INDIANA-AMERICAN WATER COMPANY, INC.

DIRECT TESTIMONY

OF

MATTHEW H. HOBBS, II

SPONSORING ATTACHMENTS MHH-1 THROUGH MHH-24

March 31, 2023

DIRECT TESTIMONY

OF

MATTHEW H. HOBBS, II

INTRODUCTION

Q. Please state your name and business address.

A. My name is Matthew H. Hobbs, II. My business address is 153 North Emerson Avenue, Greenwood, Indiana 46143.

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

A. I am employed by Indiana-American Water Company, Inc. ("Indiana-American", or "Company") as Director of Engineering.

Q. What do your job responsibilities include?

A. My job responsibilities are to lead and direct a staff of engineering personnel at Indiana-American to deliver planning, design, and construction of source of supply, treatment, production, transmission, and distribution facilities for Indiana-American, and to provide engineering support to daily operations.

Q. What is your educational background?

A. I received a Bachelor of Science Degree in Agricultural and Biological Engineering from Purdue University in 2003.

Q. Are you a Registered Professional Engineer?

A. Yes, I maintain an active Registered Professional Engineer status in Indiana and Illinois.

Q. Please describe your business experience in the water utility industry.

A. From 2004 to 2006 I was employed with the Indiana Department of Natural Resources as a water and wastewater project engineer. My job responsibilities were planning, designing, and managing construction of water and wastewater facilities for the State of Indiana. From 2006 to 2023, I was employed with HNTB Corporation as a project engineer, project manager, and engineering manager. My job responsibilities were managing a staff of engineering personnel to deliver planning, design, and construction of water and wastewater projects. From February 2023 to present, I have been employed with Indiana-American Water as Director of Engineering as described earlier in this testimony.

Q. Are you generally familiar with the business, facilities, and the operations of the Company in each of its districts?

A. Yes.

Q. Are you generally familiar with how the Company's capital investments are reflected in the Company's books and records?

A. Yes.

Q. Are all the facilities that are included in the utility plant accounts of Indiana-American in service and reasonably necessary for the provisions of safe and reliable water or wastewater service?

A. Yes.

Q. What is the purpose of your testimony?

A. I will explain Indiana-American's capital investment planning process and describe and support the Company's investments in water and wastewater utility plant and equipment since the last base rate case (valuation as of April 30, 2020) through the future test year ending April 30, 2025. Although my testimony will highlight certain capital projects through the end of the future test year, all of our capital investments, including our recurring projects, are reasonable and necessary to continue to provide safe and reliable water and wastewater service for the benefit of our customers. I also describe the Company's plans to develop future sources of supply.

Q. Please identify all Attachments and Workpapers included with your Direct Testimony.

A. A list of Attachments and Workpapers is provided in Table 1.

Table 1: List of Attachments and Workpapers

Document Reference	Document Description
Attachment MHH-1	Locations of Indiana-American's Operations throughout Indiana
Attachment MHH-2	Strategic Capital Expenditure Plan ("SCEP")
Attachment MHH-3	In-Service Capital Additions Over $500,000
Attachment MHH-4	Forecasted Capital Additions Over $500,000
Attachment MHH-5	Enterprise Solutions Additions Over $500,000
Attachment MHH-6	Recurring Capital Investments That Are Individually Less than $500,000
	MAJOR PROJECTS
	I10-250018 - Winchester WTP
Attachment MHH-7 CONFIDENTIAL	2020 WIN Comprehensive Planning Study, Projects A-1, A-2, A-3, B-1, B-2, and B-4
Attachment MHH-8	Winchester Aeralator Evaluation, TIC, 2020
Attachment MHH-9	Structural Assessment Summary, INAW, 2020
Attachment MHH-10 CONFIDENTIAL	Design-Build Request for Proposals with Addenda 1
Attachment MHH-11 CONFIDENTIAL	Design-Build Proposal - Bowen
Attachment MHH-12 CONFIDENTIAL	Design-Build Proposal - Reynolds
Attachment MHH-13 CONFIDENTIAL	Detailed Estimate of Cost
	I10-100018 - Sheridan WTP
Attachment MHH-14 CONFIDENTIAL	DRAFT SHER Comprehensive Planning Study, Project A-2

Document Reference	Document Description
Attachment MHH-15 CONFIDENTIAL	DRAFT SHER Comprehensive Planning Study, Project A-3 and A-4
Attachment MHH-16 CONFIDENTIAL	Design-Build Request for Proposals with Addenda 1 and 2
Attachment MHH-17 CONFIDENTIAL	Design-Build Proposal - Reynolds (Awarded)
Attachment MHH-18 CONFIDENTIAL	Design-Build Proposal - Bowen
Attachment MHH-19 CONFIDENTIAL	Design-Build Proposal - Kokosing
Attachment MHH-20 CONFIDENTIAL	Basis of Design Memo
Attachment MHH-21 CONFIDENTIAL	Design Drawings 90-Percent
Attachment MHH-22 CONFIDENTIAL	Specifications 90-Percent
Attachment MHH-23 CONFIDENTIAL	Detailed Estimate of Cost
	FUTURE SOURCES OF SUPPLY
Attachment MHH-24	Future Sources of Supply Plans
	WORKPAPERS OVER 5M (IN-SERVICE)
	I10-500005 - Crawfordsville Montgomery County Trans Main Ph. 2
Workpaper MHH-1	Technical Memorandum - CRW New Tank Analysis, Kurtz Engineering, 2021
Workpaper MHH-2	Technical Memorandum - CRW HSPs No. 2 Analysis, Kurtz Engineering, 2021
Workpaper MHH-3	Technical Memorandum - CRW Pipe Sizing Analysis, Kurtz Engineering, 2021
Workpaper MHH-4	Agreement between INAW and Montgomery County with Addendum
Workpaper MHH-5	Arcadis Modeling Analysis DRAFT - Water Main Extension, 2021
	I10-110001- Kokomo Wastewater Sheridan WWTP Improvements
Workpaper MHH-6 CONFIDENTIAL	Wessler Preliminary Engineering Report Sheridan WWTP
	WORKPAPERS OVER 5M (FORECASTED)
	I10-600021 - Noblesville Olio Rd EST & Distribution Improvements
Workpaper MHH-7	Technical Memorandum - High Gradient Phase 1 Improvements - Kurtz Engineering, 2023
	I10-750018 - Southern IN REI Veterans Parkway to Blackiston Mill
Workpaper MHH-8 CONFIDENTIAL	2011 SIO Comprehensive Planning Study, Project B-5

Document Reference	Document Description
Workpaper MHH-9	Technical Memorandum - New Albany System Reliability Evaluation, INAW 2023
	I10-100019 - Kokomo Sheridan Interconnect-EST to Springmill
Workpaper MHH-10	KOK Sheridan Transmission Main - INAW-HCRUD Wholesale Agreement
	I10-900061 - NWI Winfield EST & Pump Station
Workpaper MHH-11 CONFIDENTIAL	2017 NWIO Comprehensive Planning Study, Project B-9
	I10-470007 - West Lafayette 1.0 MG Elevated Storage Tank
Workpaper MHH-12 CONFIDENTIAL	2020 WLF Comprehensive Planning Study, Project A-1
Workpaper MHH-13 CONFIDENTIAL	2020 WLF Comprehensive Planning Study, Project A-4
	I10-900069 - Northwest Ogden Dunes Water Treatment Facility Chlorine Conversion
Workpaper MHH-14 CONFIDENTIAL	2017 NWIO Comprehensive Planning Study, Project A-4
Workpaper MHH-15 CONFIDENTIAL	Design-Build Request for Proposals with Addenda 1 and 2
Workpaper MHH-16 CONFIDENTIAL	Design-Build Proposal - Bowen (Awarded)
Workpaper MHH-17 CONFIDENTIAL	Design-Build Proposal - Reynolds
Workpaper MHH-18 CONFIDENTIAL	Design-Build Proposal - Thieneman
	WORKPAPERS LESS THAN 5M
Workpaper MHH-19 CONFIDENTIAL	I10-900050 - Northwest Borman Park Electrical Gear Replacement Feasibility Study, 2018
Workpaper MHH-20 CONFIDENTIAL	I10-900050 - 2017 NWIO Comprehensive Planning Study, Project A-2
Workpaper MHH-21	I10-600020 - Noblesville Washwater Tank Evaluation, TIC, 2020
Workpaper MHH-22	I10-700016 - Terre Haute Reinforcement Airport Main, Kurtz Engineering, 2022
Workpaper MHH-23	I10-700013 - Terre Haute Merom EST - TIC Evaluation, 2014
Workpaper MHH-24	I10-700013 - Terre Haute Merom EST - TIC Condition Assessments, 2019
Workpaper MHH-25	I10-250004 - Richmond Middle Fork Reservoir Assessment, Gannett Fleming, 2022
Workpaper MHH-26	I10-750021-02 - REP SIO Veterans Parkway Phase 2 Reliability Evaluation
Workpaper MHH-27 CONFIDENTIAL	I10-700011 - 2011 TER Comprehensive Planning Study, Project A-3

Document Reference	Document Description
Workpaper MHH-28 CONFIDENTIAL	I10-470008 - 2020 WLF Comprehensive Planning Study, Project A-1
Workpaper MHH-29	I10-450007-Wabash Summitville - IDEM Sanitary Survey Inspection Letter, 2019
Workpaper MHH-30	I10-450007-Wabash Summitville - INAW Inspection Summary Response, 2019
Workpaper MHH-31 CONFIDENTIAL	I10-450007 - 1996 SUM Comprehensive Planning Study, Project B-2

CAPITAL ADDITIONS – INVESTMENT PLANNING

Q. Please describe Indiana-American Operations.

A. Indiana-American provides water utility service to customers throughout the State of Indiana. The Company serves approximately 328,000 water customers and 2,400 wastewater customers. Petitioner's Attachment MHH-1 details the locations of Indiana-American operations throughout the State of Indiana.

Q. Please describe the Company's capital investment planning.

A. The Company employs standardized capital investment planning practices in identifying and planning capital investment priorities and for developing its capital investment plan. Indiana-American conducts comprehensive planning studies ("CPS") to assess and make project recommendations for its capital assets and evaluates capital needs on an ongoing basis to assess any changed circumstances and ensure that appropriate projects are being prioritized. Capital investment programs and projects are prioritized within an overall strategic planning process, utilizing drivers associated with various asset investment strategies (such as safety, regulatory compliance, capacity, resiliency, reliability, etc.) to formulate a five-year strategic capital investment plan (or Strategic Capital Expenditure Plan ("SCEP"), which largely supports the Company's capital construction plan. The prioritization of capital investment projects is a key input in developing and updating the SCEP on an annual basis. The Company's current SCEP is included as Attachment MHH-2.

Q. Please describe the CPS process and project prioritization activities in more detail.

A. The Company's CPS process includes a thorough evaluation of demand projections, regulatory requirements, asset service reliability and quality, replacement of aged infrastructure, asset impacts on safety and efficiency, public fire protection, and environmental sustainability. The CPSs identify, assess, and make project recommendations for the Company's capital assets on a fifteen-year planning horizon and include a thorough planning level evaluation of each component of utility infrastructure. The Company also completes separate studies or evaluations for specific capital projects that emerge between updates of each Company CPS. Capital investment projects are identified and are prioritized using asset investment strategy considerations of safety, regulatory compliance, capacity and growth, infrastructure renewal, efficiency, resiliency, reliability, and quality of service. The comprehensive planning studies and prioritization of identified capital investment projects are key inputs to the Company's five-year capital investment plan, which also considers affordability and impact on customer rates. Because of the specific nature of the large asset class of distribution system pipe, the Company completes a separate distinct evaluation for identifying capital investment priorities in the distribution system. This evaluation is a detailed prioritization modeling of the distribution system piping, evaluating service risks associated with pipeline failure risks for all pipes in the Company's approximately 5,200 miles of piping.

Q. Please describe the distribution system prioritization modeling in more detail.

A. The Company has created and implemented a Geographic Information System ("GIS") based prioritization model using GIS software and prioritization modeling software for identifying and prioritizing pipeline replacement investments across its approximately 5,200 miles of piping. The model prioritizes pipeline replacements through identification of service risks associated with pipe failure risks. Pipe failure risks are identified through pipe failure history, pipe material type, decade the pipe was installed, and pipe diameter. Pipe failure history is a significant input into the pipe replacement prioritization model. These pipe failures are identified during the Company's unscheduled pipe replacement projects and are also identified during pipe repair work. Pipe failures are collected and tracked by MapCall and imported into the Company's GIS system. Consequences of pipe failures are also an input to the prioritization model. Consequences of pipe failures include impacts to customers.

