westfield State: IN

Location: River Road WTP **40.00822 / -86.03372**

Well No. **RR 9** Date Drilled: 1998 Dia.: 24" Depth: 100.3' Type Well: GW

Screen ID. ____ Screen Length: 30' Depth to Top of Screen: 62' Type Screen: Johnson ssww .200

Dates of Cleaning: 2017, 2019, 2021

Phone: Randy Cell - (317) 339-8249; Kraig Cell - (317) 432-5220 Person to Contact: Randy Higginbotham, Supervisor of Water Operations; Kraig Cummings, Network & Well Technician

	DATE	STATIC (ft)	GPM	PUMPING LEVEL (ft)	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1998	13.8	2316	28.2	--	160.8
AFTER LAST CLEANING	2021	40'	2010	70.58'	20#	65.7
LAST MAINTENANCE	2021	42.53'	1512	63.6	29#	55.9
AT PUMP'S RATED FLOW	2022	46.39'	1092	79.67'	29#	32.8
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ____ Flange or Thread Size: 6" Confined Space Entry?: No

Motor HP: 75 Make: US Volts: 460 RPM: 1780 Phase: 3

S/N: B08-8334A-ME5 Installed: 2017 RPM Meter Required: No

Pump Heac: J-Line 35765 Pump Bowls: National J12XHC-2 Airline Length ____

Rated Capacity: 2200 GPM 108' TDH Operating Pressure ____

Total Setting: 88.25' Size of Packing: 5/16" Date Installed: 2019

Dates of Overhaul: 1999 (new M), 2017 (new B,M), 2019

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? No Change Motor Oil & Grease: X Repack Pump: X Grease Pump ____

Pump is Presently Developing 1092 **GPM** 147' **TDH** **Projected Curve Capacity** 2200 **GPM** 110' **TDH**

Shut Off Pressure ____ PSI Rated Shut Off Head: 160 ft. Calculated Shut Off Head ____ ft.

Electrical Data (With Pump in Operation): 484 V 75 / 74 / 74 Amps 87 @ 460 v Full Load Amps

Location of Power Lines ____ Can Electrical Box be Locked Out? ____

Dist. From Top of Pump Pedestal to Grade ____ Materials Needed to Clean Well ____

Need a Smeal to Raise Pump? ____ Remarks ____

Maintenance: 6" butterfly valve, 10' of 6" hard hose; 30' of 6" soft hose, 8" x 6" orifice

Inspected By: Tony Rouhier Date Inspected: October 12, 2022

PEERLESS MIDWEST INC.
17707 Sun Park Drive / Westfield, Indiana 46074 / 317.896.2987 / Fax 317.896.3748

WELL & PUMP SERVICE INSPECTION REPORT

Owner: CEG - Westfield City: Westfield State: IN

Location: River Road WTP Wellfield 40.00905 / -86.03359

Well No. **RR 10** Date Drilled: 2003 Dia.: 20" Depth: 107.75' Type Well: GW

Screen ID. ____ Screen Length ____ Depth to Top of Screen ____ Type Screen ____

Dates of Cleaning: 2018, 2020

Phone: Randy Cell - (317) 339-8249, Kraig Cell - (317) 432-5220
Person to Contact: Randy Higginbotham, Supervisor of Water Operations; Kraig Cummings, Network & Well Technician

	DATE	STATIC (ft)	GPM	PUMPING LEVEL (ft)	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	2003	--	1800	--	--	89.9
AFTER LAST CLEANING	2020	41.38'	1512	58.8'	25#	86.8
LAST MAINTENANCE	2021	45.36'	1512	61.69'	42#	92.6
AT PUMP'S RATED FLOW	2022	47.97'	516	59.57'	98#	44.5
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ____ Flange or Thread Size: 6" Confined Space Entry?: No

Motor HP: 75 Make: US Volts: 460 RPM: 1780 Phase: 3

S/N: 607-BF61A-MC2 Installed: 2004 RPM Meter Required: No

Pump Head: Floway "A" Pump Bowl: National H12MC-4 Airline Length: 60' poly

Rated Capacity: 1600 GPM 140' TDH Operating Pressure ____

Total Setting: 65.33' Size of Packing: 3/8" Date Installed: 2020

Dates of Overhaul: 2016 (new H&B), 2018, 2020

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? No Change Motor Oil & Grease: X Repack Pump: X Grease Pump ____

Pump is Presently Developing 516 **GPM** 286' **TDH** **Projected Curve Capacity** 1600 **GPM** 175' **TDH**

Shut Off Pressure: 103 PSI Rated Shut Off Head: 152 ft. Calculated Shut Off Head ____ ft.

Electrical Data (With Pump in Operation): 484 V 95 / 95 / 72 Amps 87 @ 460 v Full Load Amps

Location of Power Lines ____ Can Electrical Box be Locked Out? ____

Distance from top of pump pedestal to grade: ____ Materials Needed to Clean Well ____

Need a Smeal to Raise Pump? ____ Remarks ____

Maintenance: 8"x1/4" nipple, 1/4" tee, 2"x1/4" nipple, 1/4" ball valve, 1/2"x1/4" reducer

Inspected By: Tony Rouhier Date Inspected: October 12, 2022

OUCC Attachment CNS-7
Cause No. 46020
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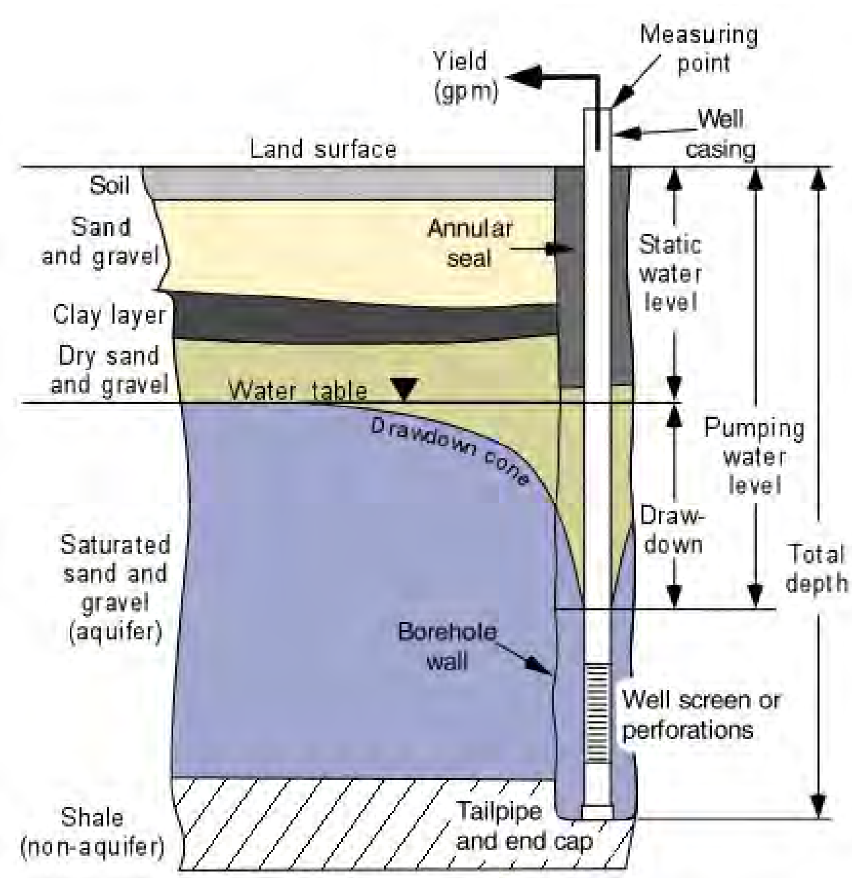
Ground Water Information Center | **MBMG Data Center**
Montana Bureau of Mines and Geology
Montana Technological University
1300 West Park Street - Natural Resources Building Room 329
Butte Montana 59701-8997
Ph: (406) 496-4336 Fx: (406) 496-4343

6/7/2024

Typical water well construction and terms

Montana Ground-Water Information Center



The drawing illustrates some of the terms related to the construction and performance of a typical non-artesian water well. Although there can be many variations in the details, all wells should contain the features shown and can be described using these terms. Artesian wells differ in that they are constructed so that pressure in the aquifer can be controlled. Under artesian conditions the water table would be above the top of the aquifer, and possibly above land surface.

The left side of the drawing shows the geologic setting for this well. The borehole penetrated soil, a near-surface sand and gravel that is separated from the aquifer by a clay layer, and a second sand and gravel. The lower part of the second sand and gravel is saturated and is an aquifer. Below the aquifer the borehole hit shale which is not an aquifer. The water-well driller describes and records the geologic units at the time a well is drilled. Geologic conditions into which wells are constructed vary widely and although those depicted in the drawing are common, they do not represent all conditions encountered by all wells.

Annular seal: The annular seal is the material between the borehole wall and the casing, usually placed near the land surface and is designed to keep surface water and other potential contamination out of the well. Materials commonly used include bentonite (a sticky clay), and neat cement grout (cement and water with no sand).

Aquifer: An aquifer is a geologic unit (sand and gravel, sandstone, limestone, or other rock) that will yield usable amounts of water to a well or spring.

Borehole: the hole drilled to construct a well. Most boreholes for domestic wells in Montana are only slightly larger than the well casing.

Casing: Steel or plastic pipe placed in the borehole to keep it from collapsing. The casing is sealed to the borehole wall near the land surface with the annular seal.

Drawdown: The drawdown in a well is the difference between the pumping water level and the static (non-pumping) water level. Drawdown begins when the pump is turned on and increases until the well reaches "*steady state*" sometime later. Therefore, drawdown measurements are usually reported along with the amount of time that has elapsed since pumping began. For example, "*The drawdown was 10 feet, 1 hour after pumping began.*"

Drawdown cone: The depression in the water table near the well that is caused by pumping is called the "*drawdown* *cone*" or sometimes the "*cone of depression*". When the well is pumping, water levels are drawn down most near the well and the amount of drawdown decreases as the distance from the well increases. At some distance from the well at any given time there is a point at which the pumping does not change the water table and the drawdown is zero.

Measuring point: Water levels in wells are usually reported as depths below land surface, although the measuring point can be any convenient fixed place near the top of the well. In this drawing the measuring point is the top of the casing. The altitude of the measuring point is commonly recorded so that static water levels can also be reported as altitudes.

Pumping water level: The pumping water level is the distance from the land surface (or measuring point) to the water in the well while it is pumping. The time that the pumping water level was measured is usually recorded also. For example, "*The pumping water level was 85 feet below land surface, 1 hour after pumping began.*"

Screen or perforations: All wells are open to the aquifer so that water can enter the well. Well completions vary from "*open hole*" in consolidated rock that does not need a casing, to "*open bottom*" where the only way for the water to enter the well is through the end of the casing. However, many wells have some sort of well screen installed or perforations cut into the casing through which water can enter. The openings must be correctly sized so that water will enter, but sand and other aquifer materials do not.

Static water level: The static water level is the distance from the land surface (or the measuring point) to the water in the well under non-pumping (static) conditions. Static water levels can be influenced by climatic conditions and pumping of nearby wells and are often measured repeatedly to gain information about how aquifers react to climatic change and development.

Tailpipe and end cap: Wells that are completed with well screens may have a tailpipe installed below the screen. The tailpipe provides a place where sand that may enter the well through the screen can settle away from the pump. The end cap forces all water to enter the well through the well screen. Most wells that are completed with perforations will not have a tailpipe.

Water table: The top of the saturated part of a water-table (also known as an unconfined) aquifer. Below the water table, pore spaces (or fractures) in the geologic media are filled with water. Above the water table, the pore spaces are filled with air. An upside-down triangle is often used by hydrologists to indicate the water table.

Total depth: The total depth of the well is the distance from land surface to the bottom.

Yield: The amount of water measured in gallons per minute a well will produce when pumped.

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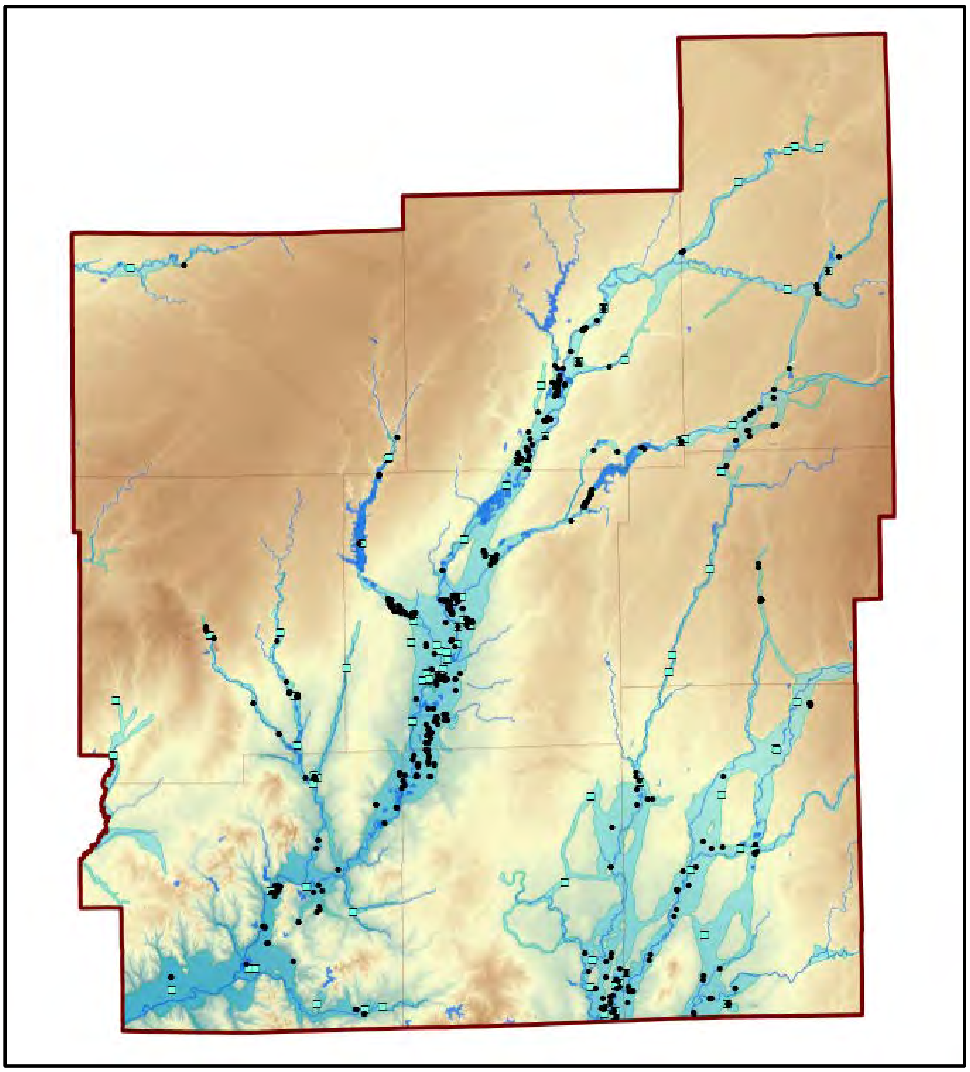
OUCC ATTACHMENT CNS-8

CAUSE NO. 46020

Executive Summary

Central Indiana Water Study

Future Demand, Availability, Options



January 2021

HIGHLIGHTS

This report summarizes the most recent analysis of future water demand and available supplies in the 9-county Central Indiana Planning Region: Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby counties. This document describes some of the key findings of two previous reports; the Phase I forecast of future water demand in Central Indiana (total increase of 111 MGD by 2070) and the Phase III analysis of water availability that applies a water budget approach to understand where and when water is available. In addition, this summary identifies options for new supplies and conservation to meet the needs of Central Indiana during periods of high seasonal demands and to manage the potential effects of climate change.

Like most larger cities in the Midwest, the water supplies in Central Indiana are dominated by surface water diversions. In 2018 more than 232 million gallons per day (MGD) were extracted from flowing streams and reservoirs in these nine counties. Most of the source water for Indianapolis' water supply comes from upstream intakes along the West Fork White River and reservoir storage that supplements seasonal low flows. These supplies have historically been stressed by droughts but the addition of strategically located well fields and new storage and transmission infrastructure has increased supplies and overall resilience. In 2018 about 132 MGD was pumped by registered high-capacity wells from regional aquifers. Over the last 25-years most of the water supply growth for municipal water systems in Central Indiana has been from new well fields in the sand and gravel aquifer along the river.

The water-availability analysis conducted for this project used existing data on stream flows, high-capacity water withdrawals, wastewater (National Pollutant Discharge Elimination System, NPDES) discharges, and climate projections to calculate the water budget in Central Indiana during the critical low-flow, high-use quarter of the year (late Summer). While this report identifies actions that will need to be taken in the next decades, new reservoirs and improved collaboration have already improved the area's long-term water security.

Analysis was done to evaluate the effect of water quality on water availability in streams and aquifers in Central Indiana. This effort showed that there needs to be additional investment in tracking long-term trends in groundwater and surface water quality, as well as quantity, in Central Indiana. Focused monitoring (remote digital systems) is recommended to track trends and detect indications of climate change impacts. A framework is presented to use surface water and groundwater models to evaluate development options so utilities and other water users can balance local and regional needs.