Q. How does the Company develop and update its five-year capital investment plan?

A. Investment projects are profiled in the five-year capital investment plan to address priorities in an appropriate time frame. For example, infrastructure capacity expansion investment projects are scheduled based on when demand projections indicate the capacity will be needed. Capital investment projects to meet environmental or water quality regulations are scheduled for completion before compliance deadlines while allowing adequate time for testing and operational performance monitoring of new assets ahead of key regulatory dates to ensure compliance, and to ensure necessary process adjustments can be successfully implemented through varying operating conditions. Rehabilitation projects for service reliability are scheduled with consideration of existing asset characteristics, and risks and impacts of failure on service quality.

Q. Please describe how Indiana-American plans for Main Relocations specifically, and how that impacts the overall capital investment plan.

A. Main relocations result from conflicts of existing pipes and appurtenances with government road, sewer, or other similar or related projects. Indiana-American plans and projects annual main relocation investments based on knowledge of existing road and utility projects in progress and in planning phases, and in part on operational experience of the amount of these projects that emerge during the course of a given year. As a year progresses, Indiana-American updates its projection of relocation investment for that year based on updated status of government projects and based on status of newly emerged government projects during the year. If the updated projection of main relocation investment for the year is lower than the amount originally projected for the year then Indiana-American adjusts its plan to complete fewer main relocations, and correspondingly adjusts its plan to complete more main replacements or other priority investments, while managing the overall capital expenditure to within the overall capital investment plan. Conversely, if, as the year progresses, the updated projection of main relocation investment for the year is higher than the amount originally projected for the year then Indiana-American adjusts it plan to complete the higher amount of main relocations, and correspondingly adjusts its plan to complete fewer main replacements or other investments, while managing the overall capital expenditure to within the overall capital investment plan.

Q. Please describe the general project categories in the Company's capital investment plan.

A. The Company's capital investment plan can be divided into two distinct areas: recurring projects ("RPs" or "RP") and investment projects ("IPs" or "IP"). RPs are designated as such because they are the type of capital projects that the Company undertakes on a frequent and regular basis, require less long-term financial and capital planning than an IP, and can be performed with either the Company's current workforce or existing contractors. IPs on the other hand, are typically projects that require a more significant amount of planning and capital resources. Whether RPs or IPs, all aspects of the Company's capital program are essential to continuing to provide safe and adequate service to Indiana-American's customers and support the long-term viability, reliability and resiliency of the Company's water and wastewater systems.

Q. Please describe the RPs that are included within the Company's capital investment plan.

A. Indiana-American's RPs include main projects generally 12 inches in diameter and smaller, reinforcement and replacement of service line and meter setting installations, meter purchases, projects to replace and maintain treatment equipment, vehicle replacements and to a lesser extent the purchase of tools, furniture, and equipment. The Company's RP investments since the last rate case through the future test year total approximately $553 million, including projects already reflected in the DSIC and SEI.

Q. Are RPs a critical component of the Company's five-year strategic capital investment plan?

A. Yes, RPs are critical investments for both the Company and customers as these investments support the backbone of Indiana-American's water systems by increasing both system resiliency and reliability.

Q. Please describe how RPs are included within the Company's capital investment plan.

A. Indiana-American prepares, plans, and updates projected recurring investments annually, for a five-year forward-looking period. Recurring construction project costs for the various line items are trended from historical and forecasted data, with specific project details accounted for where available; main replacements are planned in accordance with the Company's project prioritization plan as described herein. Estimates are prepared for the installation of new mains and service lines, meter settings, and the purchase of new meters based on preliminary plats from the appropriate governmental planning agencies and consultations with developers, homebuilders, and engineering firms. The criteria for evaluating the priority of the recurring projects are engineering requirements, consideration of national, state, and local trends, environmental impact evaluations, and water resource management. Indiana-American engineering criteria are based on accepted engineering standards and are developed from regulations, professional standards and the Company's engineering policies and procedures. The engineering criteria support Indiana-American's ability to have a water system that will continue to provide adequate capacity and appropriate levels of reliability to satisfy residential, commercial, industrial, and public authority needs, and provide flows for fire protection. Detail of the development of the projected recurring projects is provided later in my testimony.

Q. Please describe how IPs are included within the Company's capital investment plan.

A. IPs represent investments made to meet environmental or water quality regulations, infrastructure capacity expansion or rehabilitation or replacement of aging facilities. These projects allow the Company to meet the service demands of the community, maintain regulatory compliance, and help reduce asset failure.

The determination to include an IP within the capital investment plan begins with the development of the anticipated demand projections of the system, the identification of improvements needed to meet those demands and the adoption of strategies designed to bring about the correct prioritization and distribution of capital spending for the various requirements of the business. Specific capital planning requirements are addressed in both the short term (one year) and the longer term (five years). Projects are prioritized using objective criteria that validate the need for a project and assess the risk of not doing the project. A key aspect of this planning technique is that it is flexible and can be adjusted as needed to address new priorities, such as unplanned equipment failures, large or sudden growth of a service area and new regulatory requirements.

Q. Please describe the Company's capital investment implementation and management practices for IPs.

A. The Company employs standardized capital investment implementation practices for delivering IPs. The practices include preliminary engineering, detailed engineering design, permitting, bidding, award of bids, preconstruction reviews, construction activities, project testing and commissioning, and project close-out activities. Project costs are managed through standardized practices as well. The practices include a wide range of activities including project technical reviews, project establishment and tracking in the Company's financial software, project approvals, project cost forecasting, monitoring of project status, and monitoring of capital plan status on a monthly basis.

CAPITAL ADDITIONS IN THIS CAUSE

Q. Are you familiar with the Stipulation and Settlement Agreement approved by the Commission in Cause No. 45142 as it pertains to capital additions to be presented by the Company in this Cause?

A. Yes. While I was not employed by the Company at the time of the last general rate case, I have reviewed the provisions of the Stipulation and Settlement Agreement that relate to the additions to be included in this Cause. There are two such provisions, one pertaining to the rate base "cap" in that case and the other pertaining to the evidence the Company is required to submit in this case.

Q. What is the rate base "cap" provision?

A. The parties agreed to reduce the Company's forecasted net original cost rate base by $40 million, agreeing to a rate base "cap" of $1,182,170,152, to be implemented as follows:

> To the extent the Company's actual net original cost rate base as of April 30, 2020 exceeds the Rate Base Cap, the Company is not foreclosed from including those additional investments in rate base in a future general rate case. In forecasting its rate base, the Company has forecasted investment from the end of the period covered by the Company's most recent DSIC filing (November 30, 2017) through the end of the test year (April 30, 2020) totaling $ 114,004,218 (excluding costs of removals and retirements) in improvements that might qualify for a distribution system improvement charge (DSIC) pursuant to IC 8-1-31 but for their inclusion in rate base in this Cause. Accordingly, Petitioner may not apply for a DSIC for improvements placed in service before April 30, 2020, unless the Company shall have invested more than $114,004,218 (excluding costs of removals and retirements) in

> distribution system improvements during the period between November 30, 2017 and April 30, 2020. An application under IC § 8-1-31-1 et seq. that includes in-service distribution system improvements shall only include distribution system improvement costs that exceed the $114,004,218 (excluding costs of removals and retirements) projected to be made during the period between November 30, 2017 and April 30, 2020. In any application for DSIC including improvements placed in service before April 30, 2020, Petitioner shall identify the plant additions composing the $114,004,218 (excluding costs of removals and retirements) of distribution system additions as well as those plant additions that qualify for and for which DSIC recovery is sought.

Stipulation, pp. 7-8.

Q. What is the provision in the Stipulation regarding the evidence that is required to be submitted in this Cause?

A. Apparently one of the disputed items in the last case was the degree of evidence the Company had submitted in its case-in-chief in support of its capital forecast. One of the terms of the Stipulation was to establish a threshold of evidence the Company was required to submit in its next rate case where it was presenting a capital forecast in support of a forward looking test year:

> The parties have resolved their dispute regarding the support for Petitioner's forecasted capital projects for purposes of the current case and stipulate that an agreement among the parties regarding information to be included in future cases will mitigate the risk of future similar disputes. Accordingly, for purposes of future general rate cases involving a forward looking test period, Indiana-American will, to the extent such information exists, include the following information in its workpapers supporting its case-in-chief; *provided, however*, that if the Commission promulgates rules amending or adapting the minimum standard filing requirements for a rate case utilizing a forward-looking test period, then those promulgated rules shall supersede the parties' agreement in this Paragraph 6(a). To the extent the following information does not exist, Indiana-American will explain in testimony or exhibits how it determined the forecasted capital additions by subaccount and how it calculated the cost of the capital additions it forecasted by subaccount. If any of the Settling Parties believes Indiana-American

has failed to provide the required information, that party must file a deficiency notice within the timeframe as set forth in 170 IAC 1-5-4; otherwise, Indiana-American is deemed to have filed a complete case-in-chief for purposes of a motion to dismiss based on a failure to meet the Minimum Standard Filing Requirements ("MSFRs"). Nothing herein shall be construed to establish, alter, or amend any party's burden of proof in any subsequent rate case. No Settling Party shall be deemed to have waived the ability to request additional information nor shall Petitioner be deemed to have waived any objection to discovery in excess of the information promised below. The foregoing promises shall not constitute a basis for objecting to a data request or other method of discovery in any subsequent proceeding.

(i) Projects Greater than $500,000

a. Project name

b. Project number, including Comprehensive Planning Study project number (if applicable)

c. Project cost or cost estimate, including contingency allowance and non-construction costs (with identification of the amounts and percentages allocated for (or other basis for determining) non-construction costs)

d. Actual or projected project construction start and in-service date

e. Location

f. Dollar amount of additions

g. Amount and derivation of cost of removals

h. Total dollar amount of additions and cost of removals

i. Project description and purpose (including, if applicable, a list of major components of new construction, treatment and pumping capacities, and storage volumes)

j. Project benefits

k. Project background (including identification of any studies, reports, or analyses which provided background, input, or which were considered in developing the project scope, including any alternatives that were considered.)

(ii) Recurring Capital Investments That Are Individually Less than $500,000

a. Categories of recurring projects

b. Cost projections by category

c. Identification in testimony, attachment(s), or workpaper(s) of the historic operating experience and assumptions, including applicable unit costs, quantities and contingency and non-construction costs used to build the cost projections for known and anticipated recurring investments

(iii) Access to Studies Including Comprehensive Planning Studies

Subject to the terms of this Paragraph 6(a)(iii), contemporaneous with the filing of its case in chief in a general rate case, Indiana-American will provide the OUCC with copies of the studies, reports, or analyses -- including Comprehensive Planning Studies if applicable – for operations that are projected to include an individual project that would qualify as a "major project" pursuant to the MSFRs. The Parties will work cooperatively to find reasonable solutions to afford timely access to the materials related to the case. Nothing herein shall be construed as prohibiting the OUCC or any other intervenor from specifically identifying and asking for more detail, documents, or information other than what Indiana-American has agreed to provide in this section, including other or historical reports previously conducted and nothing shall be construed as estopping the Company from interposing any objection to such requests.

Stipulation, pp. 14-16.

Q. With that background from the Stipulation, please identify the time period for which the Company is including capital investments in this Cause.

A. The Company includes in this Cause utility plant in-service additions placed in service after the rate base cutoff of April 30, 2020, in Cause No. 45142 through September 30, 2022, including utility plant in-service approved in the intervening DSIC and SEI cases, together totaling approximately $402.3 million in gross additions. These additions are included in rate base as presented in Mr. Shimansky's testimony. The Company also includes in this Cause approximately $524.6 million in gross capital additions placed in service or planned to be placed in service from October 1, 2022, through the future test year ending April 30, 2025. Some of these additions are already in service as of the date the Company has filed its petition and case-in-chief in this general rate case and thus are no longer forecasted. The remainder are forecasted additions. My testimony will support these additions and, in so doing, address the Company's obligation with respect to the forecasted additions arising from the Stipulation.

Q. Were some of the projects placed in service before the end of the test year in the Company's last rate case?

A. Yes. I have included projects that were placed in service before the close of the last test year but that were not included in the last general rate base because they were above the rate base cap in Cause 45142.

Q. Please describe the Company's recent performance in delivering its capital investment plan.

A. Indiana-American has delivered its capital investment plan within 1.4% of the planned amount cumulatively over the last ten years. The Company has delivered its capital investment plan on an annual basis with variances to its plan ranging from +3.6 % to -0.4% over this ten-year period. Capital investment plans, actual capital investment deliveries, and variances to plans by year are shown in the table below.

Table 2:
Indiana-American Actual Annual Capital Investment and Plan
2013 - 2022

(Does not include Enterprise Solutions Projects)

Year	Budget ($)	Actual Delivery ($)	Variance to Budget ($)	Variance to Budget (%)
2013	54,864,589	55,180,223	315,634	**0.6%**
2014	55,493,777	57,184,538	1,690,761	**3.0%**
2015	53,870,725	55,816,847	1,946,122	**3.6%**
2016	83,783,621	83,519,536	(264,085)	**-0.3%**
2017	91,783,532	95,123,508	3,339,976	**3.6%**
2018	108,075,559	111,875,006	3,799,448	**3.5%**
2019	163,487,619	164,525,610	1,037,990	**0.6%**
2020	112,855,817	113,378,295	522,478	**0.5%**
2021	130,212,548	129,707,346	(505,202)	**-0.4%**
2022	178,102,432	180,322,907	2,220,475	**1.2%**
Cumulative:	**1,032,530,219**	**1,046,633,815**	**14,103,597**	**1.4%**

Q. Please describe how Indiana-American manages actual recurring capital investments during each year relative to the plan of projected recurring investments, with the

understanding that investment priorities emerge during the year that may not be specifically identified in the plan.

A. During each year recurring investment priorities emerge that were not contemplated in the recurring investment plan. This is a reality in most operating businesses. As new priorities emerge Indiana-American adjusts the recurring project investment plan to address emerging priorities while managing total capital expenditures to within the approved overall capital plan amount. For this reason, the in-service amount of recurring investments by project actually completed through the future test year may vary from the amounts identified in Attachment MHH-2. As shown in Table 2 above, Indiana-American has demonstrated consistent management of overall actual annual capital expenditure to within 1.4% of its overall annual capital plan, cumulatively for the past ten years.

PRESENTATION OF CAPITAL PROJECTS INCLUDED IN THIS CAUSE

Q. How are your capital project attachments organized?

A. They are organized so as to comply with the Company's commitments under the Stipulation. Attachment MHH-3 provides information about each of the capital additions that exceeds $500,000 and that are already in service as of the date the Company filed its Petition in this Cause. I have not included in this attachment those projects that are already reflected in rates through either the Company's DSIC or SEI surcharges. A second attachment, Attachment MHH-4, presents the information required by the Stipulation for each individual forecasted project that exceeds $500,000. A third attachment, Attachment MHH-5, presents the information required by the Stipulation for each enterprise-wide technology project ("Enterprise Solutions") that exceeds $500,000 that has been, or is planned to be, placed in service between April 30, 2020 and April 30, 2025.

As discussed in the next section of my testimony, a fourth attachment, Attachment MHH-6, presents the information required by the Stipulation for forecasted recurring projects that individually do not exceed $500,000.

The final series of attachments provides the studies, reports and analyses for the two individual projects that would qualify as "major projects," again, as required by the Stipulation. While the Stipulation requires these "studies, reports and analyses" only for "major projects," I have included engineering reports and additional support for projects exceeding $5,000,000 in my workpapers, as well as other projects exceeding $500,000 where supplemental information was available for the project.

Q. Please describe how you present details of the "Major Projects," and the projects exceeding $500,000 in additions included in this Cause.

A. As described previously, Paragraph 6(a) of the Settlement Agreement in Cause No. 45142 prescribed specific information to be included for capital projects greater than $500,000 in Indiana-American's next rate case. While the terms of the Settlement technically only require Indiana-American to provide this information for forecasted capital projects exceeding $500,000, Indiana-American made the determination to provide information for both forecasted capital additions and those capital additions that have already been placed in service.

There are two forecasted Major Projects included in this Cause: the Sheridan Water Treatment Plant and Well, and the Winchester Water Treatment Plant. I describe each of these projects in detail in the following section of my testimony. As described below, additional detail for each of these Major Projects is included in the supporting attachments included with my testimony.

With respect to the other projects exceeding $500,000 in additions, there are 11 projects exceeding $500,000 that have been placed in service prior to the filing of the petition in this Cause. Two of these projects were placed in service prior to April 30, 2020. These two projects are in rate base in this Cause and would have been included in rate base in the Cause No. 45142 if not for the rate base cap. I have included them in my in-service attachments because they exceed $500,000. The in-service (as of the filing of this testimony) projects exceeding $500,000 that are included in this Cause total $37,618,875, excluding DSIC and SEI projects. We have not included a description for those projects that are already reflected through rates either through the Company's DSIC or SEI.

There are 33 forecasted capital projects included in this Cause that exceed $500,000 (excluding the major projects and future source of supply additions, which I will describe later). These forecasted projects exceeding $500,000 that are included in this Cause total $114,768,753. For ease of review by the parties, and to ensure that the required information is included for each project, the details of each project exceeding $500,000 are included in a standard presentation format in Attachments MHH-3 and MHH-4 to my testimony. The project descriptions include the project name, project number, project location, project description, project background, project alternatives, the recommended and selected solution, pertinent size and capacity information, whether real estate or easements were acquired, the actual or projected in-service date, and new and retired pipe information when applicable. Related detailed estimates of cost, studies, basis of design, project proposals, drawings, and other project information are included with my testimony as attachments and are referenced with each project description. The projects included in Attachments MHH-3 and MHH-4 generally include improvements in many types of utility plant including sources of supply, treatment, structures, and the distribution system, including pipes, pumps, and tanks.

For capital additions associated with Enterprise Solutions projects, eight exceeding $500,000 have been placed in service prior to filing the petition in this Cause and there are four forecasted projects that exceed that dollar amount. For ease of review by the parties, the details of each project are provided in Attachment MHH-5, and include the project name, project number, project description, project benefits and actual or projected in-service date. Several of the other details included for the other projects are not applicable to Enterprise Solutions projects. For example, their locations are tied to technological platforms and servers, not a physical location. As such, location, real estate and easement details are not applicable. Generally, Enterprise Solutions projects are completed on an enterprise-wide basis for the benefit of all of American Water's operating utilities (including Indiana-American) and are comprised of investments that upgrade and enhance foundational technology, as well as customer facing platforms, among others, to continue to provide safe, reliable and efficient service to customers. The costs of these projects are allocated to Indiana-American and its affiliates based on customer count. The project costs in Attachment MHH-5 represent Indiana-American's proportional share of each project.

MAJOR PROJECTS

Q. Please describe the Winchester Water Treatment Plant major project.

A. The Winchester Water Treatment Plant project involves the replacement of the Winchester Water Treatment Facility identified in the Winchester 2020 CPS to help address challenges and opportunities at the facility.

These challenges and opportunities include the following:

- Capacity: The existing aeralator/filtration system at Winchester (constructed in 2001) does not provide adequate filtration capacity to reliably treat the maximum daily demands for the system. A December 2020 inspection of the aeralator system by a tank inspection and consulting firm indicated it was in poor condition and recommended rehabilitation within two years. In addition, the existing backwash residual tank is in poor condition and needs to be replaced with a larger tank of adequate size to support the proposed filtration improvements. In addition, the Winchester system is not able to deliver 3,500-gpm for 3-hour duration to meet fire flow recommendations.

- Structural Issues: Structural concerns were also identified with the existing chemical building in a study in 2019 during orthophosphate system improvements. Limited structural improvements were completed near the orthophosphate project area at that time, but it is believed that other areas of the structure are likely to have similar structural concerns.

- Safety and Water Quality and Quantity: Existing transport of 15-gallon sodium hypochlorite drums within the facility presents safety concerns. Chemical system deficiencies were also identified in the existing chemical feed building relating to secondary containment, ventilation, and eye wash systems. In addition, no clearwell storage exists, and the Winchester treatment facility does not provide chlorine contact time to meet 4-log inactivation of viruses. The EPA Groundwater Rule identifies provision of 4-log inactivation of viruses as a corrective action for ground water utilities that may be susceptible to microbial contamination, specifically bacterial and viral pathogens. While the Winchester source has not shown indications of microbial contamination to-date, the intent of providing 4-log inactivation of viruses is to help ensure that any possible microbial contamination is effectively treated. Providing 4-log inactivation of viruses provides appropriate protection for customers against these contaminants.

- Efficiency: Friction losses in the transmission mains from the high service pump station to the Winchester distribution system also exceed industry recommended standard which results in increased energy consumption.

While the CPS identifies alternatives that will be evaluated during the Design-Build proposal selection and preliminary design to determine the detailed project scope, attempting to improve the existing facilities is not recommended for several reasons, including the condition of the existing facilities and inadequate capacity of existing facilities. Therefore, while the details of project scope will be determined during the Design-Build phase, replacement of the facility is recommended. The proposed improvements, which address recommended improvements from the Winchester 2020 CPS, include the installation of aeration, detention, pressure filtration, chemical systems (sodium hypochlorite, orthophosphate, and fluoride), high service pumping, finished water storage, backwash pumping, backwash residual process, and finished water transmission improvements. Benefits include adequate filtration capacity to treat maximum daily demands, reliable backwash residual system, improved structural safety, improved chemical system safety, improved transmission head loss to meet industry standards and improved efficiency by reducing energy consumption, improved fire flow capacity, and improved chlorine contact time.

Customers will benefit from constructing the new facility by providing adequate filtration capacity to treat maximum daily demands, reliable backwash residual system, improved structural safety, improved chemical system safety, improved transmission head loss to meet industry standards and reduce energy consumption, improved fire flow capacity, and improved chlorine contact time. The project anticipated in service date is April 30, 2025, with an anticipated cost of $25,000,000.

Q. Are you providing any supplemental attachments to support the Winchester Water Treatment Plant major project?

A. Yes. See Attachments MHH-7 through MHH-13 for additional details regarding the Winchester Water Treatment Plant major project. Attachment MHH-7 includes the portions of the 2020 Winchester Comprehensive Planning Study that relate to the Winchester Water Treatment Plant project. Additional supplemental attachments include a condition evaluation of the existing aeralator treatment unit, structural condition summary of the existing treatment facility, design-build request for proposal documents, and design-build proposals received.

Q. Please describe the Sheridan Water Treatment Plant major project.

A. The Sheridan Water Treatment Plant project involves the construction of a new water treatment facility with a firm and total capacities of 1.5 MGD and 2.0 MGD respectively, to help address challenges meeting max day demands, potential growth in this service area and other operational challenges. The existing Sheridan Water Treatment Facility has a firm capacity of 0.4 MGD, has experienced max day demands that have exceeded the plant firm capacity, and is not designed for expansion. The fact that wells 4 and 5 are so close together further limits the plant's ability to provide meaningful capacity reliably because the wells adversely impact each other's capacity if operated together. Much of the existing facility and equipment also dates to the 1960's and has limited remaining life. In addition, the facility uses chlorine gas and does not have an ammonia feed system.

- Chlorine gas can be a safety hazard for employees and the public. The conversion from gaseous chlorine to liquid sodium hypochlorite will eliminate the use of toxic gases at the new facility, which will eliminate the dangers of an accidental release of the toxic gases or a deliberate attack that would pose a danger to the public and the Company's operations staff if this event occurred.

- Naturally occurring ammonia is present in some of the source water and not having an ammonia feed system can present challenges for maintaining a stable chloramine level. Implementing stable breakpoint chlorination with the existing plant is also challenging because of the lack of a good common feed point with the detention tank beneath the plant. Breakpoint chlorination may be considered during the design process for the project.

While the Company considered continuing to use the existing facility, doing so was not the recommended solution for a variety of reasons. It would require major facility upgrades and replacements, or essentially a rebuild of the existing facilities, along with requiring construction of new plant facilities for adequate capacity expansion, for conversion from gaseous chlorine to liquid sodium hypochlorite, and for addition of liquid ammonium sulfate. Maintaining the existing facility would also require additional cost for providing treatment while it is rebuilt. By constructing one new expandable facility, the Company can maintain safe and reliable service while the new facility is being completed. The old facility will then be retired. Additionally, well 4 will be retired and replaced with a new well at appropriate distance from the other wells, to provided adequate source capacity more reliably. The project anticipated in service date is August 31, 2024, with an anticipated cost of $29,817,795.

Q. Are you providing any supplemental attachments to support the Sheridan Water Treatment Plant Project?

A. Yes. See Attachments MHH-14 through MHH-23 for additional details regarding the Sheridan Water Treatment Plant major project. Attachments MHH-14 and MHH-15 include the portions of the Draft 2022 Sheridan Comprehensive Planning Study that relate to the Sheridan Water Treatment Plant Project. Additional supplemental attachments include design-build request for proposal documents, design-build proposals received, basis of design report, 90% drawings and specifications for the design of the proposed facility.