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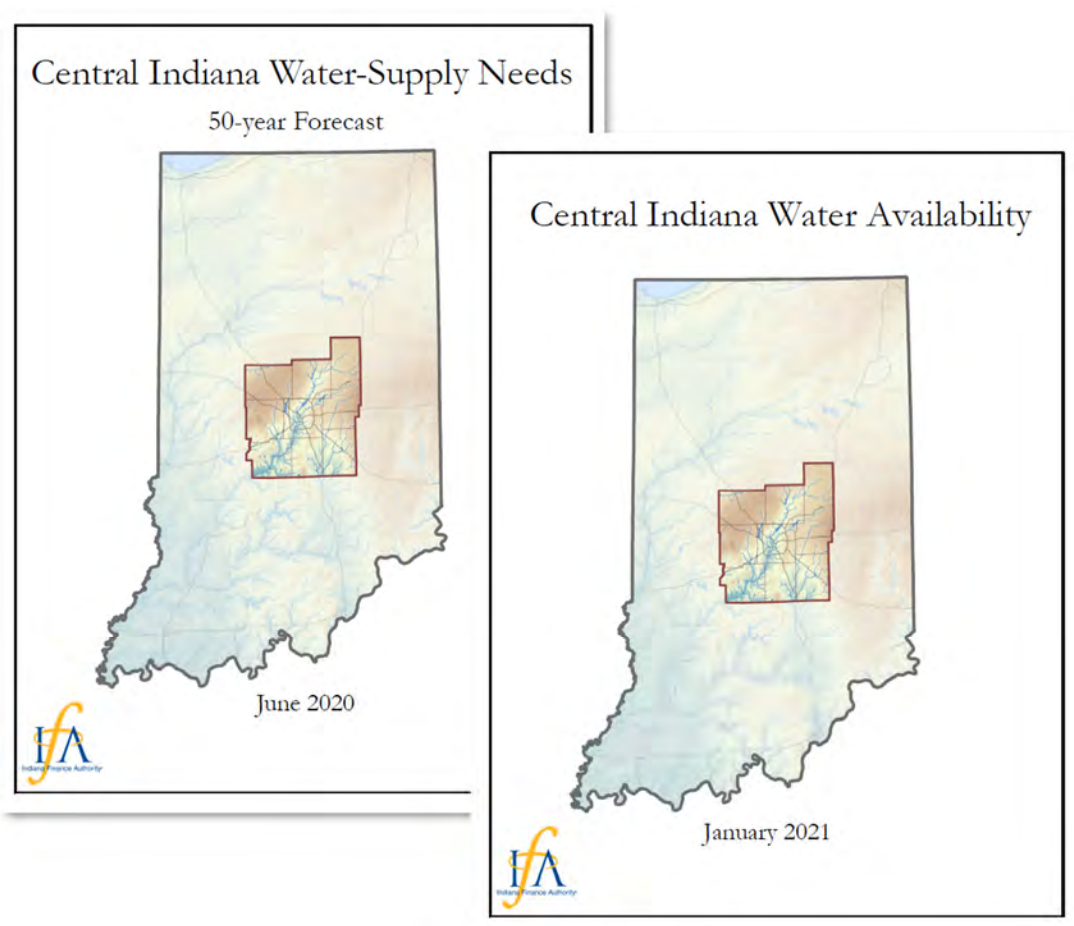
The purpose of this report

This summary report has been prepared to provide a more concise and less technical narrative of the recently completed Phase I Water-Supply Needs study (IFA, 2020) and Phase III Water Availability study (IFA, 2021). Both studies are part of the Central Indiana Water Study project. In addition, this report provides a historical context focusing on the development of water resources in the region, and a discussion of alternatives for increasing water availability in the region.

The Phase I Water-Supply Needs study (IFA, 2020) presents an analysis of current water use in the region and projects water needs to the year 2070. The Phase III Water Availability study (IFA, 2021) analyzes the current and projected future excess water availability in the region that can be relied on to support economic and population growth in the region.

The combined goal of both studies is to identify areas within the region where future demands may exceed available local supplies. The locations with gaps between availability and demand are mapped to suggest how new regional water supplies and conservation could meet future demands. The full technical reports are available on the IFA website (www.in.gov/ifa/).



Water resource development and planning in Central Indiana

Central Indiana has a long history of expanding water supplies to keep pace with economic and population growth. From the 1930s through the 1960s reservoirs were located on major tributaries to secure adequate water for thirsty industries. From the 1980s through 2019, no new reservoirs have been built. Instead, large well fields have been installed to support metropolitan growth. The increases in demand are now a reflection of population shifts towards the urban center and the underlying expansion of commerce. The demands of population growth and economic activity require continuous new water sources and careful management of existing supplies. If the region is to continue to attract new business, it is critical that we understand how to use the resources beneath our feet. Wise management and informed resource development are both needed to support the economy and improve quality of life.

Until the 1940's, new water withdrawals in one town did not affect the water supplies in neighboring communities. In Central Indiana today, however, there are many communities that share sources of supply. As more users withdraw more water, it becomes increasingly critical that areas with excess water supply are distinguished from those that are already producing as much as possible.

A statewide survey of utilities conducted in 2015 included utilities in Central Indiana. Their response was unlike the others in some important ways. The utilities near Indianapolis said that they understood the shared nature of the water supply in a way that was not common in the northern or southern parts of the state. For example:

1. most utilities had working estimates of the yield of their source of supply
2. many systems were concerned about upstream water users
3. staff monitored their sources of supply to track changes over time

These responses suggest that water utilities in Central Indiana understand that there are many commercial, agricultural, and industrial water users who rely on the same resource and compete for that resource during periods of drought. The survey also indicated that the utilities wanted to engage more to fully understand their long-term needs.

Existing surface water storage and diversion systems reflect the water supply development and planning that has occurred over the last century. The timeline presented below describes the events and features of the system that provide context for the water supply planning discussion that is occurring today.

TIMELINE

PAST CENTURY OF CENTRAL INDIANA WATER

Pre-WWII: Dust Bowl droughts of the 1930s and 40s

Period of **rapid population growth and industrialization** with repeated droughts. Several well fields were constructed, and Geist Reservoir was built to expand supply near Indianapolis.

1940 – 1980: Post War industrial development

New **reservoirs were added to keep up with the growth** in automobile and heavy manufacturing. Morse reservoir was built in the 1950s and Eagle Creek was built by the U.S. Army Corps of Engineers in the 1960s. New wells were added in the industrial center of the city.

1980 – 2000: Industrial peak production in the 1980's

Drought (1988) and water shortage renew interest in groundwater as an alternate supply. Initiation of the water Shortage Task Force. Indianapolis experiences **slower growth and new competition** for water. Water Resources Management Act of 1983 calls for Basin Studies program (1987 – 2002).

2000 – 2010: New ownership of the largest water utility

Indianapolis Water Company is acquired – twice. **Fiscal austerity** reduces water-resource monitoring investments; DNR Basin Studies program is terminated for lack of funding. The Water Shortage Task Force begins meeting again.

2010 – 2020: New ownership and drought of 2012

Suburban growth brings increased groundwater use and new utility ownership in 2011 followed by the drought of 2012. The **state reconsiders water supply planning** and management by beginning a series of data collection efforts to inform new policy.

(HistoricIndianapolis.com, 2017)

(HistoricIndianapolis.com, 2017)

TIMELINE

PAST DECADE OF CENTRAL INDIANA WATER

2011

Water Resources Legislative study committee heard testimony that suggests the state is unprepared for drought. Indianapolis sells water utility.

2012

Intense summer drought causes central Indiana utilities to ask for reductions in use. Sources of water supply and regional infrastructure pushed to their limits.

2013

Water Resources Legislative study committee asks Indiana Utility Regulatory Commission to assess water utility planning to use existing data to consider source of supply planning.

2014

Indiana State Chamber of Commerce publishes statewide water investigation that shows water needs in Central Indiana growing relative to supplies.

2015

Indiana Finance Authority directed to survey utilities for best planning practices. Some utilities unable to invest in infrastructure and more concerned about their source water supplies.

2016

IFA conducts another survey of all community water utilities (a total of 532 systems). Utilities need $17B more in the next 20 years for infrastructure.

2017

IFA conducts another investigation of the feasibility of a regional water system that could move new water from a source of supply along the Ohio River to Southeastern Indiana.

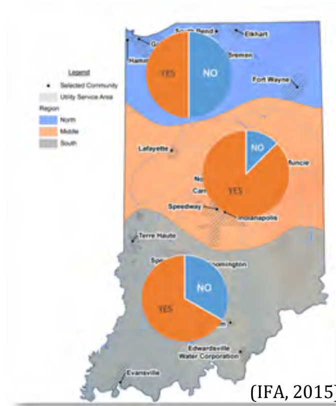
2018

Citizens Energy Group, the utility that supplies drinking water to Indianapolis and sections of all 9 counties in the region, develops innovative storage to expand supplies by up to 30 MGD.

2019

IFA selects the nine-county area of Central Indiana region to be investigated for water supply planning.


(Scheer, 2019)


(IFA, 2015)

Central Indiana Water Studies are based on publicly available data

Data from various state and federal agencies were used in completing the Phase I and Phase III studies. Agencies that maintain data critical to the water-use and water-budget analyses all informed different parts of the studies:

- Indiana Department of Natural Resources (IDNR), Division of Water: annual water withdrawal data
- U.S. Environmental Protection Agency (USEPA): NPDES discharge database
- U.S. Geological Survey (USGS): streamflow, low flow statistics
- Indiana Department of Environmental Management (IDEM): water-quality
- Indiana Geological and Water Survey (IGWS): aquifer geometry, recharge, and mapping
- Indiana University (IU) Business Research Center: demographic projections

Many of the agencies that provided the critical data are also collaborators. Monthly working group meetings were hosted by the Indiana Finance Authority, with representatives from many state and federal agencies and consultants acting as project partners. The purpose of the inter-agency meetings was to provide updates on each project phase, to coordinate efforts between phases, and to review and discuss methods and results. Agencies and consultants regularly represented in the working-group meetings include the following:

State and Federal agencies

- Indiana Finance Authority (IFA)
- Indiana Geological and Water Survey (IGWS)
- Indiana University (IU)
- U.S. Geological Survey (USGS)
- Indiana DNR, Division of Water (IDNR)
- Indiana DEM, Office of Water Quality (IDEM)

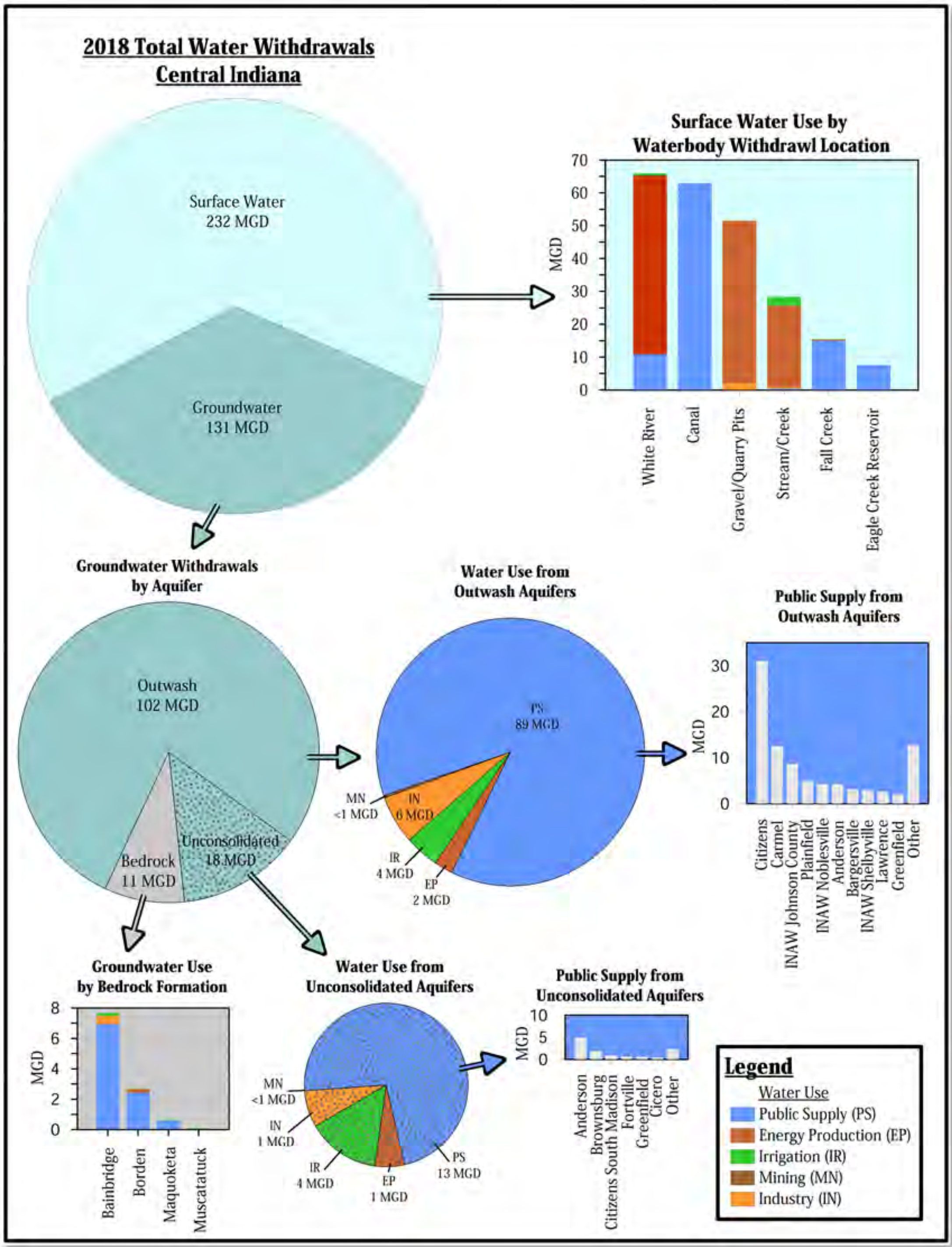
Private entities:

- INTERA Geosciences and Engineering Solutions
- Empower Results

PROJECT PARTNERS

Regional water supplies have various sources

The Phase I Report (IFA, 2020) summarizes how water use is currently distributed between water-use sectors, how the water use is distributed geographically, and how those demands are distributed among water sources. Water-use sectors include Public Supply, Energy Production, Irrigation, Mining, and Industry. Water-supply sources include direct surface water withdrawals and pumping from groundwater wells completed in outwash, unconsolidated, or bedrock aquifers. The figure below illustrates how 2018 water withdrawals were distributed among sectors and sources.



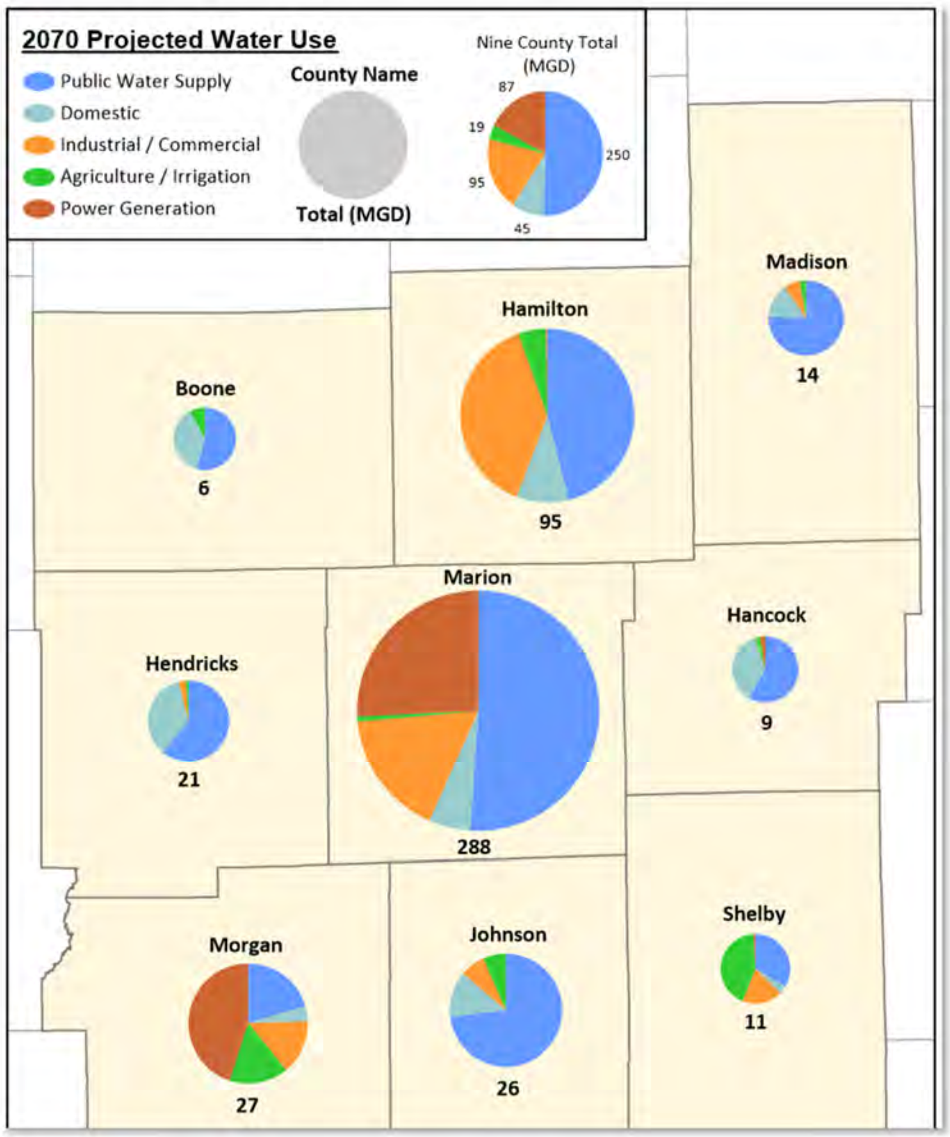
Sources of water for registered high-capacity water users in the 9-county Central Indiana Planning Region in 2018.

Average water demand expected to increase by 111 MGD

A key finding of the Phase I report (IFA, 2020) is that, on average, by 2070 the region will use an additional 111 million gallons per day (MGD). Of this total, almost half of the increase (~50 MGD) will be needed to supply drinking water systems. However, most of the increase in water use will be from the seasonal increase in demand that occurs in the growing season. So, while the lowest water use seasons for utilities may only slowly increase, future water demand is assumed to continue to create higher peak demands, especially in areas that use automatic lawn irrigation.

Population growth is expected to be greatest on the north side of Indianapolis. In addition, unlike other areas within Central Indiana, the north side of Indianapolis is expecting an increase in the gravel mining industry, which will require additional water to meet their needs. The ability to satisfy these increases in demand can only be interpreted after considering expected growth and regional water resources.

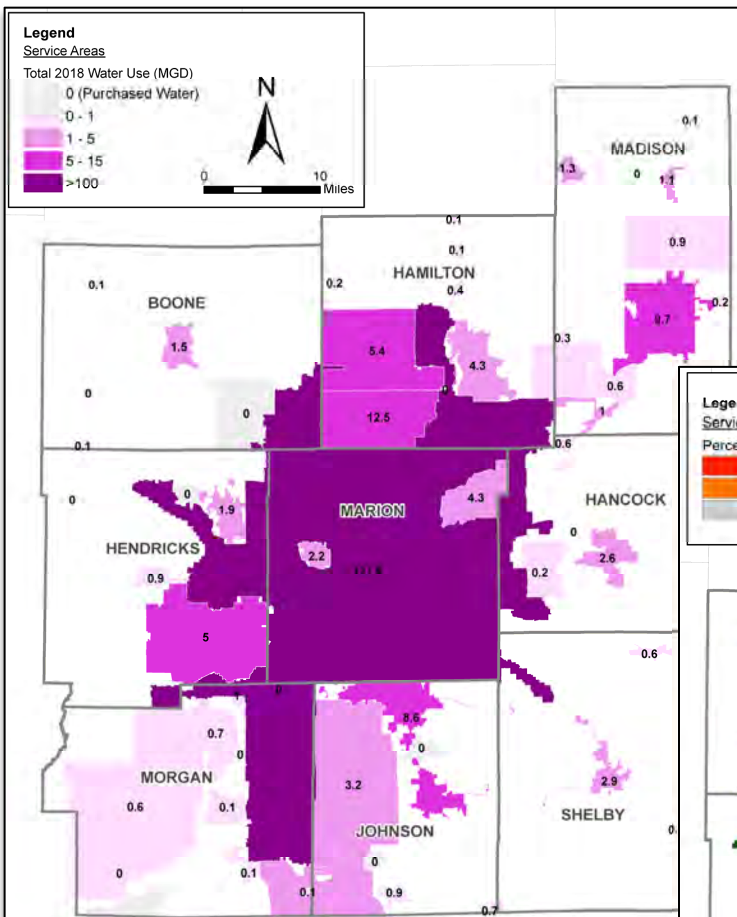
Average Annual Forecast Demand from 385 MGD today to 495 MGD in 2070.