<u>**RECURRING PROJECTS LESS THAN $500,000**</u>

Q. Does the Stipulation and Settlement Agreement in Cause No. 45142 require Indiana-American to provide specific information to support recurring projects included in this Cause?

A. Yes, as I testified, the Stipulation also requires the Company to provide specific information for forecasted recurring capital investments that are individually less than $500,000. For the forecasted recurring projects, Paragraph 6(a) of the Settlement Agreement requires Indiana-American to provide: (i) categories of recurring projects; (ii) cost projections by category; and (iii) identification of the historic operating experience and assumptions including applicable unit costs, quantities and contingency and non-construction costs used to build the cost projections for known and anticipated recurring investments. This information is included in Attachment MHH-6.

Q. What categories of forecasted recurring projects are included for recovery in this Cause?

A. The categories of forecasted recurring projects are included in Attachment MHH-6.

Q. What are the cost projections by category for the forecasted recurring projects?

A. The costs, including the projected unit costs, are set forth in Attachment MHH-6.

Q. The Settlement Agreement also requires Indiana-American to "[identify] in testimony, attachment(s), or workpaper(s) the historic operating experience and assumptions, including applicable unit costs, quantities and contingency and non-construction costs used to build the cost projections for known and anticipated recurring investments." How is Indiana-American providing this information?

A. The costs set forth in Attachment MHH-6 are generally based upon the Company's actual historical experience and actual historical unit costs as explained in the Attachment. We do not project these costs broken down by contingency and non-construction, as we are projecting based upon actual historical experience. That actual historical experience is an all-in cost that would include both construction and non-construction costs and would include the actual contingency that was experienced. For those few categories that are not based upon historical unit costs, please see Attachment MHH-6 for a description of how the costs are projected. These also are not forecasted by breaking down costs between construction and non-construction.

SOURCES OF SUPPLY

Q. Is Indiana-American also including future sources of supply in this Cause?

A. Yes. The Company is including the following future sources of supply in this Cause:

I10-100020	KOK Sheridan Property Acquisition for New Well or Wells
I10-500003	CRW SOS Test and Property Acquisition
I10-600024	NOB Hamilton Co SOS Property Purchase
I10-600010-03	NOB WRCC SOS Property

The Company has prepared plans to develop each of these future sources of supply and is seeking approval of those plans and to add the actual costs of these sources of supply to the value of the Company's property pursuant to Ind. Code § 8-1-2-23.5. The plans are attached to my testimony as Attachment MHH-24. Under Ind. Code § 8-1-2-23.5, a public utility's plan must include a completion date by which the public utility will place the future source of water supply into service. Section 23.5 also requires the public utility's plan to include: (1) the public utility's timetable for placement in service of the future source of supply; (2) the cost of the source of supply; (3) the need for a new source of supply within the public utility's timetable; (4) the availability of alternatives to the proposed source of supply; and (5) the need to secure property rights to preserve and protect the planned future source of supply. This information is included in the Company's plans for each of the future sources of supply.

Q. Are the Company's future source of supply plans reasonable and prudent for the provision of safe and reliable service?

A. Yes as explained in the respective plans, we are forecasting source of supply shortages in the coming years in these operations. It is therefore necessary that we begin plans and work so that we can continue to provide safe, adequate, and reliable service in these communities. It is necessary that we secure the property rights now so that the property does not develop in a fashion that would later preclude its use as a source of supply.

Q. Does this conclude your Direct Testimony?

A. Yes.

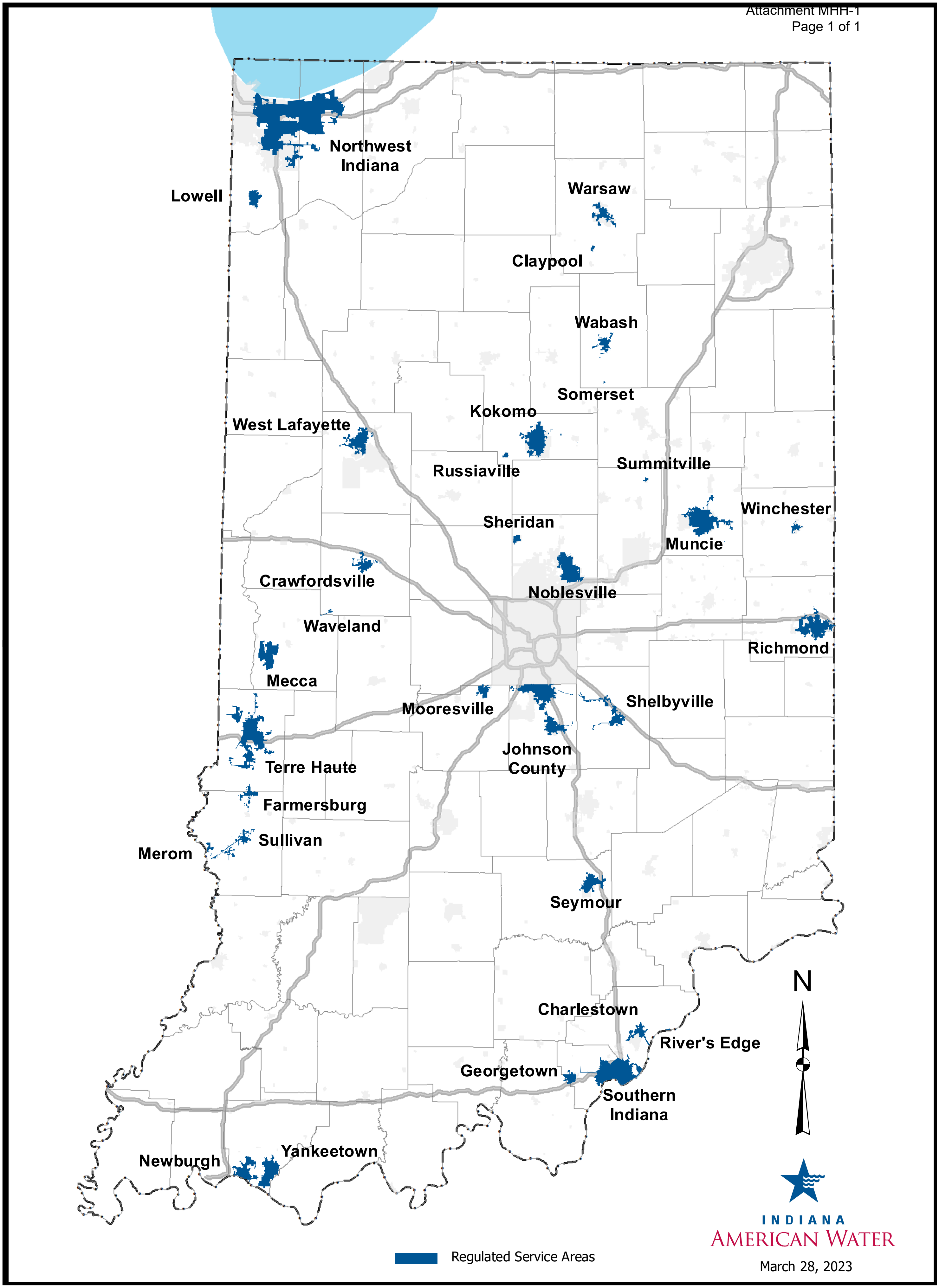
VERIFICATION

I, Matthew H. Hobbs, II, Director of Engineering, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.

Matthew H. Hobbs, II

Matthew H. Hobbs, II

Date: 3/29/2023



INDIANA AMERICAN WATER

March 28, 2023

ATTACHMENT MHH-2 IS FILED
AS AN EXCEL ATTACHMENT

Project Name: Kokomo Wastewater Sheridan WWTP Improvements
Project Number: I10-110001
Project Location: Sheridan
Actual Cost: $9,263,787
Actual In-Service Date: May 28, 2021

Project Description
Design and construct new facilities at the wastewater treatment plant to improve and expand treatment to eliminate plant overflows, comply with an agreed order and compliance plan with IDEM, and to enable growth in the community.

Background
The existing Sheridan Wastewater Treatment Plant was rated for 0.5 MGD average daily flow (ADF) and 1.0 mgd peak daily flow (PDF). Existing peak flows at the plant were estimated to exceed 1.6 MGD and could be significantly higher. The existing plant was inadequate for treating higher flows that occur at the plant during rain events and saturated ground conditions. This resulted in overflows of untreated wastewater in violation of State requirements.

The existing plant was also inadequate for community growth. The plant headworks wet well, pumping, and piping system capacities were inadequate for higher flows, which resulted in untreated wastewater overflows at the headworks. The headworks screening channel was a single channel and did not enable removal from service for maintenance or rehabilitation. Recommended Standards for Wastewater Facilities identify a design with dual or multiple screening channels as being the recommended standard, with slide gates to isolate flow from any screening unit, and to facilitate dewatering of each unit for inspection, maintenance, and rehabilitation.

The existing aerated Biolac lagoon and liner was over 20 years old and had condition and treatment deficiencies. The existing Biolac liner and internal aeration equipment was at the end of its life. The existing Biolac unit was also equipped with a small rectangular integral secondary clarifier, also over 20 years old. The Biolac and integral clarifier were inadequate for higher flow rates causing solids to be blown out of the clarifier, not allowing for proper settling and treatment, and entraining solids that settled in lower flows and passing them through to the polishing pond.

The integral clarifier was not equipped with mechanical skimming of floating solids which could result in solids passing through the treatment process. When solids were not settled in the integral clarifier, they passed through to the polishing pond. Solids had to then be removed from the polishing to pond. The plant also did not have a parallel settling treatment process to enable the existing Biolac and clarification system to be removed from service for rehabilitation.

Recommended Standards for Waterworks identifies a design with multiple settling units capable of independent operation as being the recommended design standard. Increasing the overall treatment plant capacity required that capacity be increased for various other parts of the treatment process including aeration, chlorine disinfection feed, and contact tank. Other plant deficiencies were addressed and included installing above ground ferric storage and installing improved control and SCADA systems.

Alternatives
Three alternatives were identified and considered. All alternatives included a new headworks facility with larger capacity and reliability features. All alternatives included replacing the liner and aeration equipment in the existing Biolac aeration lagoon, constructing a new chlorine disinfection feed system and contact tank, installing expanded aeration capacity and improved control and SCADA equipment. The new headworks facility included an appropriately size wet well, multiple influent pumps for varying flows and reliability, and a mechanical screen and bypass channel for reliability and maintenance. A grit removal structure and system were not planned as part of this project however they were contemplated in the overall design layout for future installation. In addition to the component alternatives described below, an alternative for replacing the existing Biolac system with an oxidation ditch concept was also contemplated but was not selected due to its anticipated higher cost.

Option No. 1: Construct two new 65 ft. diameter clarifiers and retire the existing polishing pond and existing clarifiers, which are integral to the existing Biolac aeration lagoon.

Option No. 2: Construct one new 46 ft. diameter clarifier and retire the existing polishing pond.

Option No. 3: Construct one new 65 ft. diameter clarifier and retire the existing polishing pond. The existing integral clarifiers would continue to be operated only during dry periods when maintenance is performed on the new circular clarifier. Also construct a second Biolac lagoon without integral clarifiers.

Recommended Solution
Option No. 3, consisting of one 65 ft. diameter clarifier and the second Biolac aerated lagoon, along with the components common to all alternatives, is recommended because it would increase the plant peak flow capacity from to 1.0 to 3.0 MGD, which would eliminate plant overflows and provide adequate capacity for community growth.

Option No. 2, provided only 1.5 MGD peak flow capacity which was inadequate to eliminate plant overflows, and it would provide no capacity for community growth. This alternative was identified before it was realized that the plant has already experienced peak flows estimated to be more than 1.6 MGD. Any size clarifier between the 46 ft. clarifier in Option No. 2 and the 65 ft. clarifier in Option No. 3 would be only modestly less cost than the 65 ft. diameter clarifier in Option No. 3 and would provide less capacity for peak flows and for community growth.

Option No. 1, consisting of two 65 ft. clarifiers would provide 6.0 MGD of peak flow capacity, which would provide much more capacity than alternative 3, however at significantly more cost than Option No. 3 due to the additional clarifier. Constructing clarifiers larger than 65 ft. diameter were considered less optimal for the plant site and for the addition of similar sized clarifiers in the future.

Option No. 3 was the preferred design and provided adequate capacity to eliminate overflows, and for near term community growth, while maximizing capacity per unit cost. Option No. 3 also provided for space for construction of additional similar sized clarifiers in the future. It is also noted that in lieu of rehabilitating the existing Biolac aerated lagoon and adding a new Biolac aerated lagoon near the existing polishing pond, alternative extended oxidation processes were considered, in the form of an oxidation ditch structure concept and an Aqua Pass aeration structure process. Each of the aeration structure processes weren't selected because they were more costly than the option of rehabilitating the existing Biolac aerated lagoon and adding a new Biolac aerated lagoon near the existing polishing pond.

Benefits
Option No. 3 provided expanded treatment to eliminate plant overflows, comply with an agreed order and compliance plan with IDEM, and would enable growth in the community. Plant peak flow capacity was expanded to 3.0 MGD.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-6 CONFIDENTIAL - Wessler Preliminary Engineering Report Sheridan WWTP

Project Name: Crawfordsville Montgomery County Trans Main Ph 1
Project Number: I10-500004
Project Location: Crawfordsville
Actual Cost: $2,777,506
Actual In-Service Date: October 14, 2021

Project Description
The Montgomery County Redevelopment Commission requested water mains be extended into one of its infrastructure development zones in three phases. This project was phase 1 of the Agreement between Montgomery County and Indiana American Water Company that was signed on November 11, 2019, that included approximately 8,000 feet of 20 & 24-inch water main.

Background
There was no water service in the established infrastructure development zone. The Montgomery County Redevelopment Commission requested mains be extended into this infrastructure development zone.

Alternatives
N/A.

Recommended Solution
The recommended solution was to design and construct a water main extension into the infrastructure development zone.

Benefits
Working with our community partners to extend water service to Montgomery County.

Property and/ or easements acquired: Yes.

Pipeline project: 8,000 feet

Pipeline project: 20-inch and 24-inch

Pipeline project: Retired pipe diameters (N/A)

Pipeline project: Vintage of pipe retired (N/A)

Project Name: Crawfordsville Montgomery County Trans Main Ph. 2
Project Number: I10-500005
Project Location: Crawfordsville
Actual Cost: $14,589,354
Actual In-Service Date: October 28, 2022

Project Description
The Montgomery County Redevelopment Commission requested certain mains and other water utility infrastructure be constructed in one of its infrastructure development zones in three phases. This project is Phase 2 of the Agreement between Montgomery County and Indiana-American Water Company that was signed on November 11, 2019. Phase 2 includes approximately 18,000 feet of 20-inch water main, a high service pump station, and a 1.0 MG elevated storage tank (EST). The County provided a deposit/contribution towards Ph. 2 costs of $14,680,719.

Background
There was no water service in the established infrastructure development zone. The Montgomery County Redevelopment Commission requested mains and other water utility infrastructure, including a pump station and elevated storage tank be constructed in this infrastructure development zone. This project is Phase 2 of a three-phase project.

Alternatives
A pump station option considered replacing existing high service pumps and electrical gear to increase the pumping head at the existing high service pump station to the proposed east pressure gradient. This would have required installation of pressure reducing valves between the proposed east gradient and the main service area gradient, so that the existing main gradient tanks would not overflow. This option would be less reliable because of the continuous use of pressure reducing valves. This option would also waste significant electrical energy and cost, and further impact greenhouse gas emissions because of the continuous energy wasting in the pressure reduction process. Additionally, replacing the existing pumps and electrical gear with larger equipment could present challenges with the existing plant design. Another option is the installation of a second high service pump station at the existing plant which would be specifically dedicated to serve the proposed east pressure gradient.

Recommended Solution
The recommended solution was to design and construct a new second high service pump station which would be specifically dedicated to the proposed east pressure gradient. The recommended solution also included extension of approximately 18,000 feet of 20-inch water main and a 1.0 MG elevated storage tank in the infrastructure development zone.

Benefits
Working with our community partners to extend water service to Montgomery County. .

Property and/ or easements acquired: Yes.

Pipeline project: 18,000 feet

Pipeline project: 20-inch

Pipeline project: Retired pipe diameters (N/A)

Pipeline project: Vintage of pipe retired (N/A)

Supplemental Workpapers:

Workpaper MHH-1 - Technical Memorandum - CRW New Tank Analysis, Kurtz Engineering, 2021

Workpaper MHH-2 - Technical Memorandum - CRW HSPs No. 2 Analysis, Kurtz Engineering, 2021

Workpaper MHH-3 - Technical Memorandum - CRW Pipe Sizing Analysis, Kurtz Engineering, 2021

Workpaper MHH-4 - Agreement between INAW and Montgomery County with Addendum

Workpaper MHH-5 - Arcadis Modeling Analysis DRAFT - Water Main Extension, 2021

Project Name: Mooresville Well Replacement
Project Number: I10-580002
Project Location: Mooresville
Actual Cost: $1,333,734
Actual In-Service Date: June 30, 2021

Project Description

The Company has two wellfields serving Mooresville, the Plant wellfield, and the Robinson wellfield. The project included installation of proposed well #6 and retirement of well #2. Additional priority work was identified during the preliminary engineering phase and included relocation of the existing electrical equipment for well #1 above the 100-year flood elevation per Ten States Standards, installation of electrical equipment for new well #6, installation of a 200-kW generator to provide water during utility power failures, and related transformers, electric gear, and transfer switch. The new electrical equipment and generator was installed on a new platform elevated above the 100-year flood elevation.

The prior preliminary scope included construction of proposed well #6 and retirement of well #2 due to failure, and due to discontinuing use of well #5 due to poor water quality. Well #5 remained in-service because it provided 0.5 MGD and would be used when the treatment plant was constructed. The anticipated capacity of proposed well #6 was 725 gpm. The pumping capacity of well #2 was 120 gpm before it failed. The anticipated firm source of supply capacity for the system with the addition of well #6 is 2.5 MGD; however, the objective was to not operate wells 3 and 5 until the treatment plant was constructed because of their higher levels of iron and manganese. Removing wells 3 and 5 resulted in a firm capacity of 1.6 MGD, equal to the projected maximum day demand.

New equipment included new well #6 with pump and motor, transformer, 400-amp electrical distribution board, NEMA stainless steel panel board, variable frequency drives (VFD) pump control panel for well #1, automatic transfer switch, and 200 kW generator, on a new platform elevated above the 100-year flood elevation. The proposed generator provided emergency power to existing well #1 and proposed well #6 in the Robinson Wellfield; these two wells provide up to 1.9 MGD of the available supply.

Background

Well 2 failed and was decommissioned. Remaining wells had high iron and manganese levels. Well #5 had the poorest water quality of the existing wells, with very high iron concentration, for the unfiltered treatment plant. Well #3 had high levels of manganese. From 2014-2019, manganese levels of the combined finished water exceeded the EPA health advisory limit of 0.3 mg/L, five times. Additionally, electrical equipment for well #1 was below the 100-year flood level and had be replaced to be above the 100 yr flood level. Additionally, the Robinson wellfield supply had no backup generator for providing supply in the event of utility power failure.

Alternatives

The Company has two wellfields serving Mooresville, the Plant wellfield, and the Robinson wellfield. Collectively the wells have high levels of iron and manganese that can't be effectively sequestered. Test drilling for the new well produced water quality iron and manganese results similar to well #1. The only option was to complete a new well to achieve adequate firm capacity while enabling discontinuing operation of wells 3 and 5 until the treatment plant plan was developed and delivered.

Recommended Solution
The recommended solution was to install well #6. The iron and manganese levels were anticipated to be like well #1, which had raw water iron levels of approximately 0.5 mg/l or less and raw water manganese levels of approximately 0.1 mg/l. These levels are above the EPA secondary maximum contaminant levels but were better than levels in wells 3 and 5. This enabled improved water quality until the treatment plant could be designed and built to improve water quality to below the secondary maximum contaminant levels. Additional work included relocation of existing electrical equipment for Well #1 and installation of proposed electrical equipment for Well #6 on a platform above the 100-year flood elevation, per Ten States Standards.

A 200-kW generator was recommended to provide emergency power to existing well #1 and new well #6 in the Robinson wellfield to provide water during utility power failures. The new equipment included well #6 with pump and motor, transformer, 400-amp distribution board, NEMA stainless steel panelboard, VFD pump control panel for well #1, automatic transfer switch, and 200 kW generator.

Benefits
The production capacity of well 6 installed has capacity of approximately 725 gpm.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Noblesville Wayne St Pump Station Rehab
Project Number: I10-600019
Project Location: Noblesville
Actual Cost: $561,298
Actual In-Service Date: March 19, 2021

Project Description
The Wayne Street Water Treatment Facility high service pumps and header piping have reached the end of their useful service life and require replacement. The electrical system and motor control equipment have deficiencies, and use of variable frequency drives (VFDs) for all pumps is desired.

Background
The existing pumps, motors, piping, and other equipment in the High Service Pump Station have reached end of service life.

Alternatives
No other options other than replacement are available.

Recommended Solution
Replace existing pumps, motors, and electrical gear with new equipment.

Benefits
Improved efficiency with VFD operated pumps.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Shelbyville Fairland Rd 20 in Main from London Rd WTF to SHL Ph. 1
Project Number: I10-650001-01
Project Location: Shelbyville
Actual Cost: $3,640,662
Actual In-Service Date: January 27, 2020

Project Description

Install approximately 3,686 feet of 20-inch transmission main from the Shelbyville system near Fairland Rd. and I-74 to Hession Drive, connecting to 20-inch transmission main on Fairland Rd. at Hession Dr. and 16-inch transmission main on Hession Drive. This project was part of a larger transmission main reinforcement between the Company's London Rd. treatment plant and the Shelbyville system. The Company included the overall reinforcing project in its DSIC-12 filing, but in settlement agreed to remove this portion of the project from the DSIC-12. The remainder of the reinforcing project was included and recovered in the DSIC-12. The reinforcing pipeline enables maintenance of adequate pressure and fire flows in the northern portion of the Shelbyville system, including pressures and fire flows required by the community hospital and other significant existing customers located in north end of the Shelbyville system. Pressure and fire flow requirements in the north end of the Shelbyville system could no longer be maintained without the reinforcing pipeline. Degradation of pressures and flows had occurred over time in the northern portion of the Shelbyville system, as system water demands increased from existing and new customers. This was exacerbated by a new industrial customer that increased maximum day demands in the area.

Background

Significant industrial and commercial development in Shelbyville has been occurring along I-74 at the Fairland Rd. and State Rd. 44 exits. The significant developments have communicated their water demands with the Company. The increased demands degrade pressures and flows, including available fire flows in the northern part of the Shelbyville system. Reinforcing transmission main from the London Rd. treatment plant to the northern portion of the Shelbyville system, along with the additional supply from the London Rd. treatment plant was required to maintain adequate flows and pressures in the Shelbyville system.

Combined with projected system demands, the Shelbyville service area is projected to need additional production capacity of 1.3 MGD by 2020 and 1.7 MGD by 2030. The new demand from these developments result in an updated Shelbyville maximum day demand projection of 5.8 MGD by 2030. The maximum day demand projection exceeds the Shelbyville system current firm capacity of 4.1 MGD. The increasing demands will also degrade fire protection for existing commercial and institutional customers in these areas.

Alternatives

Option No. 1: Extend transmission main from the London Rd. treatment plant to the northern portion of the Shelbyville system and expand the London Rd. treatment plant. This project included only the portion of transmission main of these options. Plant improvements are not included in this project.

Option No. 2: Perform hydrogeological study south of the existing Blue River Wellfield. If adequate additional groundwater for the current need and future growth could be discovered, then acquire property, construct a new wellfield, extend transmission main from the new wellfield to the Blue River Plant, expand the Blue River plant, construct transmission main from the Blue River plant to the Shelbyville system and extend transmission main through the Shelbyville system to the north side of Shelbyville to the area near Fairland Rd. and I-65 where existing industrial, commercial, and institutional customers' fire protection would be degraded if not for the improvements.

Recommended Solution
Option No. 1 was selected because it was the lowest cost solution.

Benefits
The transmission main improvements will provide transmission main capacity to provide adequate flow and pressures, including fire protection for existing industrial, commercial, and institutional customers in areas where fire protection was being degraded by increasing demands. The transmission main will also enable delivery of additional treated water to Shelbyville to meet projected demands through 2030.

Property and/ or easements acquired: Yes.

Pipeline project: 3,686 feet

Pipeline project: 20-inch

Pipeline project: Retired pipe diameters (N/A)

Pipeline project: Vintage of pipe retired (N/A)

Project Name: Riley Wastewater Plant Improvements
Project Number: I10-720001
Project Location: Riley WW
Actual Cost: $758,147
Actual In-Service Date: February 1, 2023

Project Description
The project scope consisted of replacement of aeration piping and diffusers in the Riley wastewater treatment plant.