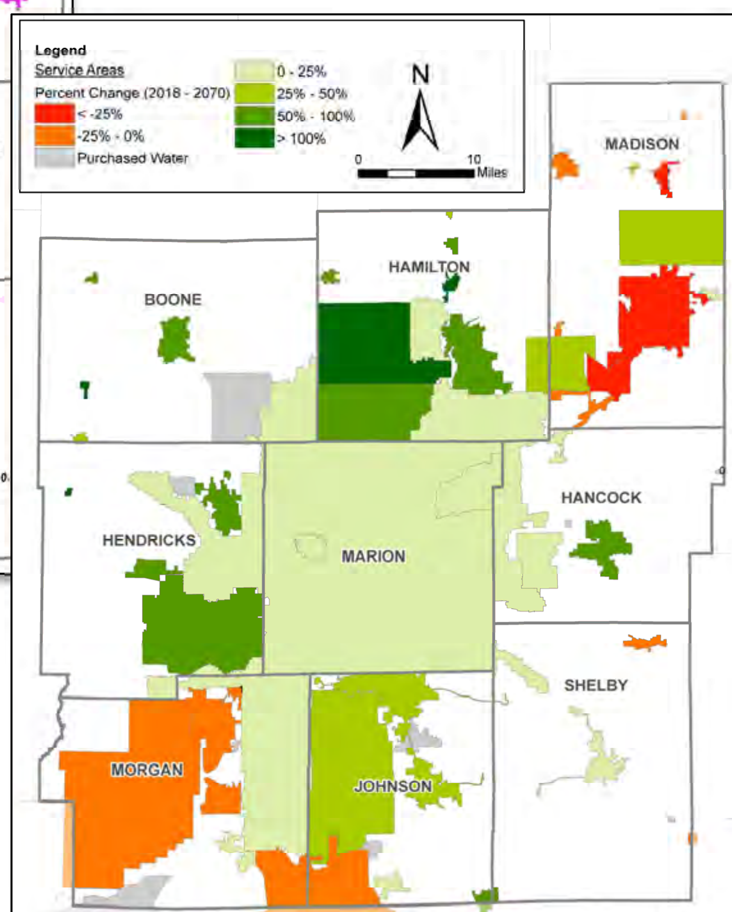
Growth in Marion and Hamilton Counties

Public water supplies accounted for half of the total water withdrawals in Central Indiana in 2018, and growth in the public supply sector is projected to continue that trend through 2070.

Withdrawals in Marion and Hamilton Counties account for 76% of the total current public water supply in Central Indiana. This proportion of the total supply is projected to remain the same through 2070, with increases of about 20 MGD required for each county. This reflects projections of nearly 100% growth in public water supplies in Hamilton County and 20% growth in Marion County by 2070.



Water withdrawals for public supply by service area: 2018 (left), and projected percent change in water withdrawals by 2070 (below).



Regional Water Availability Key Findings

Water availability is based on a water-budget analysis

From a water-supply perspective, regional water availability is a product of the natural hydrology of the local watershed, current regional water use, and existing regional infrastructure. Hydrological characteristics and the installed infrastructure combine to determine water availability. In Central Indiana, we have records to quantify the following characteristics:

1. *Landscape hydrology* – the way that stream flows increase and decrease in response to precipitation through the dry and wet periods of the year

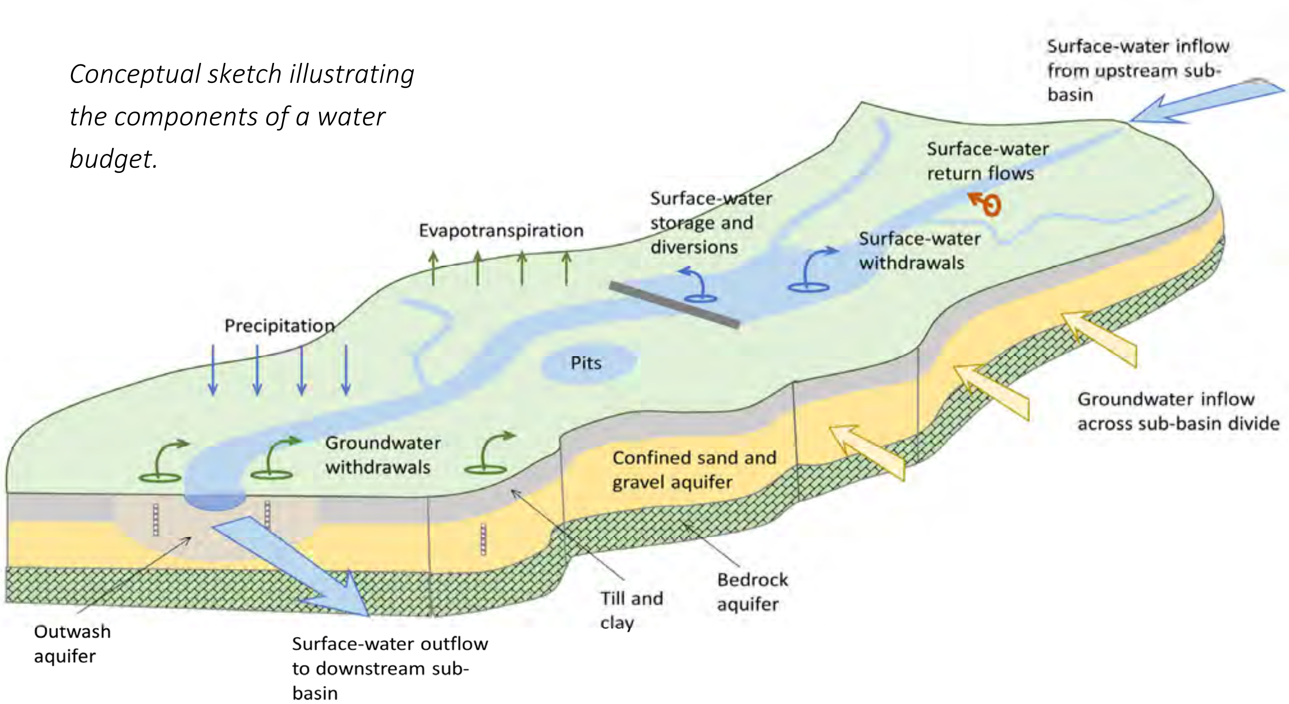
2. *Reservoir storage* - stored volumes, operations, and locations of regional reservoirs that are used to supplement stream flows

3. *Withdrawals* - high-capacity withdrawal intakes, including stream diversions and pumping centers that remove water from the stream or adjacent aquifers

4. *Return flows* - treated effluent discharged back into the streams, which supplements downstream water availability

A water budget is an accounting of water flowing into and out of a given region. The Central Indiana Planning Region and surrounding areas were divided geographically into sub-basins, and water budgets were developed for each sub-basin. The water-budget analysis forms the basis for determining water availability.

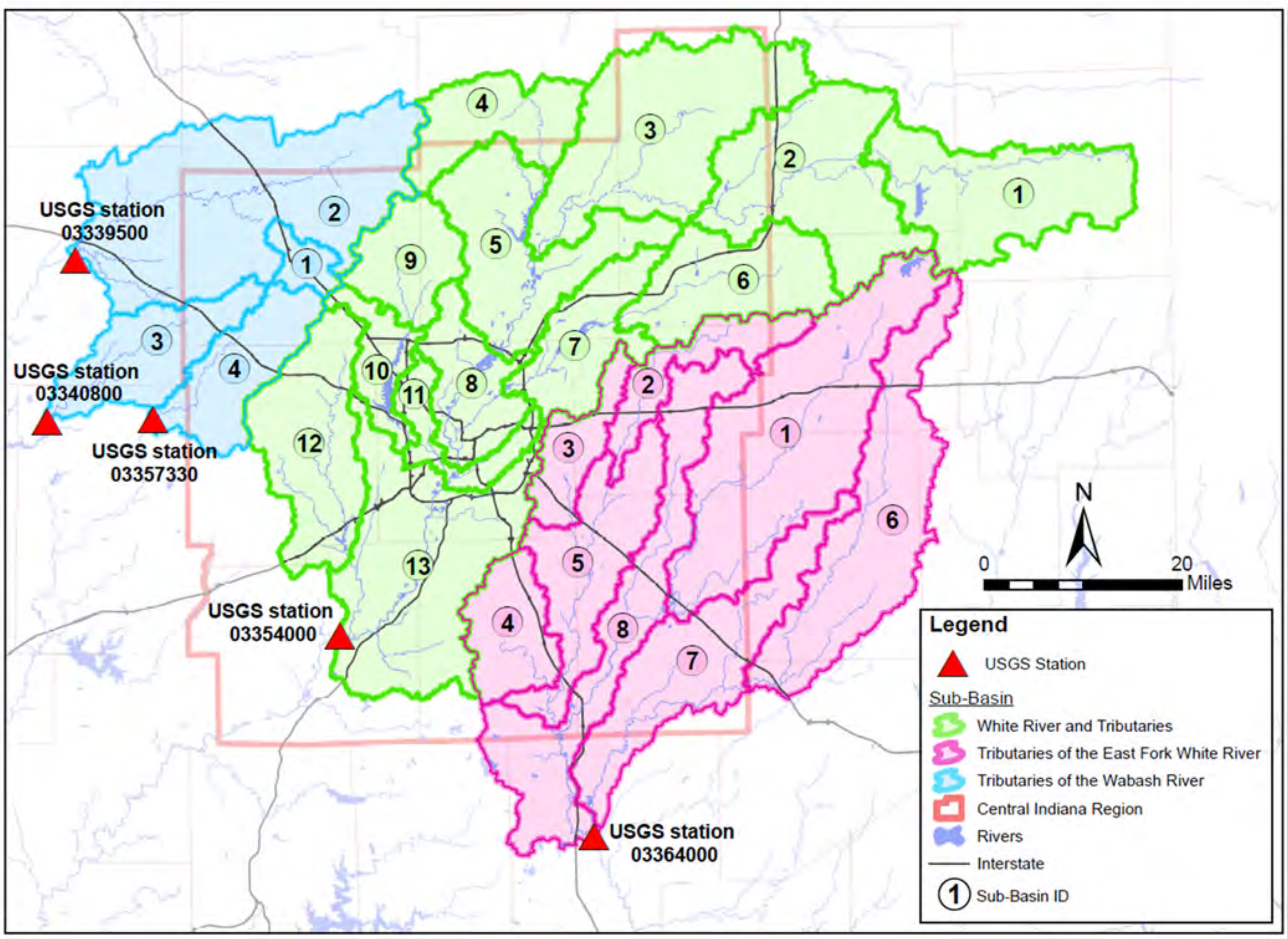
Conceptual sketch illustrating the components of a water budget.



Water budgets were computed for sub-basins defined by USGS stream gages

The 9-county planning area was divided into sub-basins that drain a fraction of the landscape in three different river basins: the Wabash River (blue) receives water from Boone and northwestern Hendricks County, the East Fork White River (pink) drains the southeastern and east-central area, including all of Shelby and some of Hancock and Johnson Counties. The West Fork White River (green) drains the northeastern and central counties in the region. Each of the three major drainage systems are further divided into sub-basins. The sizes and locations of these sub-basins reflect the drainage areas of the existing stream gages, which are the locations of available streamflow data used for these studies.

A water budget was developed for each sub-basin based on data spanning the period 2007 to 2017, which was the period of data availability for the suite of variable needed for the analysis. The water budgets were used to assess the geographic distribution of water availability over that period.



Sub-basin boundaries used to compute water budgets and water availability.

Defining hydrologic terms

To evaluate the water availability in the 9-county planning region, several concepts were developed that made use of existing data. Before the method and data used to estimate water availability can be explained, a few hydrological terms need to be defined:

Natural baseflow: discharge from aquifers to streams

Baseflow is commonly understood to be the contribution of groundwater to a stream. The water exchange in stream/aquifer interactions can go both directions. Streams can have gaining (groundwater contribution to the stream) or losing (water loss from the stream bed to recharge groundwater) reaches. In water-budget calculations, the sign of this term can be positive (gaining reach) or negative (losing reach) and can be influenced by outside factors such as near-stream well pumping. Natural baseflow is an estimate of the groundwater discharge contribution to a stream reach without considering anthropogenic interventions such as water withdrawals or wastewater-return flows.

Minimum instream flow: a lower limit on streamflow that is used as a drought-response threshold

Much of the stream/aquifer system flowing through Central Indiana also serves as the natural infrastructure for the municipal water supply system.

Indiana does not have any regulated limit on low streamflow. In this study, the $Q_{7,10}$ low flow (the average low flow that can be expected for a 7-day period, once each decade) was examined as a *placeholder* to consider the effect on water availability. Most NPDES discharges are permitted based on a $Q_{7,10}$ low flow for dilution.

Reservoir storage: water stored in reservoirs to supplement streamflow

Reservoir storage is important from a water-supply perspective because water can be diverted into storage when there is excess, and then released when needed to satisfy downstream demands. The three large reservoirs in the region were all built to supplement flows for the drinking-water supply or provide flood control. The rivers and streams transport for reservoir-storage releases to downstream intakes. In some areas, reservoir releases are designed to replace the groundwater captured by high-capacity well fields.

The analysis not only accounts for what was released in the past, but also includes the effects of new (in-progress) infrastructure that will increase availability in some parts of Central Indiana. While most of the outlying communities use groundwater exclusively because it is easier to develop and less expensive to treat, Citizens Energy Group (Citizens) has added the new Citizens Reservoir to increase the resilience of their system.

Defining the measures of water availability

In each sub-basin, water availability is the sum of these elements: natural baseflow, storage, and instream-flow requirements

Water availability = natural baseflow – instream flow + reservoir storage

Although this definition of water availability is hydrologically meaningful, it fails to account for the anthropogenic changes within a sub-basin, such as water withdrawals and return flows that are discharged back into the river. Throughout Central Indiana there are intakes located upstream and return flows from that same use located downstream. It is not unusual for a diversion to occur in one sub-basin and the return flow to be added back some distance downstream – even in another sub-basin. The amount of water any sub-basin can produce is limited by these withdrawals and return flows within the sub-basin. Excess water availability is the net water remaining in a sub-basin after all water uses are accounted for.

***Excess* water availability** = water availability – withdrawals + return flows

Each sub-basin below the headwaters also receives water from the upstream sub-basins. The cumulative excess availability is the sum of the excess water availability in all upstream sub-basins. The calculation of cumulative excess water availability uses available stream-flow records, information in NDPES permits, and water-use data, and incorporates whether each sub-basin is a gaining or losing reach.

***Cumulative* excess water availability** = the sum of all upstream excess water availability

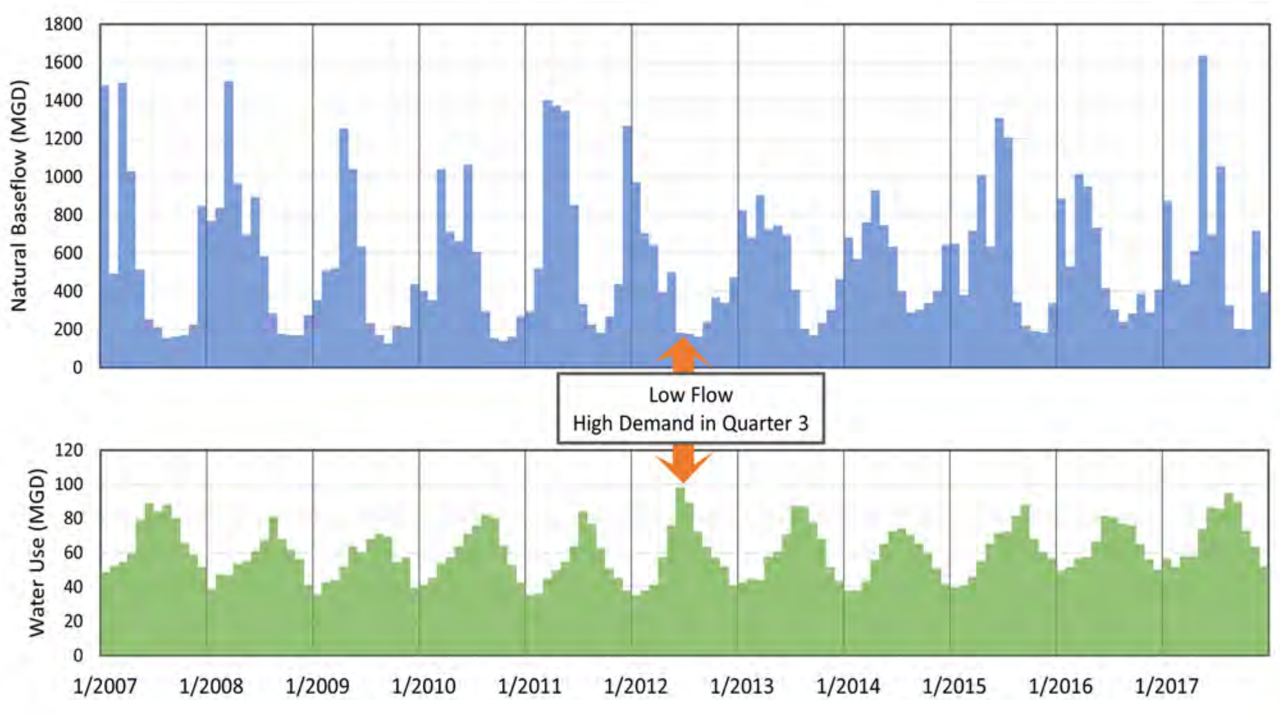
Using this definition of cumulative excess water availability and following the West Fork White River from upstream northeast of Indianapolis to downstream south of Indianapolis, more water is available above and below Indianapolis than at the city center. North of Indianapolis, withdrawals are relatively small, so the system behaves like a natural hydrological system. As the river flows into Hamilton County there is a large surface-water intake as well as more than 40 MGD of groundwater capacity. Effectively, water users within the Indianapolis sub-basin are using the water before it is treated and returned to the river downstream at the Belmont Advanced Wastewater Treatment Plant south of Indianapolis

Water availability and water use vary seasonally and annually

Natural baseflow, the largest continuous component of water availability, has a strong seasonal variation. During the Spring, the natural baseflow in a stream may be five times greater than during the summer or fall. This leads to large variations in water availability throughout a calendar year.

Water demand also has a seasonal variation, with the greatest demands occurring in the Summer. These seasonal variations produce a critical period for water supplies when availability is low and demand is high. In Central Indiana, this critical period occurs most often in the late Summer. The third quarter of the calendar year (Quarter 3; July, August, and September) is the critical period for water availability.