Background
The existing aeration piping and diffusers in the package plant were deficient in producing adequate aeration to enable the plant to consistently meet IDEM NPDES permit ammonia limits. Existing blowers were assessed and deemed to be adequately sized; however, the operation of the diffusers had become ineffective. Replacement of the fixed diffuser system and related piping required that the sole operating package plant unit be taken offline to enable the work to be completed. This involved implementing piping, pumping, aeration, and related improvements in and between an older existing, smaller, and currently non-operating treatment unit and the existing lagoons for treatment of wastewater. Upon completion of the aeration system replacements, the package plant would be returned to service.

Alternatives
Procurement of a portable packaged treatment plant was considered, however, the plan described above was less costly.

Recommended Solution
Replace the fixed diffuser system and related piping in the sole package treatment facility. Implement necessary piping, pumping, aeration, and related improvements in and between an older existing, smaller, and currently non-operating treatment unit and the existing lagoons to treat wastewater and enable the sole package plant to be removed from service to replace the aeration system including piping and diffusers. While the package plant was out of service it was cleaned and inspected, and improvements were made to address any discovered structural deficiencies. Upon completion of the aeration system replacements, the package plant was returned to service.

Benefits
Effective aeration in the wastewater treatment process, enabling treatment to meet IDEM NPDES ammonia effluent limits.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Northwest Portage CR 550 N Pressure Zone 1
Project Number: I10-900062
Project Location: Portage
Actual Cost: $1,470,295 (As of 3/14/23, $36,715.52 is forecasted)
Actual In-Service Date: December 21, 2022

Project Description
Create a new Pumping District with a higher operating pressure gradient to serve the existing customers in Porter County southeast of the City of Portage. Customers in this area experience marginal system pressure during high demand periods. The new pumping district and pump station would provide adequate distribution system pressure and fire flows to serve areas at the higher elevations to the east.

In-Service Note: The project is currently in-service, however there are some closeout items that remain such as fencing and long lead generator. These closeout items account for the $36,715.52 in forecasted costs as of 3/14/23.

Background
Customers in the southeast portion of the South Portage Pressure District experienced marginal system pressure during high demand periods. Additionally, areas east of the existing service area which will be served by the Company's Northwest District have expressed the desire to connect to the Northwest District for water service and have provided a land parcel for a pump station which will serve and improve pressures to existing customers and serve future service areas to the east.

Alternatives
Do nothing – this option does not address the low system pressures in this part of the service area.

Recommended Solution
Construct a pump station to serve the area with adequate pressure.

Benefits
Existing customers located at the higher elevations of the southeast portions of the South Portage Pumping District would have adequate system pressure during high demand periods. Customer growth could continue to the east with sufficient water capacity and higher operating pressure gradient provided by the new pumping district.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Project Name: Northwest Gary Distribution Center Solar Energy Sys
Project Number: I10-900068
Project Location: Gary
Actual Cost: $578,207
Actual In-Service Date: June 28, 2022

Project Description
The project scope included the installation of a 221.8kW solar energy system at the Northwest Distribution Center.

Background
The solar energy system would provide enough power to meet annual power demand for the Northwest Operations Distribution Center saving approximately $25,000 annually in power costs. The project was eligible for a federal tax credit of 26%, along with accelerated depreciation, and possible solar renewable energy credits (SRECS).

Alternatives
No other options were investigated.

Recommended Solution
The recommended solution was to install the solar energy system.

Benefits
The proposed solution reduced power costs by $25,000 annually.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: REL JCO I69 at W Fairland Road
Project Number: R10-01D1.19-P-0048
Project Location: Johnson County
Actual Cost: $1,447,690.13
Actual In-Service Date: October 14, 2021

Project Description

The project consisted of the relocation and replacement of existing 10-inch and 20-inch production transmission mains under existing US-37 to facilitate and coordinate the construction of the proposed I-69 highway with the Indiana Department of Transportation (INDOT). The project is partially reimbursable by INDOT and anticipated to total $1,184,002.70.

Background

The planned improvements associated with the roadway design were in direct conflict with existing production transmission mains that were present under the proposed improvement area. The mains are critical transmission mains connecting the Company's Marlin Water Filtration Facility to the adjacent Orme Treatment Facility, which serves a vast majority of the Johnson County Service Area.

Alternatives

The option selected was to relocate the mains in conflict to avoid the proposed improvements for the expansion of I-69. These improvements contemplated future demand projections within our planning horizon and ultimately included an increase in the new pipe size to avoid future construction and conflict with the I-69 roadway expansion.

Recommended Solution

Relocate and replace the existing 10-inch and 20-inch production transmission mains with dual 24-inch carrier pipelines and steel casing as required by INDOT to avoid direct conflicts with the proposed roadway improvements.

Benefits

Benefits of this relocation included coordination with INDOT to facilitate the construction and expansion of I-69, as well as maintaining critical transmission mains between the two treatment facilities that serve most of the Johnson County service area. These improvements ensured that the transmission mains that connect these facilities remained in-service and could convey treated drinking water to the distribution system. These improvements accounted for future system growth and will avoid future disturbance of I-69 and associated construction costs within the INDOT right of way.

Property and/ or easements acquired: No

Pipeline project: 1,640 feet

Pipeline project: Dual 24-inch Ductile Iron Pipe in 42-inch Stainless Steel Casing Pipe

Pipeline project: Retired pipe diameters (10-inch PVC and 20-inch Ductile Iron)

Pipeline project: Vintage of pipe retired (1974 PVC and 1988 Ductile Iron)

Project Name: REL NWI BH NICTD T-Wall - Park Rd
Project Number: R10-01D1.22-P-0029
Project Location: Northwest
Actual Cost: $1,191,268
Actual In-Service Date: December 16, 2022

Project Description
16-inch water main relocation required for a new railway bridge foundation (T-Wall) installation associated with the Northern Indiana Commuter Transportation District (NICTD) railroad double track project.

Background
Approximately 585 feet of 16-inch and 8-inch watermains were relocated due to direct conflict with the construction of a parallel railway bridge foundation (T-Wall).

Alternatives
Open cut, jack and bore, and horizontal directional drilling techniques was evaluated.

Recommended Solution

Relocate the existing 16-inch and 8-inch main service and appurtenances to avoid conflict with planned T-wall bridge foundation. Horizontal directional drilling was selected due to elevation challenges for the recessed roadway and proximity conflicts with an abandoned bridge abutment and other utilities.

Benefits

Maintain service to customers.

Property and/ or easements acquired: Installed within Right-of-Way

Pipeline project: 585 feet

Pipeline project: 16-inch HDPE and 8-inch PVC installed.

Pipeline project: Retired pipe diameters (16-inch and 8-inch)

Pipeline project: Vintage of pipe retired (1962 Cast Iron)

Project Name: Kokomo Sheridan Interconnect-EST to Springmill
Project Number: I10-100019
CPS Number: N/A
Project Location: Sheridan
Estimated Construction Start Date: August 2023
Projected In-Service Date: April 30, 2024, and September 30, 2024

Estimated Cost:

Contingency	$1,800,000
Non-Construction	1,888,301
Construction	5,550,000
Removals	40,000
Total	$9,278,301

Project Description
This project includes approximately 11,400 feet 20-inch water main from near Lamong Road to Springmill Road for Phase 1 and 7,700 feet of 16-inch watermain for Phase 2 from the water tower to near Lamong Road. The project will connect to the Hamilton County water system at Springmill Road & 236th Street.

Background
Indiana-American Water has entered into a sale-for-resale agreement to provide drinking water for the Hamilton County Regional Utility District located between Sheridan and Noblesville. Interconnection with an existing Indiana-American Water system is required to serve the district. Water supply does not currently exist for the Hamilton County Regional Utility District for the US 31 corridor project.

Alternatives
Multiple Interconnections with Sheridan and Noblesville were evaluated. Investigated alternatives included supply of water from the INAW Noblesville and Sheridan distribution systems.

Option No. 1: Noblesville supply: The Carrigan Road route, connecting Company mains at 206th St & James Road, installing 20-inch main and crossing Morse Reservoir along Carrigan Road and continuing westward to the US-31 Infrastructure area. This routes length is 44,000 feet in length and requires a difficult water crossing of approximate 900 feet via horizontal directional drilling below the Morse Reservoir at the Carrigan Road crossing. Property jurisdiction of the crossing was evaluated and discussed with Hamilton County representatives, Jurisdiction of the property located below the lake is unknown and adds legal complexity and time to any approvals and permitting. Installation of new main on the roadway bridge structure and an adjacent pedestrian bridge were also investigated, however installation of the new watermain on these structures was not feasible due to other utilities already present as well as clearance requirements below the bridge for boating traffic. A State Road 38 route connecting Company mains near S.R. 38 and near Hague Road, continuing westward along S.R. 38 to the US 31 infrastructure area includes of 37,000 feet of watermain. This route is largely in rural areas with multiple creek crossings would be required. Significant areas are also at lower elevations with concerns with constructability in areas prone to flooding and through possible wetlands, which could present additional permitting, construction, and schedule challenges.

Option No. 2: Sheridan supply: An interconnection with Sheridan for the initial interconnection is a shorter transmission main installation and offers the ability to meet the interconnection schedule desired by Hamilton County. This route follows 236th Street from the existing water tower and continuing eastward to connect to the to the US-31 Infrastructure Area at 236th St. & Spring Mill Road. with a total length of approximately 19,000 feet. This option includes two phases: Phase 1: approximately 11,400 feet of 20-inch water main from near Lamong Road to the Hamilton County Utility District at Springmill Road. Phase 2: approximately 7,700' of 16-inch watermain from the existing elevated water storage tank to phase 1. The project is planned in two phases with phase 1 providing initial water service by April 30, 2024, and phase 2 providing greater flows by September 30, 2024.

Recommended Solution
Option No. 2 is the selected option, extending main from Sheridan to the to the Hamilton County Utility District connection point at Spring Mill Rd. This option involves a shorter length of transmission main. This option includes phase 1 from near Lamong Road to the to the Hamilton County Utility District connection point at Spring Mill Rd, and phase 2 extending from the Sheridan elevated water storage tank to phase 1.

Benefits
Supply water to the Hamilton County Regional Utility District and potentially other unserved areas.

Property and/ or easements acquired: Yes
Pipeline project: 19,000 feet
Pipeline project: 20-inch and 16-inch
Pipeline project: Retired pipe diameters (N/A)
Pipeline project: Vintage of pipe retired (N/A)

Supplemental Workpapers:
Workpaper MHH-10: KOK Sheridan Transmission Main - INAW-HCRUD Wholesale Agreement

Project Name: Kokomo Wastewater Sheridan 6th Street Lift Station Replacement
Project Number: I10-110002
CPS Number: N/A
Project Location: Sheridan
Estimated Construction Start Date: September 2024
Projected in-service date: March 31, 2025

Estimated Cost:

Contingency	$200,000
Non-Construction	702,009
Construction	630,000
Removals	50,000
Total	$1,582,009

Project Description
The project includes a proposed submersible lift station near the location of the current 6th Street Lift Station (LS) but located outside of the State Road 38 right-of-way in an easement. The project would replace an existing duplex submersible lift station with 6-foot diameter wetwell that is past its useful life and currently cannot handle the peak flows associated with the sanitary basin.

Background
The 6th Street LS conveys flow from the Central West basin and Central East basin into the 2nd St. Intercept basin of the Sheridan District. This lift station provides service for approximately 30% of the existing wastewater customer base. While significant customer growth in not anticipated in these basins, increased I&I present capacity concerns in these areas. INAW has noted overflows downstream the lift station as well as flooding of the wet well during wet weather conditions. The current lift station mechanical and electrical components are in poor condition and at the end of their useful life. Additionally, the lift station is located within the State Road 38 right-of-way and the location and lack of safe access poses a safety risk to Company personnel during regular maintenance and operation.

Alternatives
Investigated alternatives included:

Option No. 1: Installation of a new submersible lift station and metering structure with safety and security features located outside of the right-of-way, within a new easement.

Option No. 2: Rehabilitate and utilize existing lift station in its current location.

Recommended Solution
The recommended solution is Option No. 1: Installation of a new lift station, safety features, and new flow meter structure. Rehabilitation of the existing lift station would not solve the current issues with peak flow nor address the safety and security issues with being in the state right-of-way.

Benefits

The 6th Street Lift Station improvements will provide adequate capacity to convey sewerage discharge from the Sheridan Central drainage basin as well as provide reliability of a critical lift station to maintain customer service. Installing the lift station outside of the right-of-way will increase the safety and security of company personnel and the site.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Project Name: Kokomo Wastewater Sheridan Maple Run Lift Station
Project Number: I10-110003
CPS Number: N/A
Project Location: Sheridan
Estimated Construction Start Date: August 2023
Projected In-Service Date: October 31, 2023

Estimated Cost:

Contingency	$200,000
Non-Construction	333,346
Construction	250,000
Removals	50,000
Total	$833,346

Project Description
This project includes improvements to the existing Maple Run Lift Station (LS) pumping and electrical as well as the addition of a metering vault structure. Improvements are needed to provide necessary pumping capacity for the South drainage sub-basin.

The current forcemain is also planned to be upsized and re-routed downstream of its current location and is discussed separately in Project Number I10-110004.

Background
Maple Run subdivision is an existing development with residential lots being planned and developed in various phases. Of the 527 total proposed lots, 353 lots have already been developed or are in development. The subdivision is served by a lift station (Maple Run LS) that discharges to downstream gravity sewer ultimately flowing to a downstream lift station to the north. The Maple Run LS capacity is limited by number of factors such as wet well size, pump capacity, force main size and downstream discharge location capacity. Based on the available data, the Maple Run LS wet well, and force main are sized for full build out flows from Maple Run but the current pumps are only sized for peak flows of 200 gpm. The full buildout of the development is anticipated to be close to 450 gpm and the current lift station can accommodate this while keeping with 10 states standards recommendations.

Alternatives
Investigated alternatives included:

Option No. 1: Installation of a new lift station with metering vault and acquisition of property.

Option No. 2: Upgrading existing lift station pumps and associated mechanical and electrical components, installation of new metering vault.

Recommended Solution
The recommended solution is Option No. 2: Upgrade existing lift station pumps and electrical components, in addition to new meter vault. This option provides full build out of the Maple Run development while utilizing the existing lift station footprint and maximizing station

buildout at a fraction of the cost of a new lift stion. Installing a new lift station would require property acquisition.

Benefits
The Maple Run Lift Station improvements will provide adequate capacity to convey sewerage discharge from the Sheridan South drainage sub-basin as well as provide reliability of a critical lift station to maintain customer service.

Property and/ or easements acquired: N/A

Pipeline project: N/A

Project Name: Kokomo Wastewater Sheridan Force Main Rerouting
Project Number: I10-110004
CPS Number: N/A
Project Location: Sheridan
Estimated Construction Start Date: July 2023
Projected In-Service Date: October 31, 2023

Estimated Cost:

Contingency	$150,000
Non-Construction	311,111
Construction	460,000
Removals	80,000
Total	$1,001,111

Project Description
This project includes a new force main from the planned new Maple Run lift station upgrade (referenced in Project Number I10-110003) to a new downstream location that will provide capacity for increasing flows from customer growth in the Maple Run service area of the Sheridan wastewater system.

Background
The capacity of the existing force main and current discharge location is not sufficient for flows associated with the planned ultimate buildout of the Maple Run lift Station discussed in the above project. A new forcemain is required to convey the increased flows from the updated lift station and to discharge the flow at a new downstream manhole location capable of handling the increased flow from the station along with existing system flows.

Alternatives
Investigated alternatives included:

Option No. 1: Install 2,000 feet of new force main from the existing force main at a point eastward of manhole MSD-113 to manhole MSD-94. The new force main will be sized in conjunction with the sizing of the new Maple Run lift station pumps. The new pumps are anticipated to be sized at approximately 450 gallons per minute for projected peak flows associated with the complete build out of the Maple Run service area. Final pump sizing will be determined during design. Additional easements would be required for the forcemain extension.

Option No. 2: Increasing size and capacity of the gravity sewer from Manhole MSD-113 to MSD-94 and use existing force main route from the Maple Run Lift Station to the Tower lift station. This option requires costly replacement of the gravity sewers located in the roadway and challenges to maintain customer service during construction.

Recommended Solution
The recommended solution is Option No. 1, installing a new forcemain as described above. Option No. 1 is the lowest cost option and will provide adequate capacity for the Maple Run service area as described above.

Benefits
The force main improvements will provide adequate capacity to convey sewerage discharge for current flows being added and for projected flows of complete the build-out of the Maple Run service area.

Property and/ or easements acquired: Yes.

Pipeline project: 2,000 Feet

Pipeline project: Diameter Determined During Design

Pipeline project: Retired pipe diameters (6-in)

Pipeline project: Vintage of pipe retired (2005)

Project Name: Richmond Middle Fork Reservoir Improvements
Project Number: I10-250004
CPS Number: N/A
Project Location: Richmond
Estimated Construction Start Date: June 2023
Projected In-Service Date: November 30, 2023

Estimated Cost:

Contingency	$180,000
Non-Construction	749,183
Construction	996,486
Removals	75,000
Total	$2,000,669

Project Description

Improvements to the Richmond Middle Fork Dam which will include addressing cracks, spalls and delamination of concrete on the spillway and adjacent structures, installation of an access vault on the toe drains, limited recoating of the spillway bridge support beams, and other minor improvements.

Background

In 2022, a comprehensive dam assessment study was conducted, which included a slope stability evaluation and a structural evaluation of the dam. The summary report noted areas of spalled concrete on the principal spillway, cracks on the abutment walls and abutment wall turnbacks, and other areas where concrete rehabilitation is required. The evaluation also identified areas of the principal spillway bridge and the toe drain gutter recommended to be rehabilitated. Additionally, it was recommended that a vault/manhole be installed to enable inspection of the underground toe drain piping.

Alternatives
The only known alternative is to make the recommended improvements. Unless addressed, areas of concrete spalling and cracking may deteriorate further, impacting the service life of the structure.

Recommended Solution
Perform recommended improvements identified in the structural evaluation.

Benefits
Extended service life of the structure, increased ability to monitor and maintain the structure.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-25 - I10-250004 - Richmond Middle Fork Reservoir Assessment, Gannett Fleming, 2022

Project Name: Richmond National Road Booster Station
Project Number: I10-250012
CPS Number: N/A
Project Location: Richmond
Estimated Construction Start Date: October 2024
Projected In-Service Date: February 28, 2025

Estimated Cost:

Contingency	$200,000
Non-Construction	466,377
Construction	899,831
Removals	30,111
Total	$1,596,319

Project Description
The project scope is to install a prefabricated pump station to replace the existing National Road Pump Station. The project includes the realignment of the existing National Road Pressure Gradient. The gradient realignment will improve pumping efficiency, eliminate pressure reducing valves (PRVs) at customer meters with excessive pressure and improve fire flow capacity. The project scope also includes the construction of a PRV station to allow emergency flow from the National Road Pressure Gradient into the Main Service Pressure Gradient. Property acquisition is required for the pump station and PRV station.

Background
The existing underground National Road Pump Station, constructed in 1957, is difficult to access, located within INDOT right of way, and has operated past its useful life. No safe access parking area exists within the right-of-way for access. Traffic control is required creating additional safety risks for employees and motorists. Confined space hazard entry procedures are also required for entry into the underground pump station vault.

The existing National Road Pressure Gradient delivers pressures exceeding 130 psi to customers in certain areas. Relocating the pump station will move these areas into the Main Service Pressure Gradient with customer pressures below 100 psi. The pressure gradient modifications reduce the volume of water pumped from the lower elevation in the Main Service Pressure Gradient to the higher elevations in the National Road Pressure Gradient.

Alternatives
Rehabilitation of the existing National Road Pump Station was considered, however no safe access parking within the right-of-way for access would still be a concern. Additionally, the excessive pressure concerns with the existing National Road Pressure Gradient would still exist.

Recommended Solution
The recommended solution is a proposed pump station, PRV station, and pressure gradient modification.

Benefits
The proposed improvements will provide safe, reliable service. It will also provide more efficient system operation, reduce excessive customer pressures, improve fire flow capacity, and increase reliability of the National Road Pump Station.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Project Name: Wabash Summitville Property Acquisition & Well Replacement
Project Number: I10-450007
CPS Number: 1996 SUM CPS B-2
Project Location: Summitville
Estimated Construction Start Date: September 2023
Projected In-Service Date: March 31, 2024

Estimated Cost:

Contingency	$150,000
Non-Construction	595,392
Construction	766,164
Removals	15,000
Total	$1,526,556

Project Description
Replace Summitville well #2 with proposed well #4.

Background
Summitville Well #2 is located inside a building owned by Superior Tote Solutions, Inc. who provides a well water use easement to the Company. Although no detections of contamination have been identified to date, there is potential for contamination at the facility. In 2019, IDEM conducted a sanitary survey inspection, and a Recommendation deficiency was identified with recommended periodic testing of well #2 as well as continued weekly visual inspection of an above ground storage diesel tank with double walls and leak protection.

Alternatives
Option No. 1: Install a new well on a property identified as having good production potential and properly abandoning well #2.

Option No. 2: keep well #2 in service and investigate options to reduce the risk of contamination.

Recommended Solution
Option No. 1 is recommended to decrease the risk of contamination to the system.

Benefits
The primary benefit will be decreasing the risk of contamination and increased firm source of supply capacity.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-29 - I10-450007-Wabash Summitville - IDEM Sanitary Survey Inspection Letter, 2019

Workpaper MHH-30 - I10-450007-Wabash Summitville - INAW Inspection Summary Response, 2019

Workpaper MHH-31 CONFIDENTIAL - I10-450007 - 1996 SUM Comprehensive Planning Study, Project B-2

Project Name: West Lafayette 1.0 MG Elevated Storage Tank
Project Number: I10-470007
CPS Number: 2020 WLF CPS A-1, A-4
Project Location: West Lafayette
Estimated Construction Start Date: July 2023
Projected In-Service Date: November 30, 2024

Estimated Cost:

Contingency	$500,000
Non-Construction	1,773,779
Construction	5,003,112
Removals	0
Total	$7,276,890

Project Description
Acquire real estate in the vicinity of US 231 and Cumberland Rd. in the west portion of the West Lafayette service area, and design and construct a new 1.0 MG elevated water storage tank.

Background
The 2020 West Lafayette Comprehensive Planning Study (CPS) identified a storage deficit of 0.23 MG in 2020, and projects a storage deficit of 0.47 MG by 2033, 10 years from now, which was the end of the planning period when the CPS was completed. Additionally, the existing 0.36 MG Salisbury standpipe, which is in the Low Service gradient, is nearly 129 years old and is nearing the end of its useful life. It is anticipated that the Salisbury standpipe will need to be retired, and its volume be replaced. The expected near future retirement of the Salisbury standpipe volume of 0.36 MG was not included in the projected storage deficit of 0.47 MG because the tank volume is presently in-service, however the likely near future retirement of this tank should be considered along with the storage deficit when sizing the new elevated tank planned in this project. Constructing a new tank to replace the Salisbury standpipe at any location would be a future capital cost.

Alternatives
Because the future retirement of the 129-year-old Salisbury standpipe should be considered in sizing of this new elevated tank, additional discussion of options for the Salisbury standpipe will be discussed. The Salisbury standpipe is the only tank in the Low Service gradient, and while storage is available from the High Service gradient to the Low Service gradient through a pressure reducing valve (PRV) station, having some elevated storage in the Low Service gradient provides enhanced service reliability for the Low Service gradient because it reduces reliance on the operation of PRV valves which can fail. Providing some elevated storage in the Low Service gradient also avoids creation of a closed system in the Low Service gradient and thereby enables plant high service pumps in the Low Service gradient to operate in a more consistent and efficient manner as the elevated storage can provide the equalization volume for peak demands during the day. For these reasons providing some elevated storage in the Low Service gradient at the retirement of the Salisbury standpipe is recommended. This would require construction of new elevated storage tank in the Low Service gradient with the future retirement of the Salisbury standpipe.

Finding adequate real estate at an optimal ground elevation for the new elevated storage tank is a challenge because of how the community has fully developed around the existing Salisbury standpipe since it was constructed in 1894. While vacant adjacent property exists, it isn't optimal because of its significant elevation decline, sloping away from the existing tank site. It may be possible to construct a new storage tank on the existing tank site, however because of current set back requirements and limited space it is anticipated that the tank volume would need to be reduced from the current 0.36 MG to a smaller volume. Constructing a new tank to replace the Salisbury standpipe at any location would be a future capital cost. Replacing it with a smaller tank on the existing Salisbury site will be a lower capital cost than replacing it at a different site.