In addition to seasonal variations, the natural streamflow values vary from year to year, with both wet years and dry years appearing in the records, as well as years of low and high annual demand. For the period of record (2007-2017), the minimum availability occurred under drought conditions in 2012 for most of the sub-basins in Central Indiana. Consequently, 2012 is used as a basis for reporting availability for both current and future conditions.



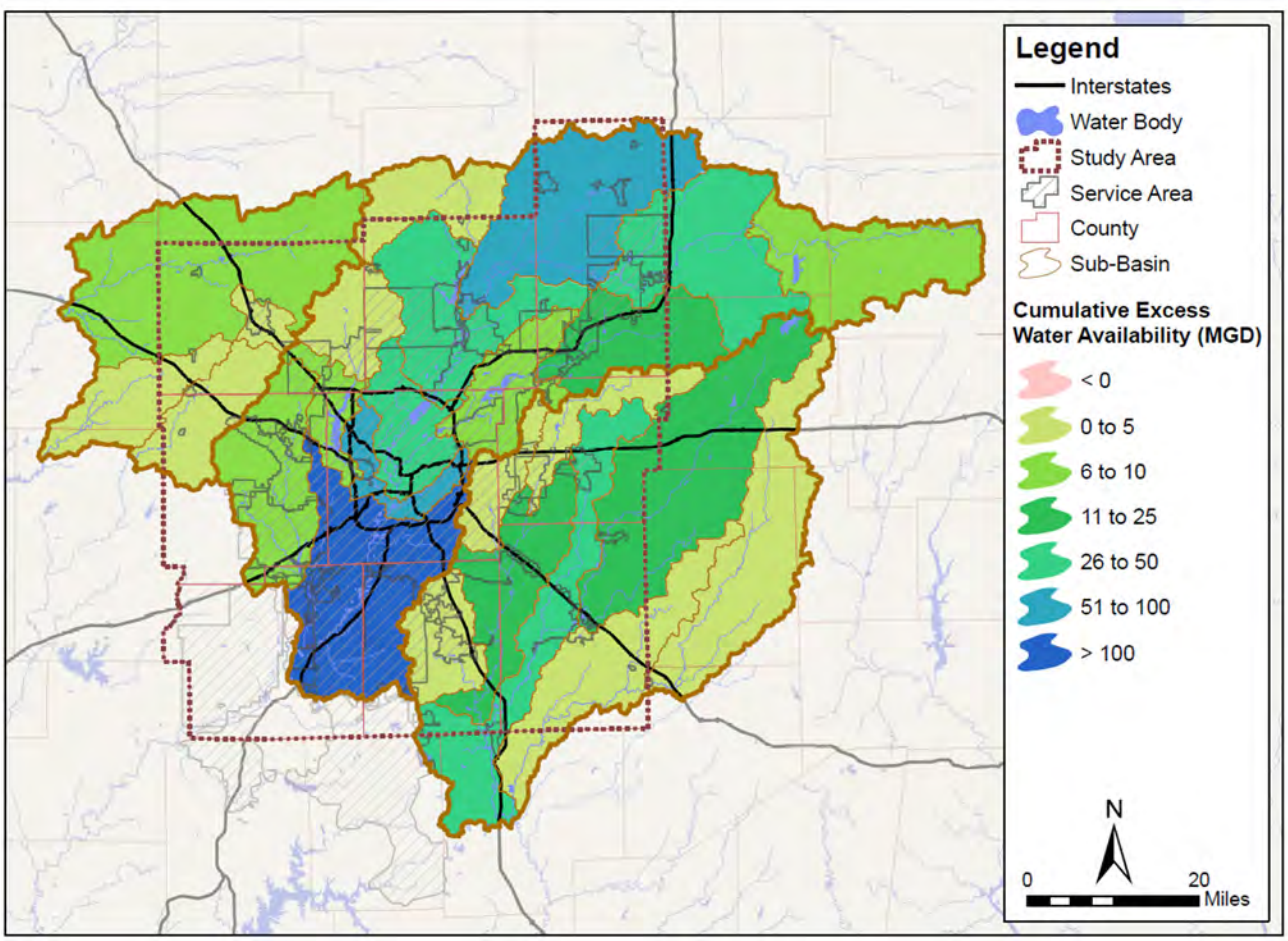
Natural baseflow and water use vary seasonally and annually. Quarter 3 (July, August, September) of the calendar year is generally a critical period when baseflow is low and demand is high.

Water availability varies geographically

Mapping water availability for the driest 3-months of the annual record shows that there is more water available downstream of the city, reflecting the added flows from the Belmont Advanced Wastewater Treatment Plant.

Results show that an expansion of the water supply system up to 50 MGD could be possible along the White River corridor. To the northwest and southeast, outside of the White River drainage system, water availability is very limited and expanding existing supplies will be difficult.

While some sub-basins in Central Indiana were found to have annual water deficits, as a whole, the region has *cumulative* excess water availability for the period of record, 2007-2017. This highlights the fact that informal transfers (*e.g*., downstream channel flow) of excess water between sub-basins is an important feature of the regional water-supply system as it exists today. The water supply for both Hamilton and Marion Counties depends, in part, on utilizing excess water availability in upstream sub-basins.

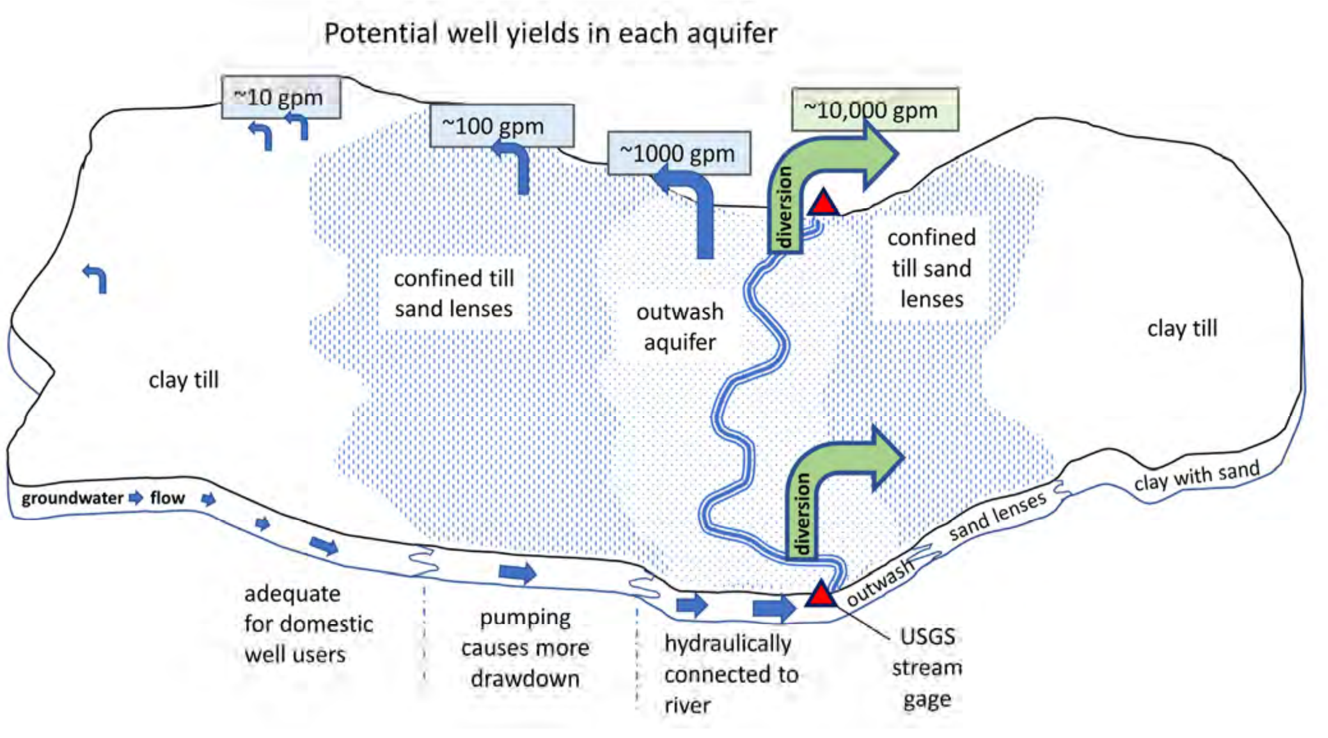


Minimum (2007-2017) Cumulative Excess Water Availability during the Quarter 3 of the calendar year (i.e., July, August, September) for sub-basins in the region. Availability is high upstream of the intakes north of Indianapolis and high downstream of the Belmont Advanced Wastewater Treatment Plant (See Phase III Report for details).

Available water may not be accessible water

The cumulative excess water availability is mapped as a single representative value for each sub-basin. The actual conditions within a sub-basin, however, may restrict where available water can be accessed and extracted.

The geologic history of Central Indiana explains the distribution of aquifers, with ancient bedrock units (e.g., sandstone or limestone aquifers) lying below more recent sediments (i.e., unconsolidated aquifers) emplaced by glaciers or glacial rivers. In each sub-basin, the ability to sustainably extract new supplies of water is limited by aquifer properties and local perennial stream flows (closely related to natural baseflow). The largest withdrawals in Central Indiana are direct surface-water diversions extracted from major rivers. The highest capacity wells pump from the very permeable sand-and-gravel glacial outwash aquifer adjacent to rivers. Withdrawals from the outwash deposits either intercept water on its way to the river or capture river water through the sediments. Access to groundwater from the thin sand lenses confined in glacial till is limited to pumping rates that may only be suitable for domestic supplies. These low-productivity regions typically lie along the ridges and watershed divides, farthest from the streams.



Water accessibility varies within a sub-basin: water is most accessible along the river corridor that includes glacial outwash deposits and becomes less accessible as you move from the river.

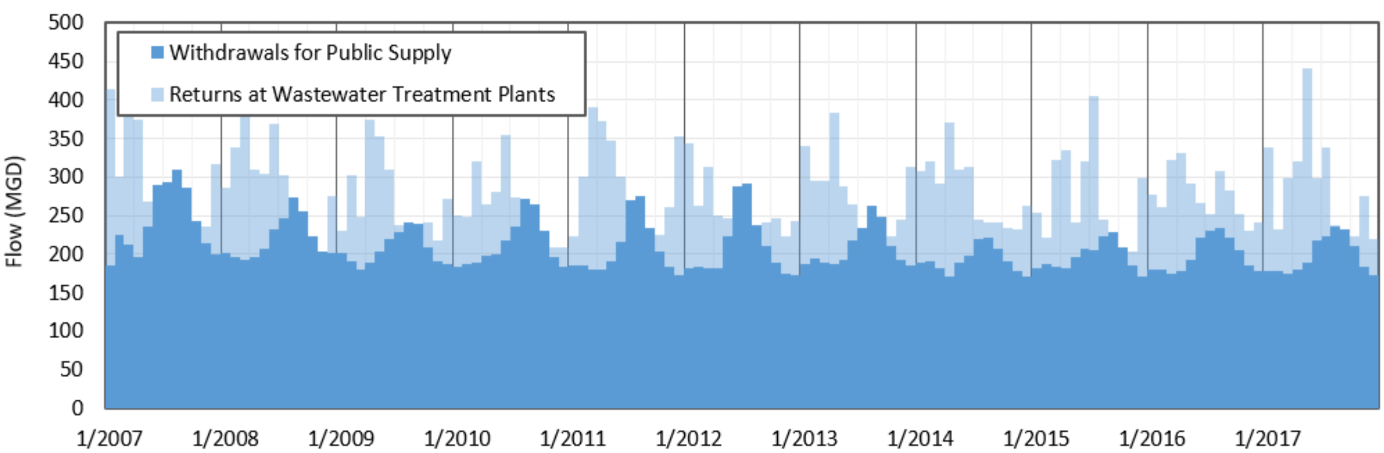
Current and future water supplies depend on unplanned water reuse

Water reuse is the process of reclaiming wastewater and converting it for use for beneficial purposes. Unplanned water reuse describes a situation in which a source of water is, at least sometimes, substantially composed of previously used water. The most common example of unplanned, but managed, water reuse that applies to Central Indiana occurs when communities draw their water supplies from rivers that receive treated wastewater discharges from upstream communities. During the driest part of the year (Summer), treated wastewater and groundwater discharge (natural baseflow) are the largest components of streamflow.

In this case, downstream water supplies depend on treated upstream effluent. We rely on instream biological processes, UV sunlight, and the ecosystem within the water-exchange zone near the riverbed, to further improve water quality for the next user. The quality improvements in wastewater discharge, along with the technology of advanced drinking water treatment processes, make surface waters more resilient as sources of supply.

The USEPA does not require or restrict any type of water reuse. Generally, states maintain primary regulatory authority (i.e., primacy) in allocating and developing water resources. Although Indiana does not, some states have established programs to specifically address reuse, and some have incorporated water reuse into their existing programs.

Treated wastewater discharge is a critical regional asset from a water-availability perspective. In Central Indiana, some of the fastest growing communities depend on their upstream neighbors to discharge reliably clean and consistent flows to the stream.



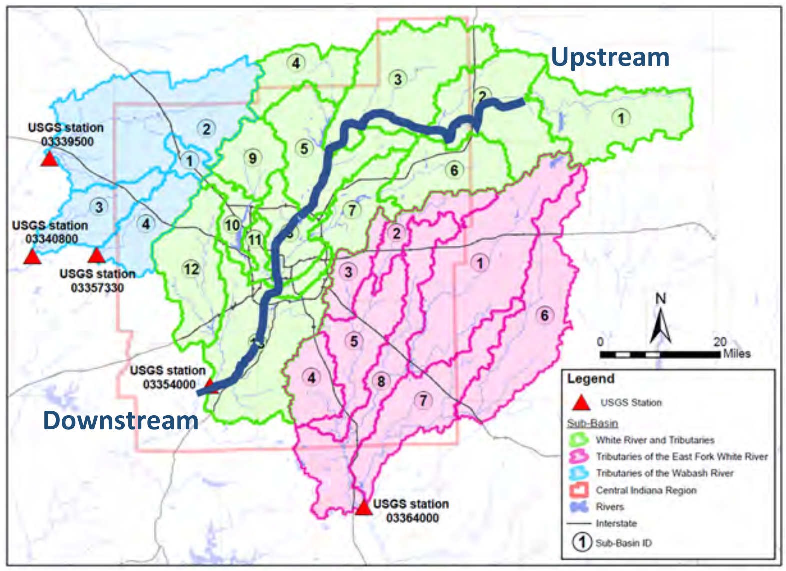
Treated wastewater discharge is a regional asset, critical to maintaining water supplies.

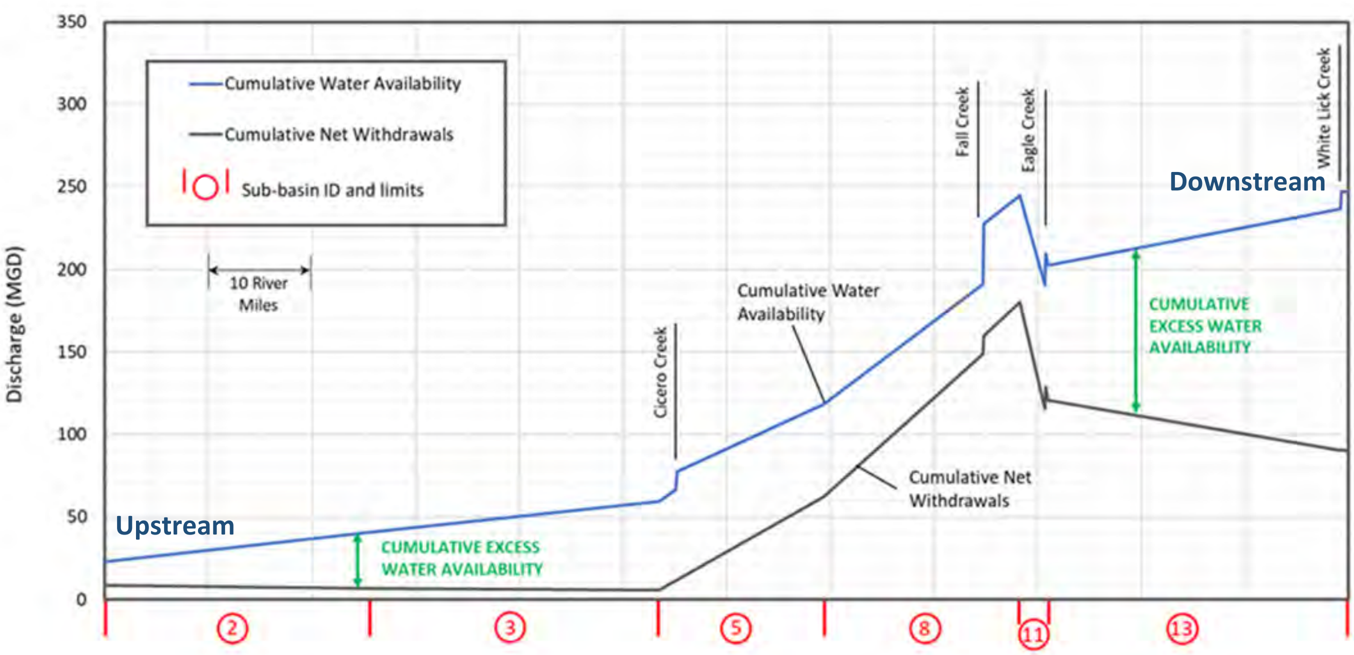
Water availability increases from upstream to downstream in the West Fork White River Basin

The gap between availability and net withdrawals (withdrawals minus return flows) shows approximately 50 MGD of cumulative excess water availability in the basins upstream and more than 130 MGD in the basins downstream of Indianapolis.

In Marion County and upstream, regional supplies are being efficiently expanded with repurposed aggregate quarries to supplement low flows. Additional storage, new well fields, and more efficient conveyance structures upstream will supply the water needed for local growth. Development of water supplies downstream could be one option for a sustainable, long-term future source of supply.

Below: Availability and net withdrawals. The plot follows the centerline of the White River from upstream to downstream, as illustrated on the map to the right.



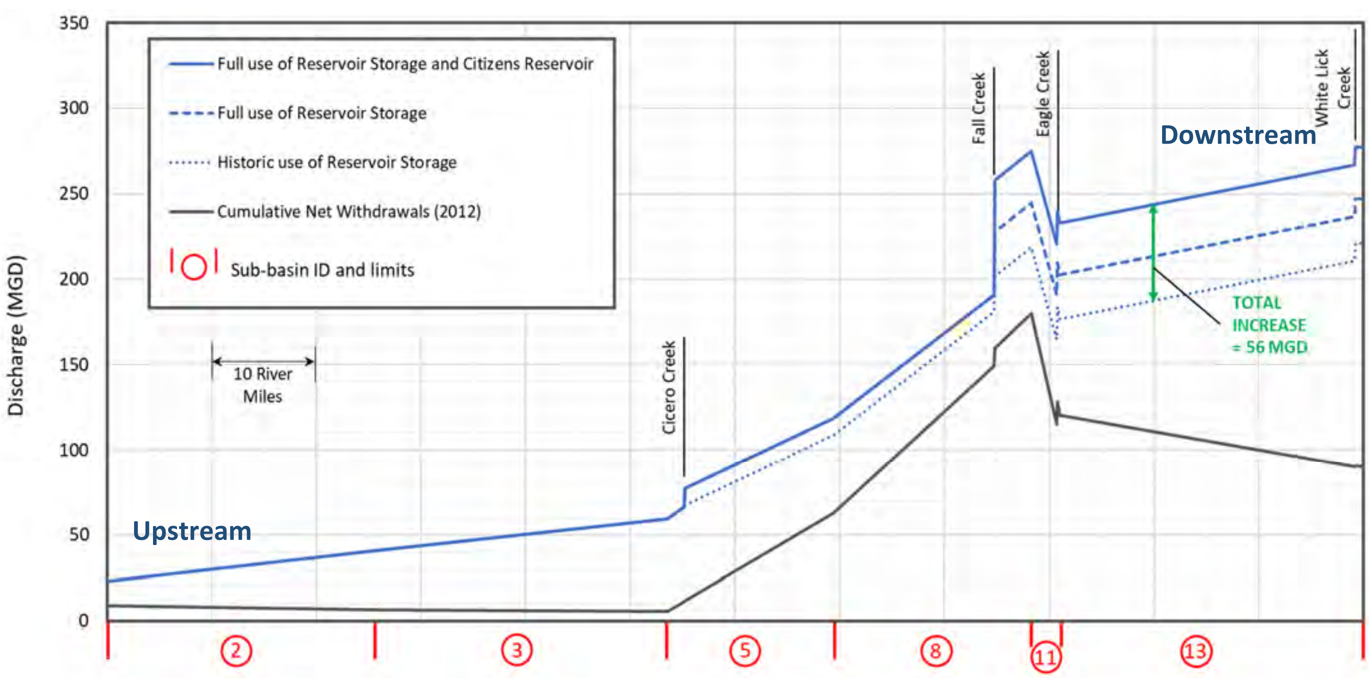


Utilities increased future water availability through capital improvements

Many Central Indiana utilities have taken steps to address water supply and demand issues. Changes made by Citizens, the largest utility, have a large impact on the regional supply. Since acquiring the Indianapolis water supply utility in 2011, Citizens has conducted infrastructure improvement projects to expand water accessibility and availability in their service areas and provide a more resilient water supply.

Projects in Indianapolis include the new 30th Street surface-water intake which makes it possible to divert water from the White River to the Central Canal during low flows. In addition, a new intake was constructed near 16th Street that allows water to be transferred from Fall Creek to the Central Canal. These improvements have increased water availability by making it possible for Citizens to capture water released from their reservoirs, allowing more regular use of reservoir storage in the future.

In 2019, Citizens began converting a former limestone quarry adjacent to Geist Reservoir into a water-storage reservoir, named Citizens Reservoir. The quarry lies at the northern, upstream end of Geist Reservoir, and was formerly owned and operated by Irving Materials Inc. When full, the reservoir will hold up to three billion gallons of stored water. The reservoir will be operated solely for purposes of water storage with no public access for development or recreation. The reservoir is planned to be operational in 2021.



Impacts of Citizens infrastructure improvements on cumulative water availability relative to cumulative net withdrawals. The plot follows the centerline of the White River from upstream to downstream.

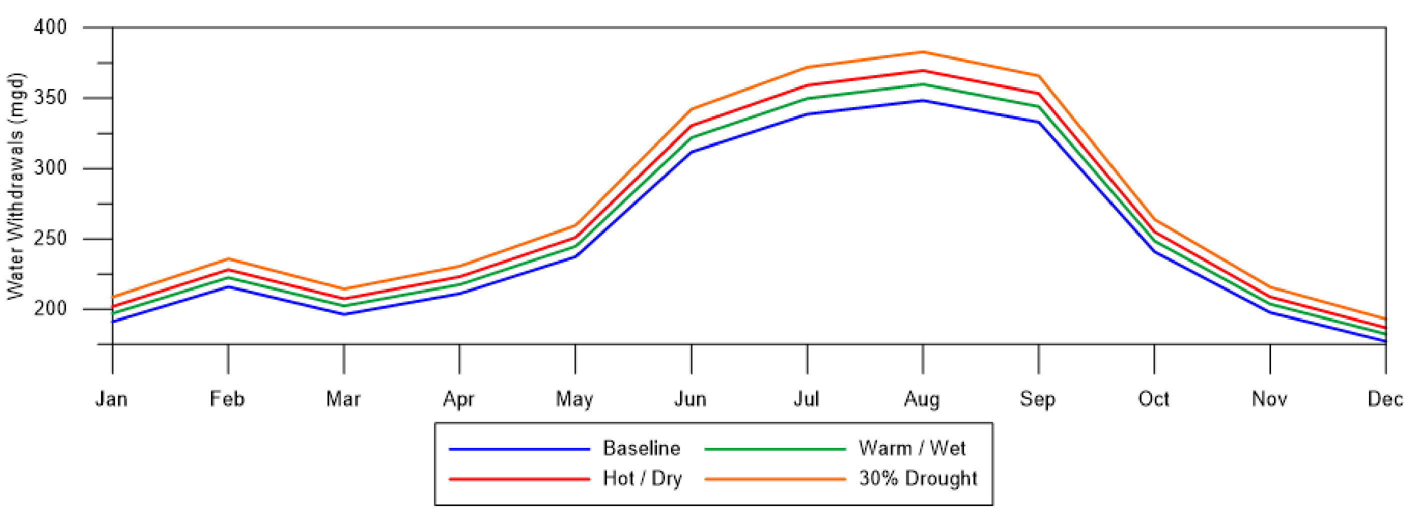
Climate change will impact water availability – monitoring is necessary

Observations of temperature, precipitation, and streamflow in Indiana over the last 100 years show increasing annual averages, with increasing rates of change over the last 20 years (Widhalm et al, 2018). These observations are consistent with trends in temperature and precipitation predicted by global climate models and are commonly attributed to climate change. Climate change will impact excess water supplies in Central Indiana in two ways: first, through changed demand patterns, and second, through changed streamflow.

Impacts on demand for public water supply are included in the projections of the Phase I Study (IFA, 2020). EPA guidance for utilities (US EPA, 2018) was used to define three future demand scenarios based on future climate projections. The climate scenarios, listed in order of increasing demands include warm/wet, hot/dry, and 30% drought conditions.

Predicting the impacts of climate change on streamflow and baseflow is a more difficult problem. Results from independent researchers attempting to predict climate-driven changes to streamflow in Indiana have been inconsistent: a study conducted at Indiana University (Dierauer and Zhu, 2020) predicts that the critical Summer streamflow will decrease by 40% of long-term averages (1971-2000) by 2100; a study by the US Army Corps of Engineers (Drum et. al, 2017) indicates a likely increase in July, August, and September streamflow of 30% of the long-term average. USGS streamflow records from the last decade indicate that streamflow and baseflow have increased in response to changing climate.

It remains unclear whether utilities should plan for decreasing water availability or increasing availability due to climate change impacts in Central Indiana. Recent decades have seen increasing streamflow, baseflow and water availability in the region. The use of natural baseflows calculated for the 2007-2017 period in estimates of future water availability assumes that the observed increases in that period relative to long-term averages, continue into the future.

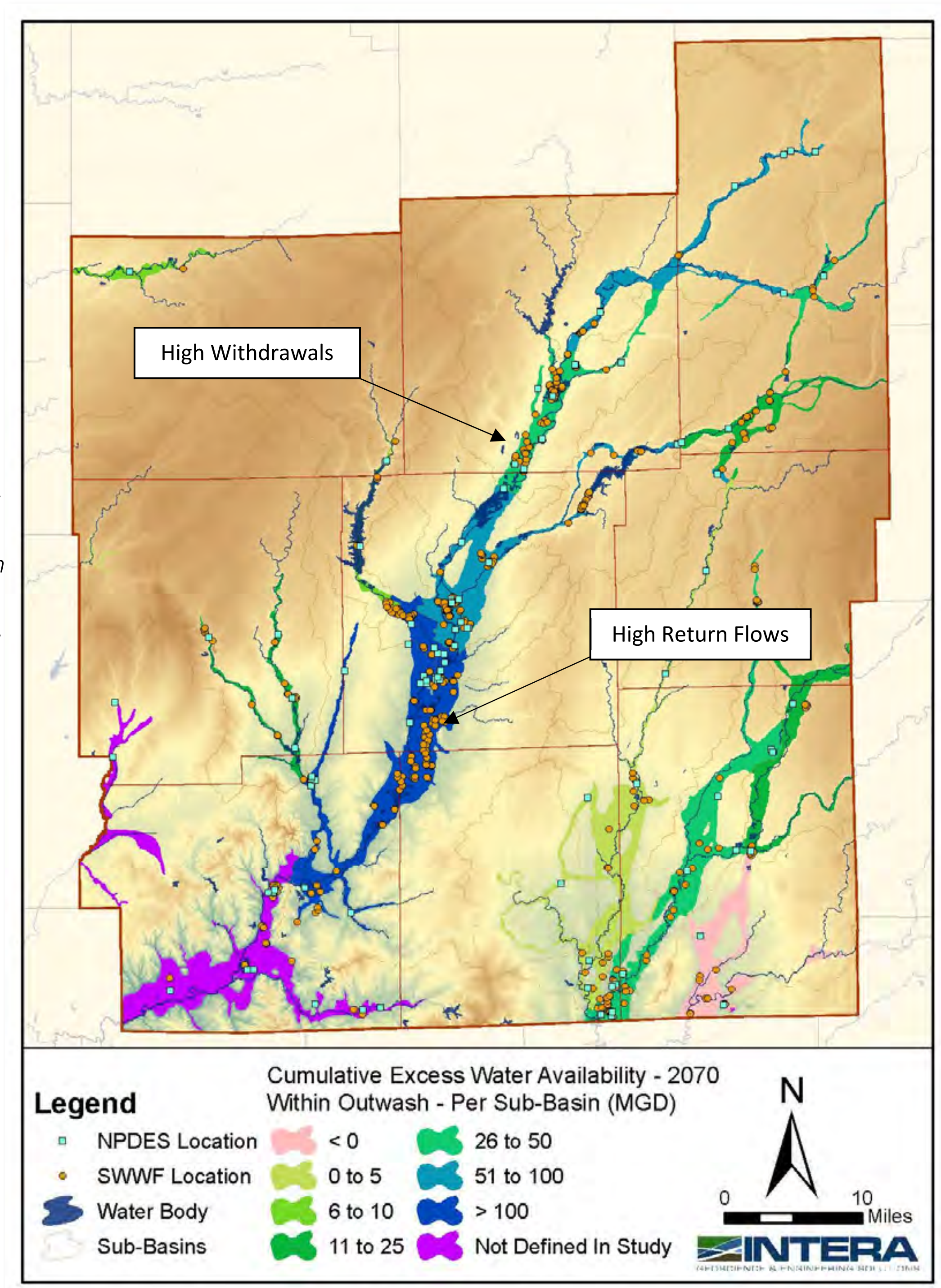


Projected impacts of climate change on water demand in 2070: Baseline and 3 model scenarios.

Future growth maintains similar patterns to availability today – less water north, more water south

Results of the water-availability model, including average projected 2070 water withdrawals and returns, are illustrated in the map below. In the White River and Tributaries of the Wabash River drainage systems, projected water availability remains positive in all sub-basins. Small negative cumulative values are projected in south-central Shelby County in the East Fork White River drainage system.

Minimum Quarter 3 cumulative excess water availability for the 2070 baseline scenario, shown in the outwash where water is most accessible.

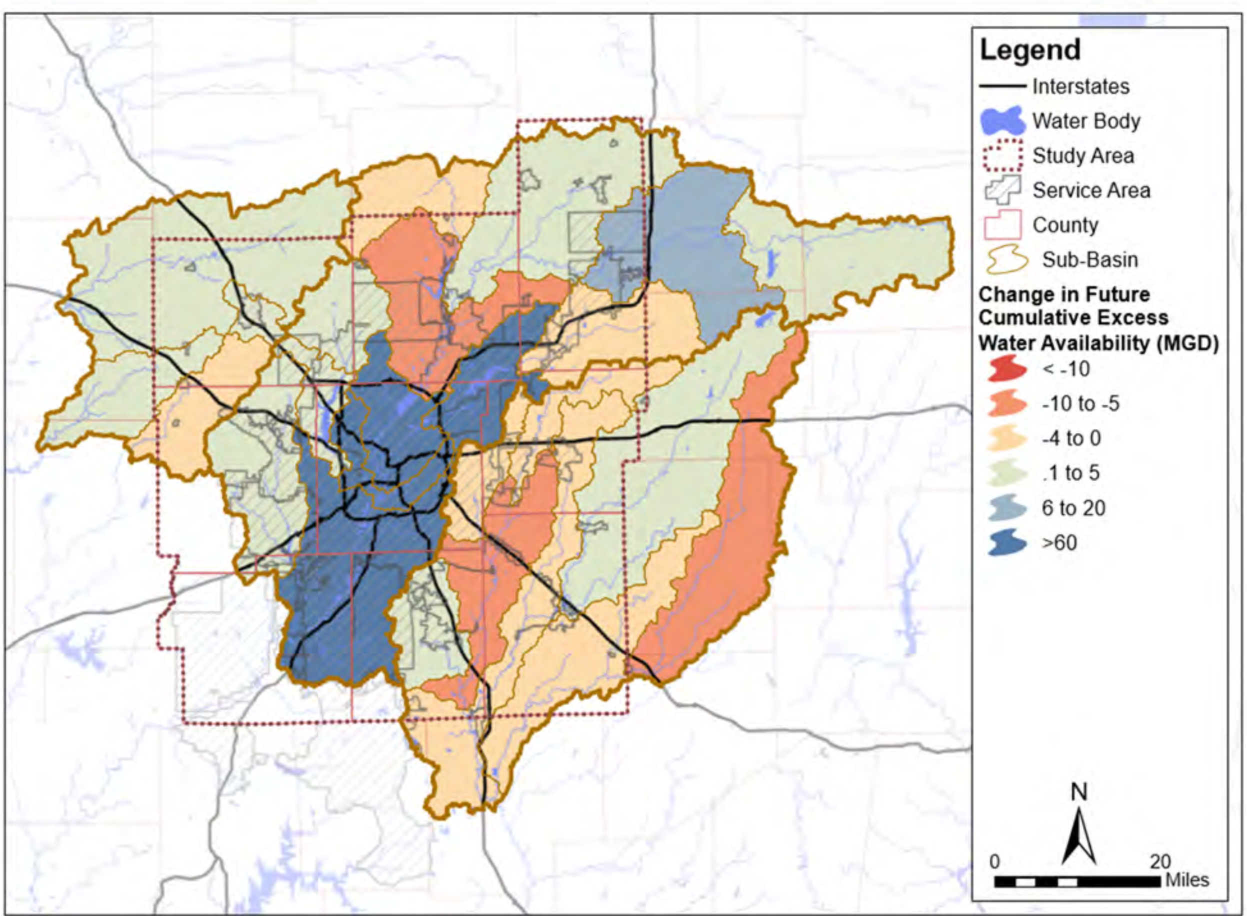


Water availability changes between now and 2070

The changes in water availability from current conditions range from -5 to +5 MGD in most sub-basins. In the West Fork White River drainage system, larger projected decreases in availability occur in Hamilton and Marion Counties, primarily due to increased withdrawals for public supply. In Hamilton County, the increased demand is not offset by returns from wastewater treatment plants, so there is projected to be a local increase in the deficit.

On the flip side, water-availability increases are projected in the Fall Creek watershed downstream of Geist Reservoir, as well as to the south of Indianapolis. The projected availability increase in the Fall Creek watershed is due to the operation of the new Citizens Reservoir, while the increase south of Indianapolis is due to increasing return-flow discharges at the Belmont Advanced Wastewater Treatment Plant.

Changes in the other major drainage systems are projected to be small, except for the south- central portion of Shelby County in the East Fork White River drainage system, which is a result of anticipated increased withdrawals in the Irrigation and Agriculture Sector.



Change in sub-basin water availability in the 2070 baseline scenario. The total change accounts for projected growth, increases in water availability from Citizens improvements, and increases in wastewater treatment plant return flows. This scenario does not account for climate change impacts.

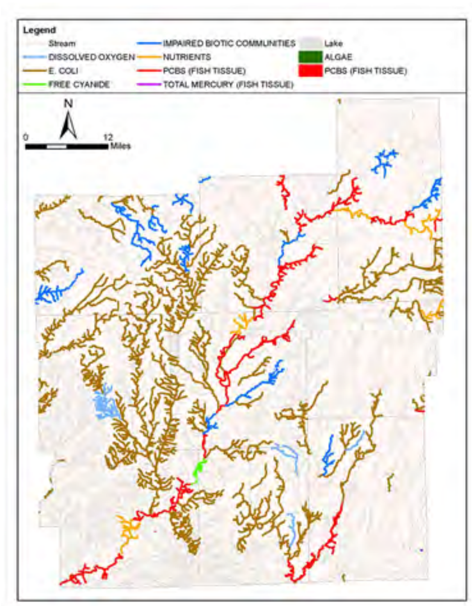
Regional water quality is not pristine and may locally limit availability

Water quality in the White River Basin is typical for the industrial Midwest with local pods of legacy contaminants in urban groundwater and high sediment runoff into streams from municipalities.

Ambient, or background, groundwater quality in Central Indiana is well-characterized by the ongoing statewide monitoring activities conducted by the Groundwater Section of IDEM. In an analysis based on IDEM data, the ambient groundwater quality does not limit the potential sources for groundwater supply for a large water utility. Although several constituents occur at levels greater than the maximum contaminant level, most can be removed by standard treatment to provide a potable water supply.

Groundwater contamination from historical pollutant releases poses a larger threat to groundwater supply, accessibility, and availability in Central Indiana than ambient conditions. A potential-contaminant source inventory was conducted to assess this concern. The inventory suggests that impacts to groundwater availability are primarily of concern in Marion County, where many potential (where an event occurred) and actual (measured pollutants) contamination sources exist. The potential-contaminant sources alone account for over 11% of the surface area of the outwash deposits in Marion County, which are the primary source of groundwater supply in the county. Substantially more area is covered by known contaminant plumes, but those areas remain largely unmapped on a regional scale.

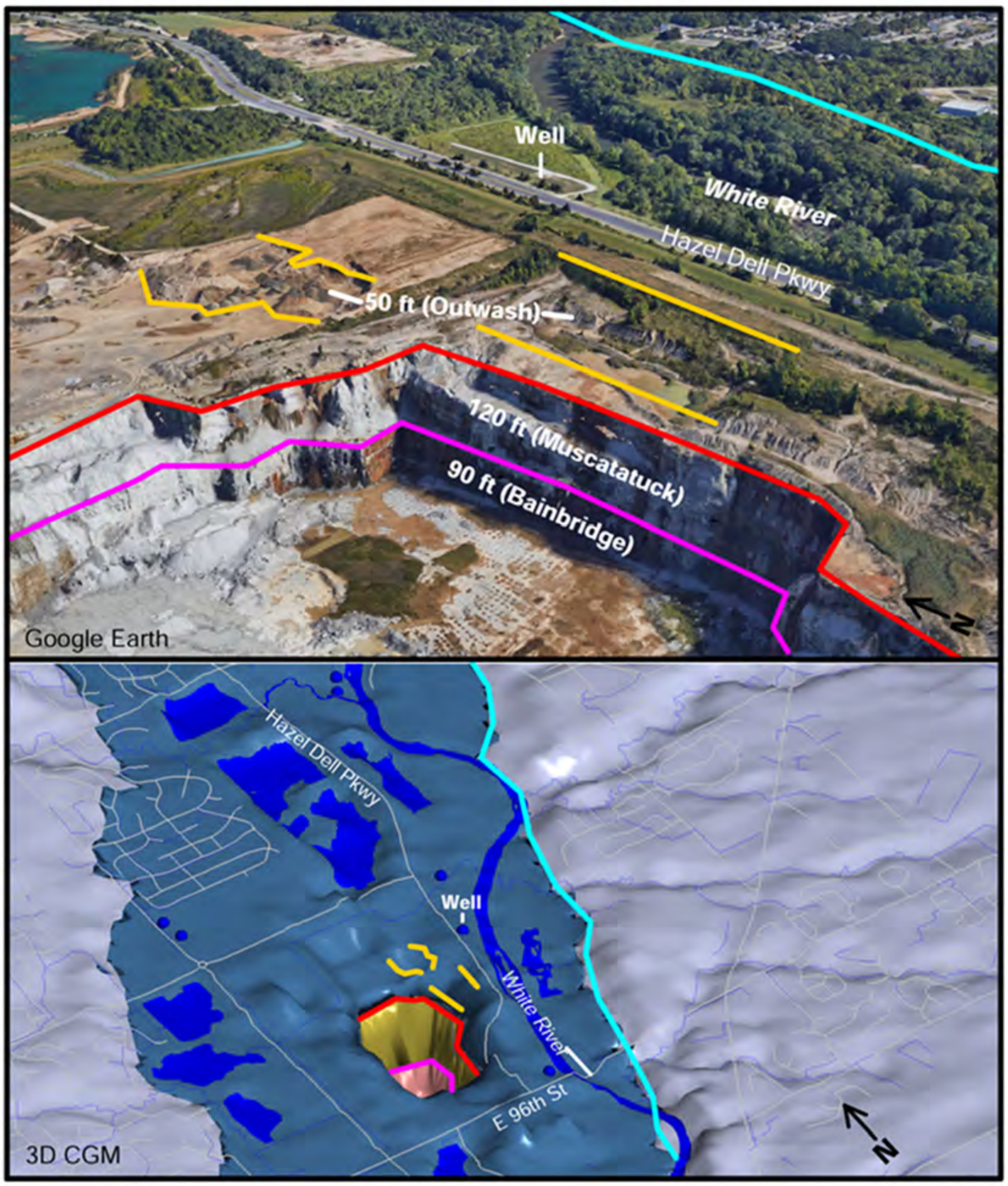
The current state of surface water quality in the region is summarized in the federal 303(d) listing of impaired waterways, which shows most major rivers and streams in the region to be impaired by a large range in chemical, bacterial, and biological parameters. Surface water quality in the past has been impacted by combined sewer overflows; conditions in Marion County will improve significantly with the operation of the deep tunnel interceptor.



Water-quality impaired surface waters in Central Indiana.

There are signs of local groundwater-supply shortages in Hamilton County

In Hamilton County, both public supply and industrial uses of groundwater are changing. More municipal wells are being located near the river to amplify groundwater recharge and minimize impacts on other groundwater users. Industrial use in Hamilton County is dominated by water handling and dewatering related to aggregate and gravel quarries along River Road in Carmel. These quarries have begun using nearly 10 MGD that is stored in the linked network of surface gravel pits in reclaimed quarry ponds. Some of these gravel pits are have hydraulic connection with the local outwash aquifer, so they act as imperfect infiltration drains to the local shallow aquifer. The operational withdrawals in the quarries, however, lower water levels in the overlying water-supply aquifer, reducing yields in nearby municipal wells.



Quarry activity and dewatering of the outwash aquifer that is the source of water for many high-capacity wells in the region. In some conditions, industrial and water-supply uses appear to conflict.

Regional water-supply options

Estimates of future need for all water users in communities east and west of Indianapolis, including the needs of self-supplied residential wells, are likely to be satisfied by local groundwater resources. In the center of the planning region, Marion County's growth may benefit from new high-capacity supplies downstream along the West Fork White River in Johnson and Morgan Counties. In this area the groundwater resources are entirely sustainable. However, the sub-basin water budgets on the north side of the planning region, especially in Boone and Hamilton Counties, may exceed available local supplies between now and 2070. Estimated water needs from the Phase I Demand Forecast suggest that there will be significant growth on the north side of Indianapolis as well as to the suburban counties to the south. At the same time, it is expected that withdrawals from subsurface mine dewatering will increase as the mined area expands. More underground excavations are statistically more likely to encounter fractures and other secondary porosity that can drain water from overlying saturated unconsolidated sand and gravel units.

Given the projected increased seasonal demands and the available resources, there are a variety of water-supply options that could close the gap between existing resources and future demand. They can be grouped into two categories: 1) alternatives to increase water availability, and 2) an alternative to decrease demand.

Alternative Descriptions, Capabilities, and Cost Estimates

The discussion in this section is neither exhaustive nor descriptive of any specific water-supply system discussed in this report. The information is offered as a generalized discussion of potential alternatives and anecdotal experiences. Therefore, none of the information presented should be construed as a recommendation that can be directly applied to any system's situation.

Cost information provided in this section is extracted from isolated regional projects and is empirical; it is not descriptive of any or all specific water-supply alternatives and/or future application of alternatives relative to Central Indiana referenced in this report. As such, any cost estimates provided are representative of order-of-magnitude costs for various types of water-supply projects.

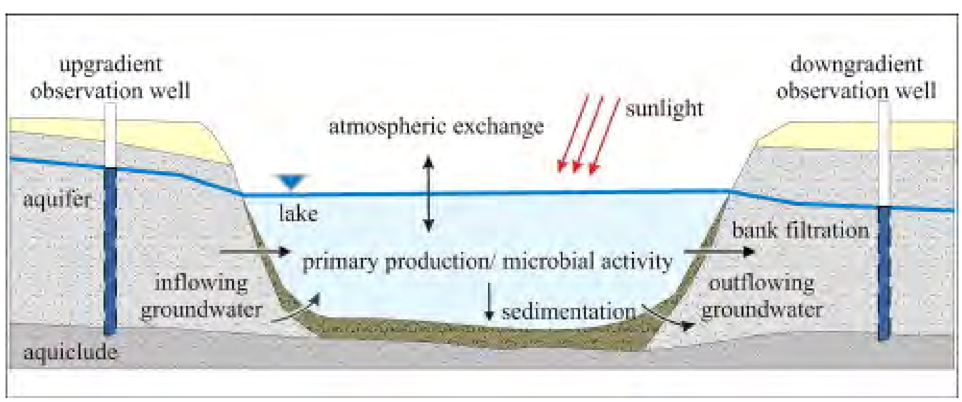
Increasing water availability – Local surface-water storage

For the center of the state, creating additional water storage is the most traditional method of increasing source-water resources. Central Indiana has a set of reservoirs to capture and store a proportion of the annual runoff from within their respective watersheds. Additional seasonal runoff could be captured in reservoirs by adding new storage volume or by making additional use of existing quarries or mines to create new local storage. Storage can be added to existing reservoirs by dredging sediment to increase the water volume. Because dredging to increase reservoir volume can be expensive and new single-purpose storage is cheaper, re-purposing existing rock quarries is one of the most economical methods to increase regional water availability. The cost and complexity of utilizing reservoirs varies based on scale of the project and likely impacts.

The different factors that could affect cost include procurement of state and federal permits, mitigation of impacts to natural resources and surrounding land uses, property acquisition requirements, location, reservoir volume and depth, dam and spillway construction, and contractor market conditions. Similar factors affect cost when considering dredging. However, dredging could potentially release large amounts of suspended solids and other pollutants to the reservoir water column and would likely require a reconfiguration of the water-withdrawal system, which might make sense in the right circumstances.

Expanding surface-water withdrawals for public supplies may not be possible where other water users reduce aquifer yields in Hamilton County. Data are needed to understand any conflict between mine dewatering and water-supply development so that solutions can be found. Currently the mine-water management system – discharging the water into mine lakes before they flow to neighboring streams – could be the beginnings of a collaborative solution. With a few changes in design of the mine lakes and the discharge, these lakes could become an infiltration system to supplement increased groundwater extraction. To engineer a solution, additional data need to be collected to understand how the lakes could be optimized for recharging the shallow aquifer. The figure below illustrates some of the physical mechanisms that influence water supplies near a mine lake.

Conceptual cross section of a mine lake (from Muellegger et al., 2013).



Increasing water availability – Development of reservoirs in quarries

Historically, reservoir storage has been developed in Central Indiana to supplement low flows during drought conditions and increase water availability. However, because there is higher population density and more legal restrictions that address these projects today, the task of building a dam across a valley has become much more complex. These complications mean that building a large reservoir can be so expensive and contentious that it is hard to prioritize as a new water-supply option. Without federal funding, the cost for the planning and development is beyond the reach of most utilities. The regulatory, economic, and political difficulty of developing a traditional reservoir, along with the delays and uncertainty that come with legal challenges, make this option a less attractive water-supply alternative.

Another approach to develop surface-water storage is to reuse existing rock quarries as reservoirs. In the last several years, Citizens developed a new 30 MGD reservoir in a 230 ft-deep limestone aggregate quarry adjacent to Geist Reservoir solely dedicated to water-supply use. This approach holds promise, with many advantages over traditional reservoir construction. The fact that it has such a small footprint to produce large supplies is part of the reason it is so much less expensive than building a dam to fill another valley with water. This new use of the existing quarry could be applied to other locations in Central Indiana. The yield of this reservoir will also be more reliable than other storage because it is dedicated to water supply. It is a simple approach to solving a complex problem. This new utility infrastructure also points out that aggregate mining is not necessarily incompatible with water-supply development. The new reservoir holds almost half of the volume of Geist Reservoir, more than 3 billion gallons of water, that can be used to produce additional sustainable supplies for the community.

Indianapolis' next reservoir a drought '~insurance policy'

AP By JOHN RUSSELL

Posted 11/24/2019 7:00 AM

FORTVILLE, Ind. -- It's not much to see yet-just a deep, empty pit with rocky walls and a few puddles on the bottom. But in a year or so, the 230-foot-deep former limestone quarry in Fortville will be outfitted with pumps, pipes and tunnels, and filled with 3 billion gallons of water, making it the newest reservoir in central Indiana.

Indianapolis-based Citizens Energy is constructing the reservoir as a backup water supply during droughts or periods of high water consumption. When completed, the 88-acre project, called Citizens Reservoir, will be able to pump up to 30 million gallons a day of captured rainwater into nearby Geist Reservoir. From there, the water will flow over a dam into Fall Creek and Citizens' water-treatment plants in Indianapolis.

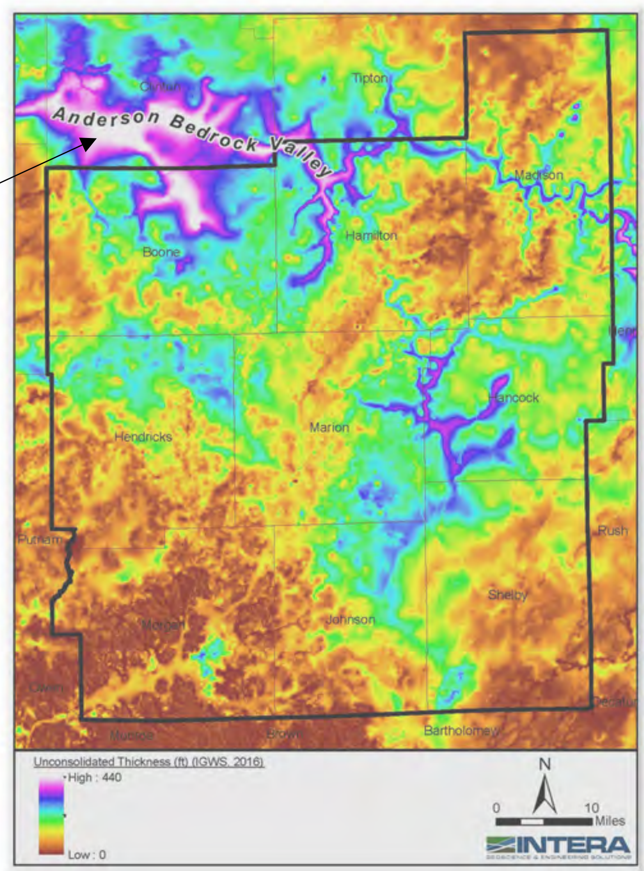
(Daily Herald, 2019)

Increasing water availability – New well field in buried valley aquifer

Just north of the planning region boundary (north of Boone County) there is a relatively unexplored aquifer that could supply several million gallons per day (gpd) from a properly designed well field. This regional supply, depending on hydraulic properties of the valley fill, could be used to satisfy near-term growth and then expand infrastructure with demand. This bedrock-valley aquifer is defined by a pre-glacial drainage of the ancestral Teays River just north of the Wabash River. In Clinton County municipal wells in the 300-400 ft deep buried valley aquifer can produce more than 1200 gallons per minute (gpm). While the sustainable yield of this groundwater resource is not yet known, the difficulty of collecting the necessary data to understand the hydraulic characteristics of the system is relatively low. Exploration and testing would be required to consider the regional value of the Anderson Valley Aquifer.

If the Anderson Valley Aquifer system could be developed as a water-supply alternative, it would be very practical from a fiscal, technical, and political perspective. Increases in pumping would occur incrementally. A new well field in this aquifer would be the most straightforward way to expand supply to meet the rapidly growing demand for water in Boone and Hamilton Counties. Although the yield is likely to be limited to 10-20 MGD, this "add-on" alternative is less complex and less expensive than many other regional supply options.

Thick deposits fill the untested Anderson Valley Aquifer in Clinton County.

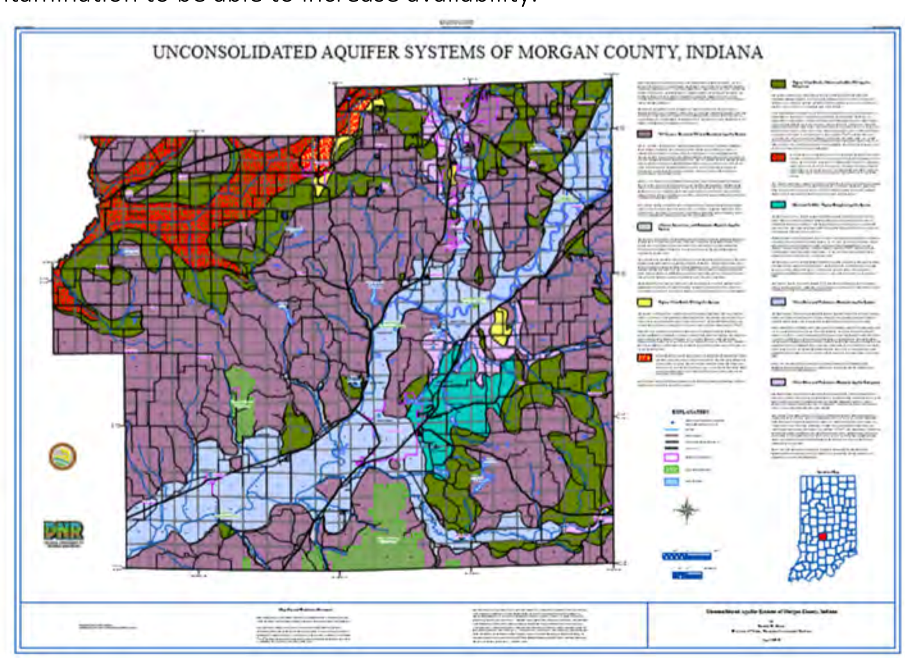


Increasing water availability – Strategic development of the regional outwash aquifer

In contrast to development of new untested aquifer systems is the potential of expanding the use of the regional outwash aquifer. In general, it is difficult to quantify the added capacity and sustainable yield that could be seasonally derived from additional new uses of the outwash aquifer. The outwash aquifer is a heterogeneous sand and gravel aquifer that is, in some places, divided into an upper and lower aquifer separated by leaking confining units that vary in thickness throughout the region. The potential groundwater yield varies spatially; modeling of specific scenarios using both regional and local groundwater models was required to develop the estimates for the water-availability analysis in the Phase III report.

One important factor to consider in the use of the outwash aquifer is its rapid recharge from annual precipitation. Because there is no continuous clay-confining unit associated with this aquifer, recharge is relatively fast when compared to the deeper bedrock aquifers. While limited by recharge rates, the near-river outwash aquifer can be a sustainable source if managed properly.

The forecasted increasing demands on the south side of Indianapolis could be sustainably met with new groundwater extraction along the West Fork White River in Morgan County. Growth in Shelby County could be supplied by existing sources, but additional growth in irrigation needs to be monitored to avoid conflicts. On the south side of the planning region, the outwash deposits are not as abundant near the southern limit of the most recent glacial sediments and have multiple competing uses. The shallow sand-and-gravel outwash aquifer developed by most of the municipal systems is also used by gravel mining operations for wash water and is pumped by farmers for irrigation. In this area, high yields are attainable in properly designed riverbank-filtration (RBF) well fields. Water supplies in outwash would only need to avoid pre-existing contamination to be able to increase availability.



Map of the prolific West Fork White River outwash aquifer (light blue). With the addition of metropolitan wastewater return flows, the White River Basin has ample water supplies, even at low flow.

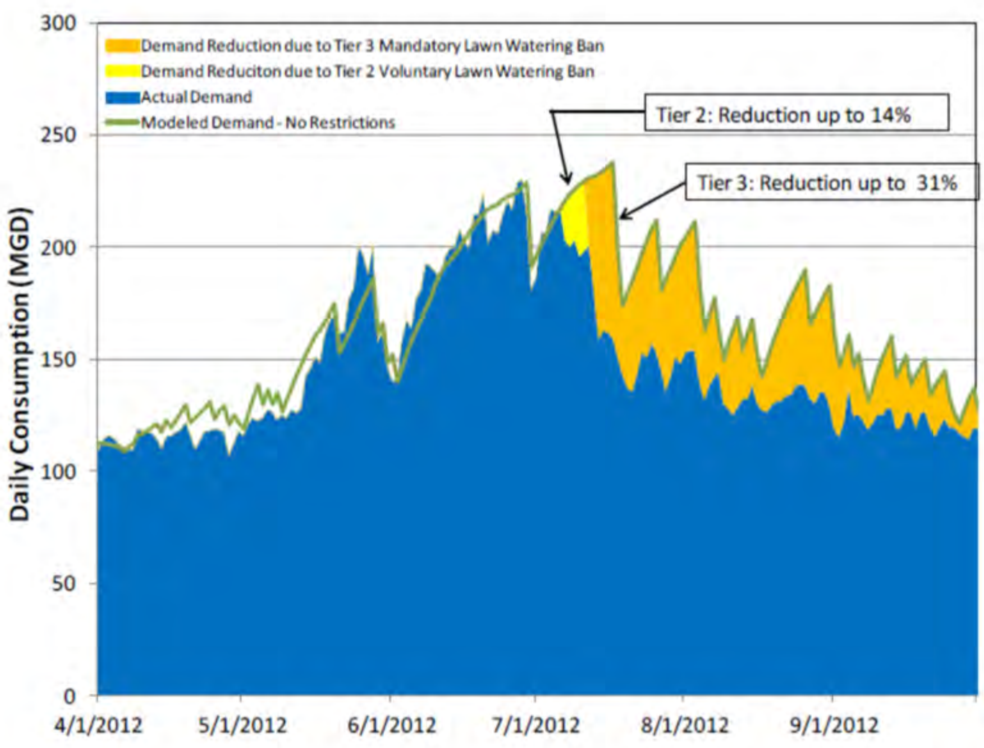
Alternative for decreasing demand – Water conservation

Both sides of the water demand-supply system can be adjusted. Increases in demand in the Summer can potentially be mitigated by voluntary conservation. It is difficult to predict how much demand reduction is achievable without having some historical data from implemented conservation efforts, but we do have some insights about the effect of water conservation during the 2012 drought.

Citizens has documented the impacts of voluntary and mandatory conservation to manage demand in 2012 (CEG, 2013). With a tiered drought response action plan already in place before the drought, the utility was able to effectively manage demand (primarily lawn watering) through their public response to water-shortage triggers. The demand reductions achieved in 2012 were as high as 31%. Peak seasonal demands can successfully be managed with outward-facing communications and public cooperation. This approach is inexpensive and effective and should be a part of any regional supply plan.

Water conservation measures are used throughout the region to encourage people to change behaviors and habits to reduce water use. Water conservation also includes any beneficial reduction in water losses or waste. Water-conservation programs are aimed toward water consumers and can involve technical or financial means and public-education programs. Utilities have worked hard to imbue a conservation ethic in residents, industries, and businesses. Future demand projections show that there is a role for conservation as a component of everyday water use and as a demand-management tool during drought conditions.

Graph taken from Citizen's Drought Management Plan. Shows demand reduction over 30% from voluntary and mandatory lawn watering bans during the drought (CEG,2013).



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DETAILED PROJECT COST ESTIMATE

PROJECT NUMBER: 48CY05691
PROJECT NAME: Cherry Tree Clear Well Expansion
ALTERNATIVE XXXXXXXXX
PREPARED BY: P Johnson
DATE OF ESTIMATE: 3/24/2023
CLASS OF ESTIMATE 4 (20% to 30%)
(Refers to the Typical Contingency Used)

ACCURACY RANGE
L: -15% to -30%
H: +20% to +50%

COST SUMMARY

$	*5,849,757.28*	*TOTAL PROJECT COST ESTIMATE ($)*
$	*773,881.38*	*ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)*
$	*5,075,875.90*	*CONSTRUCTION COST ESTIMATE TOTAL ($)*

DIVISION AND DESCRIPTION	UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
DIV 1-GENERAL REQUIREMENTS						
Submittals	%	1%	1	$ 33,201.70		Percentage of Div 2 through 16
Project Management and Administration	%	1%	1	$ 33,201.70		Percentage of Div 2 through 16
Startup/Testing/Commisioning	%	1%	1	$ 16,600.85		Percentage of Div 2 through 16
Construction Facilities and Temporary Controls	%	0%	1	$ -		Percentage of Div 2 through 16
Project Construction Engineering	%	1%	1	$ 16,600.85		Percentage of Div 2 through 16
Bonds and Insurance	%	1%	1	$ 33,201.70		Percentage of Div 2 through 16
		DIV 1-GENERAL REQUIREMENTS		**SUB TOTAL**	**$ 132,806.80**	
DIV 2-SITE WORK						
Common Excavation	CY	$ 25.00	4896	$ 122,400.00		
Backfill	CY	$ 35.00	2523	$ 88,305.00		
18" DI Overflow Pipe	LS	$ 19,000.00	1	$ 19,000.00		
16" Steel Piping	LF	$ 435.00	10	$ 4,350.00		
24" DI Piping	LF	$ 315.00	146	$ 45,990.00		
18" DI Piping	LF	$ 220.00	195	$ 42,900.00		
146th Street Extention (See attached UE&C Estimate)	LS	$ 809,000.00	1	$ 809,000.00		
8" DI Piping	LF	$ 130.00	0	$ -		
24" BFV	EA	$ 20,000.00	1	$ 20,000.00		
18" BFV	EA	$ 11,000.00	1	$ 11,000.00		
16" BFV	EA	$ 10,000.00	1	$ 10,000.00		
12" GV	EA	$ 3,000.00	0	$ -		
8" GV	EA	$ 1,600.00	0	$ -		
12x8 Tee	EA	$ 2,000.00	0	$ -		
18" PVC Piping	LF	$ 175.00	75	$ 13,125.00		
8" PVC Piping	LF	$ 100.00	25	$ 2,500.00		
4" PVC Piping	LF	$ 50.00	45	$ 2,250.00		
1-1/2" HDPE Piping	LF	$ 18.00	1700	$ 30,600.00		
Fencing	LF	$ 100.00	360	$ 36,000.00		
Access Drive	LF	$ 110.00	45	$ 4,950.00		
Tree Clearing/Restoration	LS	$ 95,300.00	1	$ 95,300.00		
48" Manholes	EA	$ 10,750.00	4	$ 43,000.00		
Septic System Demo	LS	$ 25,000.00	1	$ 25,000.00		
		DIV 2-SITE WORK		**SUB TOTAL**	**$ 1,425,670.00**	
DIV 3-CONCRETE						
500,000-Gal Concrete Tank	CY	$ 1,200.00	800	$ 960,000.00		
Pre-cast Hollow Core Roof Decking	SF	$ 30.00	8380	$ 251,400.00		
CIP Concrete Baffles	CY	$ 1,200.00	220	$ 264,000.00		
		DIV 3-CONCRETE		**SUB TOTAL**	**$ 1,475,400.00**	
DIV 4-MASONRY						
				$ -		
		DIV 4-MASONRY		**SUB TOTAL**	**$ -**	
DIV 5-METALS						
				$ -		
		DIV 5-METALS		**SUB TOTAL**	**$ -**	
DIV 6-WOODS AND PLASTICS						
				$ -		
		DIV 6-WOODS AND PLASTICS		**SUB TOTAL**	**$ -**	
DIV 7-THERMAL AND MOISTURE PROTECTION						
Clearwell Roofing System	SF	16	8380	$ -		
				$ -		
		DIV 7-THERMAL AND MOISTURE PROTECTION		**SUB TOTAL**	**$ -**	
DIV 8-DOORS AND WINDOWS						
48"x48" Access Hatches	EA	$ 12,000.00	4	$ 48,000.00		
				$ -		
		DIV 8-DOORS AND WINDOWS		**SUB TOTAL**	**$ 48,000.00**	
DIV 9-FINISHES						
				$ -		
		DIV 9-FINISHES		**SUB TOTAL**	**$ -**	
DIV 10-SPECIALTIES						
				$ -		
		DIV 10-SPECIALTIES		**SUB TOTAL**	**$ -**	
DIV 11-EQUIPMENT						
6" Vents	EA	$ 1,100.00	6	$ 6,600.00		
Level Sensor	EA	$ 4,500.00	1	$ 4,500.00		
Grinder Pump Station	EA	$ 10,000.00	1	$ 10,000.00		
Control Valve assembly (w/ flow meter and vault)	EA	$ 125,000.00	0	$ -		
Control Valve assembly (w/ vault)	EA	$ 100,000.00	2	$ 200,000.00		
		DIV 11-EQUIPMENT		**SUB TOTAL**	**$ 221,100.00**	
DIV 12-FURNISHINGS						
				$ -		
		DIV 12-FURNISHINGS		**SUB TOTAL**	**$ -**	
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)						
I&C Equipment and Programming	LS	$ 75,000.00	1	$ 75,000.00		
				$ -		
		DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)		**SUB TOTAL**	**$ 75,000.00**	
DIV 14-CONVEYING SYSTEMS						
				$ -		
		DIV 14-CONVEYING SYSTEMS		**SUB TOTAL**	**$ -**	
DIV 15-MECHANICAL						
				$ -		
		DIV 15-MECHANICAL		**SUB TOTAL**	**$ -**	
DIV 16-ELECTRICAL AND COMMUNICATIONS						
Electrical	LS	$ 75,000.00	1	$ 75,000.00		
				$ -		
		DIV 16-ELECTRICAL AND COMMUNICATIONS		**SUB TOTAL**	**$ 75,000.00**	
CONSTRUCTION COST SUB TOTAL ($)					**$ 3,452,976.80**	

Cause No.: 46020
OUCC DR 4-22
Page 2 of 13

DIVISION AND DESCRIPTION		UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
CONTINGENCY (% OF CONSTRUCTION COST SUB TOTAL)		%	20			$ 690,595.36	
MOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)		%	5			$ 172,648.84	
DEMOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)		%	2			$ 69,059.54	
CONTRACTOR MARK UP (% OF CONSTRUCTION COST SUB TOTAL)		%	10			$ 345,297.68	
CONTRACTOR PROFIT (% OF CONSTRUCTION COST SUB TOTAL)		%	10			$ 345,297.68	
CONSTRUCTION COST ESTIMATE TOTAL ($)						$ 5,075,875.90	
REAL ESTATE		ACRE	$ 12,500.00	1	$ 12,500.00		Includes Land+Vendor+Internal
LEGAL	0%	LS			$ -		
PLANNING	0%	LS			$ -		
ENGINEERING/DESIGN	7%	LS	$ 355,311.31	1	$ 355,311.31		
GEOTECHNICAL ENGINEERING	0%	LS			$ -		
SITE/TOPO SURVEY	0%	LS			$ -		
CONSTRUCTION ADMINISTRATION (ENGINEER)	0%	LS			$ -		
CONSTRUCTION INSPECTION (PART TIME)	2%	LS	$ 101,517.52	1	$ 101,517.52		
CONSTRUCTION INSPECTION (FULL TIME)	0%	LS			$ -		
CONSTRUCTION TESTING	0%	LS			$ -		
ENVIRONMENTAL NEEDS	0%	LS			$ -		
DIRECT COSTS (% CONSTRUCTION COST ESTIMATE TOTAL)		%	3		$ 152,276.28		
LOADINGS (% CONSTRUCTION COST ESTIMATE TOTAL)		%	3		$ 152,276.28		
CLOSEOUT	0%	LS			$ -		
ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)						$ 773,881.38	
TOTAL PROJECT COST ESTIMATE ($)						$ 5,849,757.28	

Preliminary Project Cost Estimate

Project #: 48CY06325 Date: 9/6/2023

Project Name: Cherry Tree Raw Water Valves

Item	Unit Cost	Unit	Qty	Cost
Cl2 Feed Equipment	$ 8,000.00	EA	1	$ 8,000.00
16" Butterfly Valves w/ Actuators	$ 20,600.00	EA	2	$ 41,200.00
Valve Installation	$ 50,000.00	LS	1	$ 50,000.00
Bollards	$ 5,000.00	EA	4	$ 20,000.00
Electrical	$ 20,000.00	LS	1	$ 20,000.00
I&C	$ 25,000.00	LS	1	$ 25,000.00
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
Subtotal				$ 164,200.00
Contingency	20%			$ 32,840.00
Design	7%			$ 13,792.80
Real Estate	$ 25,000.00	Acre	0	$ -
Direct & Loadings	10%			$ 21,083.28
Totals				$ 231,916.08

Living Waters Company, Inc
PO Box 402
Monrovia, IN 46157

Quotation

Date	Quote #
8/25/2023	LT-111928

Proposal For:
CITIZENS ENERGY GROUP
ATTN: ACOUNTS PAYABLE
2020 N MERIDIAN STREET
Indianapolis, IN 46202

Contact Name: JON BERRY
Contact Phone:
Contact Email:
Contact Fax:

Terms: Net 30 **FOB:** Monrovia **Submitted By:** HC/lt

Item	Description	Qty	Unit	Unit Cost	Total
WTS10KA1	AUTOMATIC CONTROL KIT W3T100465 ORDERING CODE -S10KA5C5 FRAME TYPE - A LENGTH - 5" GAS TYPE - CL2 ROTAMETER CAPACITY - 50# CONTROL/ACTUATOR -	2	ea	3,041.37	6,082.74
*SP100	MISCELLANEOUS PVC AND TUBING TO INSTALL	1	ea	125.00	125.00
LABOR-HI	INSTALLATION	1	ea	1,400.00	1,400.00

Phone #:	(317) 996-2508	**E-mail:**	sales@livingwatersco.com	**Total** $7,607.74
Fax #:	(317) 996-3093	**Website:**	www.livingwatersco.com	

FLOSOURCE
VALVES | ACTUATION | INSTRUMENTATION | STEAM SPECIALTIES

Quote# 239978-00

1405 Hancel Parkway
Mooresville, IN 46158
800-752-5959
sales@flosource.com

Entered Date	Inside Contact	Quote#
9/13/23	Eric Sessions	239978-00
PO #	**Outside Contact**	**Quote Validity**
	Water Group	30 Days

Bill To	Ship To
Citizens Energy Group PO Box 1220 2020 N. Meridian st. Indianapolis, IN 46202	Citizens Energy Group PO Box 1220 2020 N. Meridian st. Indianapolis, IN 46202

Correspondence To
FloSource, Inc. 1405 Hancel Pkwy Mooresville, IN 46158

Instructions			
Pre Pay & Add Freight			
Ship Point	**Via**	**Shipped**	**Terms**
FloSource, Inc.	OurTruck PPA		Net 30

Notes
Project Ref: CEG Westfield, River Road Well Piping Lead Time: 6-8 weeks ARO. Subject to prior sale.

Minimum Order Amount: $100.00 – Effective 03/14/2022

Line	Product and Description	Order Quantity	Qty UM	Unit Price	Amount(Net)
1	A 16.0 GHM/QX5-HV-MOD-APT/EB96 Non Stock 16" Pratt GHM AWWA 150B MJ x MJ Groundhog Butterfly Valve with 96" Carbon Steel Extended Bonnet (centerline of Valve to actuator base), Limitorque QX5 Elect Mot Act for Modulating Service, Analog Position Feedback, OA Relays, 3/60/460 Power Supply, Mounted/Tested.	2.00	each	20,580.00	41,160.00

1	**Lines Total**	**Total Order Quantity**	**2.00**	**Total:**	**41,160.00**
				Credit Card Surcharge	**0.00**

Terms & Conditions

Industrial Line Card/Municipal Line Card

Return Policy: All returns must be in new, resalable condition, in original packaging, and must be returned within 60 days of purchase. Stock items are subject to a 20% restock charge. Non-stock items and valve assemblies are subject to the return policy of the manufacturer and require written approval. All credits will be applied to future orders. Special orders are non-cancellable, non-returnable. All returns require a RGA issued by FloSource Inc.

Valued FloSource Customer,

FLOSOURCE
VALVES | ACTUATION | INSTRUMENTATION | STEAM SPECIALTIES

This letter is to inform you of an impending remittance change. Beginning immediately, we are going to change our remittance address in order to streamline FloSource accounting operations. Those customers already using the FloSource ACH system will continue utilizing the same process with no changes.

Those customers not utilizing our current ACH process will need to revise the FloSource remittance address, listed below, on their purchase orders and checks moving forward. FloSource will allow a two-month window to implement this address remittance change. However, beginning January 1, 2023, any purchase order received not referencing the new remittance address will be returned for correction prior to processing.

FloSource, Inc.
PO BOX 88808
Milwaukee, WI 53288-8808

Please note that this change in our remittance address will not affect current credit terms. All terms and conditions regarding remittance will remain the same except the address listed above. We value your business and look forward to a smooth transition.

If you have any questions, please contact ar@flosource.com

DETAILED PROJECT COST ESTIMATE

PROJECT NUMBER: 48MW06291
PROJECT NAME: Miscellaneous Improvements
ALTERNATIVE XXXXXXXXX
PREPARED BY: PAJ
DATE OF ESTIMATE: 1/20/2023
CLASS OF ESTIMATE 5 (30% to 40%)
(Refers to the Typical Contingency Used)

ACCURACY RANGE
L: -20% to -50%
H: +30% to +100%

COST SUMMARY
$ 97,897.61 TOTAL PROJECT COST ESTIMATE ($)
$ 19,354.33 ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)
$ 78,543.28 CONSTRUCTION COST ESTIMATE TOTAL ($)

DIVISION AND DESCRIPTION	UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
DIV 1-GENERAL REQUIREMENTS						
Submittals	%	1%	1	$ 498.69		Percentage of Div 2 through 16
Project Management and Administration	%	1%	1	$ 498.69		Percentage of Div 2 through 16
Startup/Testing/Commisioning	%	1%	1	$ 498.69		Percentage of Div 2 through 16
Construction Facilities and Temporary Controls	%	0%	1	$ -		Percentage of Div 2 through 16
Project Construction Engineering	%	1%	1	$ 498.69		Percentage of Div 2 through 16
Bonds and Insurance	%	1%	1	$ 498.69		Percentage of Div 2 through 16
DIV 1-GENERAL REQUIREMENTS				**SUB TOTAL**	**$ 2,493.44**	
DIV 2-SITE WORK						
Wet Excavation	CYS	$ 91.25	15	$ 1,368.75		
Concrete Cutting (crocks)	LFT	$ 250.00	8	$ 2,000.00		
Riprap, Revetment, placed	SYS	$ 350.00	2	$ 700.00		
Stainless Steel Weir Plates	EA	$ 1,375.00	2	$ 2,750.00		
Aluminum Portable Walkway, 48" wide with Railing	EA	$ 3,050.00	1	$ 3,050.00		
Temporary Dewatering	LS	$ 10,500.00	1	$ 10,500.00		
DIV 2-SITE WORK				**SUB TOTAL**	**$ 20,368.75**	
DIV 3-CONCRETE						
DIV 3-CONCRETE				**SUB TOTAL**	**$ -**	
DIV 4-MASONRY						
DIV 4-MASONRY				**SUB TOTAL**	**$ -**	
DIV 5-METALS						
DIV 5-METALS				**SUB TOTAL**	**$ -**	
DIV 6-WOODS AND PLASTICS						
DIV 6-WOODS AND PLASTICS				**SUB TOTAL**	**$ -**	
DIV 7-THERMAL AND MOISTURE PROTECTION						
DIV 7-THERMAL AND MOISTURE PROTECTION				**SUB TOTAL**	**$ -**	
DIV 8-DOORS AND WINDOWS						
DIV 8-DOORS AND WINDOWS				**SUB TOTAL**	**$ -**	
DIV 9-FINISHES						
DIV 9-FINISHES				**SUB TOTAL**	**$ -**	
DIV 10-SPECIALTIES						
DIV 10-SPECIALTIES				**SUB TOTAL**	**$ -**	
DIV 11-EQUIPMENT						
Level Sensor, ultrasonic	EA	$ 2,500.00	1	$ 2,500.00		
DIV 11-EQUIPMENT				**SUB TOTAL**	**$ 2,500.00**	
DIV 12-FURNISHINGS						
DIV 12-FURNISHINGS				**SUB TOTAL**	**$ -**	
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)						
SCADA Integration/programming	LS	$ 15,000.00	1	$ 15,000.00		
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)				**SUB TOTAL**	**$ 15,000.00**	
DIV 14-CONVEYING SYSTEMS						
DIV 14-CONVEYING SYSTEMS				**SUB TOTAL**	**$ -**	
DIV 15-MECHANICAL						
				$ -		
DIV 15-MECHANICAL				**SUB TOTAL**	**$ -**	
DIV 16-ELECTRICAL AND COMMUNICATIONS						
Electrical wiring	LS	$ 12,000.00	1	$ 12,000.00		
				$ -		
DIV 16-ELECTRICAL AND COMMUNICATIONS				**SUB TOTAL**	**$ 12,000.00**	
CONSTRUCTION COST SUB TOTAL ($)					**$ 52,362.19**	
CONTINGENCY (% OF CONSTRUCTION COST SUB TOTAL)	%	20			**$ 10,472.44**	
MOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	5			**$ 2,618.11**	
DEMOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	5			**$ 2,618.11**	
CONTRACTOR MARK UP (% OF CONSTRUCTION COST SUB TOTAL)	%	10			**$ 5,236.22**	
CONTRACTOR PROFIT (% OF CONSTRUCTION COST SUB TOTAL)	%	10			**$ 5,236.22**	
CONSTRUCTION COST ESTIMATE TOTAL ($)					**$ 78,543.28**	

REAL ESTATE		ACRE			$ -		Includes Land+Vendor+Internal
LEGAL	0%	LS			$ -		
PLANNING	0%	LS			$ -		
ENGINEERING/DESIGN	10%	LS	$ 7,500.00	1	$ 7,500.00		
GEOTECHNICAL ENGINEERING	0%	LS			$ -		
SITE/TOPO SURVEY	0%	LS			$ -		
CONSTRUCTION ADMINISTRATION (ENGINEER)	0%	LS			$ -		
CONSTRUCTION INSPECTION (PART TIME)	5%	LS	$ 4,000.00	1	$ 4,000.00		
CONSTRUCTION INSPECTION (FULL TIME)	0%	LS			$ -		
CONSTRUCTION TESTING	0%	LS			$ -		
ENVIRONMENTAL NEEDS	0%	LS			$ -		
DIRECT COSTS (% CONSTRUCTION COST ESTIMATE TOTAL)		%	5		$ 3,927.16		
LOADINGS (% CONSTRUCTION COST ESTIMATE TOTAL)		%	5		$ 3,927.16		
CLOSEOUT	0%	LS			$ -		
ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)						**$ 19,354.33**	
TOTAL PROJECT COST ESTIMATE ($)						**$ 97,897.61**	

Indiana Reclamation & Excavating, Inc.
7720 Records Street
Indianapolis, IN 46226
(317)926-3770

September 7, 2023

Citizens Energy Group
Attn: Paul Johnson

Estimate: Re Grade mounds around 3 Wells

Work to be performed:

- Grade around 3 wells to prevent water from sitting on top of mound
    - Install stone drainage channel at each mound
- Grass seed, fertilize, and straw mat each location
- IRE will hire for private locates around wells

➢ Quote is good for 60 days

Total Cost: $4,744.80 + any permit/paperwork fees if required

Respectfully submitted,
Jake Allen
Vice President

AAA Roofing Co., Inc.
910 N Highland Ave
Indianapolis, IN 46202
Phone: (317) 635-2928
Fax: (317) 685-8876
www.aaaroofingcompany.com

Issued To:

CITIZENS ENERGY
2020 N MERIDIAN ST
INDIANAPOLIS, IN 46202

Date: 11/6/2023

Building:
SOUTH MADISON PLANT CITIZENS
5309 S STATE ROAD 13
LAPEL, IN 46051

Commercial Service - Leak Investigation

Work to be Performed:

1) Tear off shingle roof down to wood deck.
2) Install new 15# felt paper.
3) Install new ice and water along the edge.
4) Install new continuous ridge vent.
5) Install new pipe boots.
6) Install new flashing around the skylights.
7) Install new 30 year architectural shingles. Color to best match current.

Price: $7,610.00

- **Any wood deck replacement would be 75.00 a sheet.**

I hereby approve the work specifically as stated above and agree to the standard 30 day invoice terms of AAA Roofing Co., Inc.. Work to be scheduled within 30 days of receipt of this signed proposal and authorization to proceed with work.

I, ______________________________ authorize the above proposal on ___________20____

____
Authorized Signature

DETAILED PROJECT COST ESTIMATE

PROJECT NUMBER: 48SS04086
PROJECT NAME: River Road Well 17
ALTERNATIVE XXXXXXXXX
PREPARED BY: P. Johnson
DATE OF ESTIMATE: 1/20/2023
CLASS OF ESTIMATE 5 (30% to 40%)
(Refers to the Typical Contingency Used)

ACCURACY RANGE
L: -20% to -50%
H: +30% to +100%

COST SUMMARY

$	1,351,774.00	TOTAL PROJECT COST ESTIMATE ($)
$	197,434.00	ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)
$	1,154,340.00	CONSTRUCTION COST ESTIMATE TOTAL ($)

DIVISION AND DESCRIPTION	UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
DIV 1-GENERAL REQUIREMENTS						
Submittals	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Project Management and Administration	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Startup/Testing/Commisioning	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Construction Facilities and Temporary Controls	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Project Construction Engineering	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
Bonds and Insurance	%	1%	1	$ 8,712.00		Percentage of Div 2 through 16
DIV 1-GENERAL REQUIREMENTS				**SUB TOTAL**	$ 52,272.00	
DIV 2-SITE WORK						
Meter Vault and Piping	LS	$ 120,000.00	1	$ 120,000.00		
New well site and piping	LS	$ 325,000.00	1	$ 325,000.00		
				$ -		
DIV 2-SITE WORK				**SUB TOTAL**	$ 445,000.00	
DIV 3-CONCRETE						
DIV 3-CONCRETE				**SUB TOTAL**	$ -	
DIV 4-MASONRY						
				$ -		
DIV 4-MASONRY				**SUB TOTAL**	$ -	
DIV 5-METALS						
				$ -		
DIV 5-METALS				**SUB TOTAL**	$ -	
DIV 6-WOODS AND PLASTICS						
				$ -		
DIV 6-WOODS AND PLASTICS				**SUB TOTAL**	$ -	
DIV 7-THERMAL AND MOISTURE PROTECTION						
				$ -		
DIV 7-THERMAL AND MOISTURE PROTECTION				**SUB TOTAL**	$ -	
DIV 8-DOORS AND WINDOWS						
				$ -		
DIV 8-DOORS AND WINDOWS				**SUB TOTAL**	$ -	
DIV 9-FINISHES						
				$ -		
DIV 9-FINISHES				**SUB TOTAL**	$ -	
DIV 10-SPECIALTIES						
				$ -		
DIV 10-SPECIALTIES				**SUB TOTAL**	$ -	
DIV 11-EQUIPMENT						
Flow Meter	EA	$ 12,500.00	2	$ 25,000.00		
Valves	EA	$ 11,200.00	1	$ 11,200.00		
24-inch Well	EA	$ 95,000.00	1	$ 95,000.00		
Well Pump and Motor	EA	$ 105,000.00	1	$ 105,000.00		
				$ -		
DIV 11-EQUIPMENT				**SUB TOTAL**	$ 236,200.00	
DIV 12-FURNISHINGS						
				$ -		
DIV 12-FURNISHINGS				**SUB TOTAL**	$ -	
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)						
Well Instrumentation	LS	$ 55,000.00	1	$ 55,000.00		
				$ -		
DIV 13-SPECIAL CONSTRUCTION (INCLUDES INSTRUMENTATION AND CONTROL)				**SUB TOTAL**	$ 55,000.00	
DIV 14-CONVEYING SYSTEMS						
				$ -		
DIV 14-CONVEYING SYSTEMS				**SUB TOTAL**	$ -	
DIV 15-MECHANICAL						
				$ -		
DIV 15-MECHANICAL				**SUB TOTAL**	$ -	
DIV 16-ELECTRICAL AND COMMUNICATIONS						
Electrical Feed/Transformer	LS	$ 35,000.00	1	$ 35,000.00		
Electrical Connections and Equipment	LS	$ 100,000.00	1	$ 100,000.00		
				$ -		
DIV 16-ELECTRICAL AND COMMUNICATIONS				**SUB TOTAL**	$ 135,000.00	
CONSTRUCTION COST SUB TOTAL ($)					$ 923,472.00	
CONTINGENCY (% OF CONSTRUCTION COST SUB TOTAL)	%	5			$ 46,173.60	
MOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	2			$ 18,469.44	
DEMOBILIZATION (% OF CONSTRUCTION COST SUB TOTAL)	%	1			$ 9,234.72	
CONTRACTOR MARK UP (% OF CONSTRUCTION COST SUB TOTAL)	%	7			$ 64,643.04	
CONTRACTOR PROFIT (% OF CONSTRUCTION COST SUB TOTAL)	%	10			$ 92,347.20	
CONSTRUCTION COST ESTIMATE TOTAL ($)					$ 1,154,340.00	

REAL ESTATE		ACRE			$ -		Includes Land+Vendor+Internal
LEGAL	0%	LS			$ -		
PLANNING	0%	LS			$ -		
ENGINEERING/DESIGN	5%	LS	$ 55,000.00	1	$ 55,000.00		
GEOTECHNICAL ENGINEERING	2%	LS	$ 27,000.00	1	$ 27,000.00		
SITE/TOPO SURVEY	0%	LS			$ -		
CONSTRUCTION ADMINISTRATION (ENGINEER)	0%	LS			$ -		
CONSTRUCTION INSPECTION (PART TIME)	0%	LS			$ -		
CONSTRUCTION INSPECTION (FULL TIME)	0%	LS			$ -		
CONSTRUCTION TESTING	0%	LS			$ -		
ENVIRONMENTAL NEEDS	0%	LS			$ -		
DIRECT COSTS (% CONSTRUCTION COST ESTIMATE TOTAL)		%	5		$ 57,717.00		

Cause No.: 46020
OUCC DR 4-22
Page 11 of 13

DIVISION AND DESCRIPTION		UNITS	UNIT PRICE	QTY	TOTAL COST		COMMENTS
LOADINGS (% CONSTRUCTION COST ESTIMATE TOTAL)		**%**	5		$ 57,717.00		
CLOSEOUT	0%	**LS**			$ -		
ENGINEERING, LEGAL, ENVIRONMENTAL, LOADINGS AND REAL ESTATE COSTS ($)						**$ 197,434.00**	
TOTAL PROJECT COST ESTIMATE ($)						**$ 1,351,774.00**	

Cause No.: 46020
OUCC DR 4-22
Page 12 of 13

Preliminary Project Cost Estimate

Project #: 48SS06378 Date: 10/24/2023

Project Name: WF 2024 Well Rehabilitation

Item	Unit Cost	Unit	Qty	Cost
Double--Disk Surge Cleaning	$ 15,500.00	EA	5	$ 77,500.00
Pump Repairs/Replacements	$ 30,000.00	EA	3	$ 90,000.00
Misc Well Equipment Repairs	$ 12,000.00	EA	3	$ 36,000.00
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
Subtotal				$ 203,500.00
Contingency	0%			$ -
Design	0%			$ -
Real Estate	$ 25,000.00	Acre	0	$ -
Direct & Loadings	10%			$ 20,350.00
Totals				$ 223,850.00

Preliminary Project Cost Estimate

Project #: 48SS06403 Date: 10/30/2023

Project Name: WF 2025 Well Rehabilitation

Item	Unit Cost	Unit	Qty	Cost
Double--Disk Surge Cleaning	$ 15,500.00	EA	6	$ 93,000.00
Pump Repairs/Replacements	$ 30,000.00	EA	4	$ 120,000.00
Misc Well Equipment Repairs	$ 12,000.00	EA	2	$ 24,000.00
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
Subtotal				$ 237,000.00
Contingency	0%			$ -
Design	0%			$ -
Real Estate	$ 25,000.00	Acre	0	$ -
Direct & Loadings	5%			$ 11,850.00
Totals				$ 248,850.00

Citizens Energy Group
Water Main Replacement and Extensions Cost Template
Project Name: 146th St Interconnect - Alt 2 - Mainly HDD Construction
Date: 4/13/2023
ENR CCI: **13230** **ENR CCI Date: Apr '23** **Grout**

Item	Unit	Quantity	Material Cost/Unit Subtotal	Material Cost/Unit[1]	Labor Cost/Unit	Labor Escalation Factor (%)	Total Cost/Unit[2]	Total Cost
Mobilization/Demobilization (5%)	LS							25982.5
In Pavement Construction[3]								
3-inch HDPE[4]	LF		$ 3	$ 3	$ 68		$ 70	$ -
8-inch HDPE	LF		$ 15	$ 17	$ 109		$ 125	$ -
8-inch Ductile Iron[5]	LF	50	$ 32	$ 37	$ 245	100%	$ 280	$ 14,000
8-inch Restrained Joint (Certa Lok) PVC[6]	LF		$ 39	$ 45	$ 109		$ 155	$ -
8-inch Push-on Joint (C900) PVC[7]	LF		$ 12	$ 14	$ 245		$ 260	$ -
12-inch HDPE	LF		$ 32	$ 37	$ 126		$ 165	$ -
12-inch Ductile Iron	LF		$ 50	$ 57	$ 258		$ 315	$ -
16-inch HDPE	LF	1450	$ 56	$ 64	$ 150	100%	$ 215	$ 311,750
16-inch Ductile Iron	LF		$ 80	$ 93	$ 316		$ 410	$ -
Outside of Pavement Construction								
3-inch HDPE	LF		$ 3	$ 3	$ 62		$ 65	$ -
8-inch HDPE	LF		$ 15	$ 17	$ 99		$ 115	$ -
8-inch Ductile Iron	LF	100	$ 32	$ 37	$ 99	100%	$ 135	$ 13,500
8-inch Restrained Joint (Certa Lok) PVC	LF		$ 39	$ 45	$ 99		$ 145	$ -
8-inch Push-on Joint (C900) PVC	LF		$ 12	$ 14	$ 99		$ 115	$ -
12-inch HDPE	LF		$ 32	$ 37	$ 113		$ 150	$ -
12-inch Ductile Iron	LF		$ 50	$ 57	$ 109		$ 165	$ -
16-inch HDPE	LF		$ 56	$ 64	$ 135		$ 200	$ -
16-inch Ductile Iron	LF		$ 80	$ 93	$ 128		$ 220	$ -
Valves								
4-inch Gate Valve	EA		$ 424	$ 487	$ 552	N/A	$ 1,100	$ -
6-inch Gate Valve	EA		$ 546	$ 628	$ 690	N/A	$ 1,400	$ -
8-inch Gate Valve	EA	1	$ 843	$ 970	$ 828	N/A	$ 1,800	$ 1,800
10-inch Gate Valve	EA		$ 1,237	$ 1,423	$ 966	N/A	$ 2,400	$ -
12-inch Gate Valve	EA		$ 1,568	$ 1,803	$ 1,104	N/A	$ 3,000	$ -
16-inch Butterfly Valve	EA		$ 5,057	$ 5,816	$ 1,241	N/A	$ 7,100	$ -
Miscellaneous[8]								
Hydrant Assembly[9]	EA	3	$ 3,969	$ 3,969	$ 2,206	N/A	$ 6,200	$ 18,600
Residential Tap to Right-of-Way Service Line[10]	EA		$ 374	$ 430	$ 5,283	N/A	$ 6,000	$ -
Residential Tap to Home for Lead Service Line[11]	EA		N/A	N/A	N/A	N/A	$ 8,000	$ -
Environmental Site Assessment	EA		N/A	N/A	N/A	N/A	$ 3,200	$ -
Stream Crossing Riffle Alternative 3 year Mitigation	YR		N/A	N/A	N/A	N/A	$ 5,000	$ -
12-inch control valve and meter	LS	1			$ 120,000	N/A	$ 120,000	$ 120,000
Misc Construction	LS	1			$ 25,000	N/A	$ 25,000	$ 25,000
Restoration	LS	1			$ 15,000	N/A	$ 15,000	$ 15,000
						N/A	$ -	$ -
						N/A	$ -	$ -
							Material Subtotal	$ 111,120
							Labor Subtotal[12]	$ 448,514
							Construction Subtotal (Rounded)	$ 560,000
Contingency and Incidentals[13]		30%						$ 168,000
Close Out[14]								$ 5,000
							Construction Total	**$ 733,000**
Permanent Easement - Hamilton and Marion Co.	SF						$ 1.00	$ -
Easement Legal/Recording Fees	EA						$ 4,000	$ -
Real Estate Direct		30%						$ -
							Real Estate Total	**$ -**
Consulting/Engineering Fees		8%						$ 58,240
Inspection Fees		3%						$ 21,840
							Design Total	**$ 81,000**
Direct Costs[15,16]		6%						$ 48,540
Allocations[17,18]		5%						$ 40,450
							Estimate at Completion (Rounded)	**$ 903,000**

[1]Includes 15% for fittings
[2]400% Escalation factor for projects less than or equal to 500 linear feet
[3]Use 'in pavement' costs when the project is within 5' of the pavement or will likely damage the street
[4]HDPE uses Horizontal Directional Drilling (HDD) installation method
[5]Ductile Iron uses Open Cut installation method
[6]Certa Lok PVC uses HDD installation method
[7]C900 PVC uses Open Cut installation method
[8]Specify miscellaneous items with their unit, quantity, and cost per unit
[9]Cost includes swivel tee, valve, hydrant branch, and hydrant
[10]Assumes in-pavement 50 LF of 3/4-inch HDPE material, tap, and installation of meter pit and meter setting but excludes restoration.
[11]Assumes full length replacement of a service line and connecting inside the home.
[12]Uses ENR Construction Cost Index
[13]Use Contingencies based on Reference Table 1