Option No. 1 for the new elevated tank in the High Service gradient is to construct the new elevated tank with a capacity of a standard 1.0 MG size. This option provides the projected immediate 10-year storage deficit of 0.47 MG. A larger tank capacity of 1.25 MG may be considered to enable the retirement of the 129-year-old 0.36 MG Salisbury standpipe without needing replacement storage. This would also accommodate the option of replacing the Salisbury standpipe with a smaller tank on the existing Salisbury standpipe site as may be recommended. This option also provides modest additional storage reserve beyond the 10-year period ending in 2033 which was the end of the planning period when the West Lafayette CPS was completed. Salisbury standpipe. It is recommended a cost analysis be completed to determine if a tank with a volume of 1.25 MG or 1.50 MG should be constructed.

West Lafayette is expected to continue to grow, and because the storage tank life will extend much further than the immediate ten-year period, and for all the factors discussed with respect to the Salisbury standpipe, Option 1 for the new elevated storage tank capacity of 1.0 MG or larger is recommended. A larger tank provides resiliency in the event of an emergency or during planned maintenance which takes other assets out of service.

Option No. 2: Construct a new elevated tank volume with smaller capacity than the recommended 1.0 MG size. This option is not recommended because it does not contemplate or provide flexibility for retirement of the Salisbury standpipe with or without replacement of the Salisbury standpipe with a smaller tank volume. It also doesn't consider the expected long asset life of the new elevated tank in conjunction with continuing growth of the West Lafayette system beyond the immediate ten years ending in 2033 which was the end of planning period when the most recent West Lafayette CPS was completed.

Recommended Solution
Construct a new elevated storage tank with capacity of 1.0 MG or larger.

Benefits
The new elevated storage tank provides the recommended equalization and public fire protection volume for the West Lafayette system while enabling flexibility for retirement of the 129-year-old Salisbury standpipe in the future.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-12 - 2020 WLF Comprehensive Planning Study, Project A-1

Workpaper MHH-13 - 2020 WLF Comprehensive Planning Study, Project A-4

Project name: West Lafayette 231 & Cumberland Ave. Transmission Main for New EST
Project Number: I10-470008
CPS Number: 2020 WLF CPS A-1
Project location: West Lafayette
Estimated Construction Start Date: August 2023
Projected in-service date: December 31, 2023

Estimated Cost:

Contingency	$200,000
Non-Construction	299,867
Construction	682,073
Removals	0
Total	$1,181,940

Project Description
West Lafayette- Distribution reinforcements on Route 231 & Cumberland Avenue.
Improved transmission capacity will significantly improve the ability to deliver water from the Davis Ferry WTP to the central and western parts of the High Service gradient and to the location of the proposed elevated tank (Project Number I10-470007).

Background
Several 12-inch mains have been installed in the west central portion of the West Lafayette High Service pressure zone; however, some segments are not connected. A 12-inch main was installed west on Cumberland Avenue in 2001, a 12-inch main was installed on Route 231 and Cumberland Avenue in 2011, and a 12-inch main was installed on McCormick Road and along Route 231 in 2015. Connecting these mains will eliminate the dead ends and provide additional transmission routes to the central and western portion of High Service pressure zone. The additional transmission capacity will enable the proposed elevated tank to be fully utilized.

Alternatives
Investigated alternatives included:
Option No. 1: Install 12-inch watermain connections listed above.

Option No. 2: Continue operation of existing distribution system piping network.

Recommended Solution
Install 1,850 feet of 12-inch main on Cumberland Avenue from the existing 12-inch main east of Route 231 to the existing 12-inch main near "The Lodge on the Trail" apartments. Install 1,250 feet of 12-inch main on Route 231, from the existing 12-inch main north of McCormick Road to the existing 12-inch main south of Cumberland Avenue.

Benefits
Connecting these mains will eliminate the dead ends and provide additional transmission routes to the central and western portion of High Service. The additional transmission capacity will enable the proposed elevated tank to be fully utilized.

Property and/ or easements acquired: Yes.

Pipeline project: Approximately 3,100 Lineal Feet

Pipeline project: 12-inch

Supplemental Workpapers:

Workpaper MHH-28 CONFIDENTIAL - I10-470008 - 2020 WLF Comprehensive Planning Study, Project A-1

Project Name: Johnson County London Road Well #5 and #6
Project Number: I10-550022
CPS Number: N/A
Project Location: Johnson County
Estimated Construction Start Date: April 2023
Projected In-Service Date: September 2023

Estimated Cost:

Contingency	$200,000
Non-Construction	696,358
Construction	2,147,539
Removals	0
Total	$3,043,897

Project Description
Increase source of supply capacity at the London Road Water Treatment Facility by constructing 2 new wells, with anticipated production capacities of 1.0 MGD each. The improvements are expected to increase the firm and total wellfield capacities to 5.0 MGD and 6.0 MGD, respectively.

Background
The Johnson County and Shelbyville systems are interconnected and rely on multiple wellfields and treatment facilities to meet the combined system demands including maximum day demands. During droughts, maximum day demands for the systems can occur simultaneously on the same day. Because of the large numbers of wells and the criticality of each of wellfield and treatment Plant for meeting system demands, the Company considers the firm capacity of each wellfield and treatment facility when assessing the ability to meet projected maximum day demands. Maximum day demands in typical comprehensive planning methodology are projected based on average day demands and maximum-to-average day demand ratios. Average day demands are tracking close to the projections; therefore, the 95% confidence interval maximum day demand projections continue to be the Company's projection for maximum day demands. Currently, maximum day demand projections through 2025 for the combined systems is approximately 22.5 MGD. The Company has adequate firm treatment capacity to meet this demand but has a firm source of supply deficit of approximately 1.7 MGD to meet this demand. It is recommended that two new wells with expected production capacity of 1.0 MGD each be constructed at the London Rd wellfield to provide adequate source of supply capacity.

Alternatives
Additional supplemental source of supply and treatment capacity options will be implemented in the future as demand projections necessitate. These options may include constructing a booster station at the Sloan Drive pressure reducing valve (PRV) station to enable pumping capacity from Franklin to Greenwood, constructing additional source of supply at JCO WRE wellfield, constructing additional raw water transmission main at WRE wellfield, and expansion of Marlin treatment facilities, or construction of a new wellfield and treatment facility along Sugar Creek between Johnson County and Shelbyville. The current recommendation of constructing two additional wells at the London Rd. facility provides the most capacity flexibility for the Johnson

County and Shelbyville systems because this is the only facility amongst the systems that can deliver water to both the Johnson County system and the Shelbyville system. Therefore, this option is recommended.

Recommended Solution
Construct 2 new wells with expected capacities of 1.0 MGD each at the London Rd. wellfield.

Benefits
The additional wells will provide adequate firm capacity to meet projected maximum day demands of the Johnson County and Shelbyville systems through 2025.

Property and/ or easements acquired: No

Pipeline Project: No

Project Name: Johnson County London Road Backup Power
Project Number: I10-550025
CPS Number: N/A
Project Location: Johnson County
Estimated Construction Start Date: February 2024
Projected In-Service Date: May 31, 2024

Estimated Cost:

Contingency	$300,000
Non-Construction	461,727
Construction	652,612
Removals	0
Total	$1,414,339

Project Description
The project scope includes the installation of a backup generator, platform, automatic transfer switch (ATS), electrical gear, electrical cabling and conduit, and appurtenances for the London Road Wellfield, supporting backup power to Wells #1, #3, #4, #5, and #6.

Background
The London Rd treatment facility was recently expanded to serve both the Johnson County and Shelbyville systems because of increased system demands across both service areas. Two filters were added for additional treatment capacity for service to both Johnson County and Shelbyville systems, and two high service pumps with a transmission main were installed to provide service to the Shelbyville system.

To provide reliable service for the 2030 projected demands of both Johnson County and Shelbyville systems, two additional wells are also planned to be added to the London Rd treatment facility to have a source of supply firm capacity of 5.0 MGD (Project Number: I10-550022). In the Johnson County – Risk and Resilience Assessment, the London Rd treatment facility is identified as a critical asset.

With Johnson County and Shelbyville systems both relying on this plant for water service, it is a more critical component. The London Rd treatment facility currently has backup power for the treatment plant and Well #2, which is located on the plant site. Wells #1, #3, and #4, located in the London Rd wellfield and future wells #5 and #6, all do not have backup power to maintain reliable source of supply in the event of a power outage. In the event of a power outage, the London Rd facility is not able to provide adequate service to the Johnson County and Shelbyville systems.

Alternatives
The design and installation of a backup generator and related electrical systems at the London Road Wellfield for Wells #1, #3, #4, and future wells #5 and #6 to provide reliable source of supply during a power outage. The design and installation of a new backup generator at London Road Wellfield and a larger generator at the Blue River wellfield to provide full backup power, where less reliable source of supply would be required of the London Rd wellfield. This option

would have a higher capital investment cost. No other options exist to provide backup power to the existing wellfield.

Recommended Solution
The recommended solution is to install a backup generator and related electrical gear and cabling at the London Road Wellfield. This option satisfies the requirements for backup power while providing the best value and system resiliency via the recommended improvements at the London Rd. critical asset facility.

Benefits
The installation of a backup generator at the London Road Wellfield will provide appropriate source of supply capacity reliability and resiliency in the event of a power outage.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Johnson County Sugar Creek Chlorine Conversion
Project Number: I10-550026
CPS Number: N/A
Project Location: Johnson County
Estimated Construction Start Date: July 2023
Projected In-Service Date: February 29, 2024

Estimated Cost:

Contingency	$300,000
Non-Construction	802,898
Construction	1,871,135
Removals	50,022
Total	$3,024,055

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system.

Benefits
Elimination of hazardous chlorine gas.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Noblesville Washwater Tank Replacement
Project Number: I10-600020
CPS Number: N/A
Project Location: Noblesville
Estimated Construction Start Date: July 2023
Projected In-Service Date: September 30, 2023

Estimated Cost:

Contingency	$150,000
Non-Construction	478,849
Construction	1,737,312
Removals	0
Total	$2,366,161

Project Description
Replace the existing Noblesville Wayne Street filter backwash tank at the end of its service life with a new backwash tank and pump station. The design concept for the new facilities will eliminate the need for confined space entries and for working at heights for equipment access and maintenance. The new facilities provide for safer operation by personnel. An evaluation of the tank was completed in 2020, recommending replacement.

Background
The existing 90,000-gallon welded steel backwash water holding tank has reached the end of its service life. Continued operation of this treatment facility requires replacement of these facilities.

Alternatives
The existing tank is a conventional welded steel tank with a flat bottom. After recycling decanted water, residuals are pumped to the sanitary sewer daily. The existing flat bottom tank accumulated residuals resulting in the need for additional manual, annual cleanouts on to maintain adequate backwash capacity. This involved safety risks of personnel entering the confined space to perform cleaning work. Access and management of removing recycle and residuals discharge pumps also involved safety risks of working from heights because access was from the top of the tank. These significant safety concerns and operational challenges would remain if the tank were replaced with the same concept as the original design.

The recently completed Allisonville Road Treatment Facility is equipped with a partially buried concrete basin with a sloped floor which enables complete discharge of residuals to the sanitary sewer daily without need for annual manual cleaning. The basin has two chambers which allow one side to be taken down for inspections and for potential future maintenance work while enabling continued treatment operation. This tank design does not require personnel to annually enter into a confined space to perform tank cleaning, thereby reducing the significant safety risks of performing work in a confined space. Additionally, access for removing recycle and residuals discharge pumps is at ground level, thereby also eliminating the significant safety risks of working from heights for this work.

Based on anticipated volumes required for the Wayne Street Water Treatment Facility, it is feasible to provide a setup like the design at the Allisonville Road Treatment Facility. The decant pump station will also be constructed at ground level. This safer design concept was selected.

Recommended Solution
Construct a two-cell rectangular cast-in-place concrete basin and a prefabricated pump station at ground level to house decant pumps and process piping. Submersible residuals discharge pumps in the tank wet well will be used for residuals pumping. This design concept eliminates the need for confined space entries and for working at heights for equipment access and maintenance. The new facilities will replace the existing facilities at the end of their useful life and will provide for safer operation by personnel.

Benefits
New reliable backwash facilities and improved and safer backwash residuals management.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-21 - I10-600020 - Noblesville Washwater Tank Evaluation, TIC, 2020

Project Name: Noblesville Olio Rd EST & Distribution Improvements
Project Number: I10-600021
CPS Number: N/A
Project Location: Noblesville
Estimated Construction Start Date: September 2023
Projected In-Service Date: November 30, 2024

Estimated Cost:

Contingency	$2,000,000
Non-Construction	4,211,784
Construction	7,613,602
Removals	25,000
Total	$13,850,386

Project Description

The project includes the installation of a proposed 1.25-1.5 MG elevated storage tank (EST) and approximately 11,000 feet of 20-inch, 16-inch and 12-inch transmission main to address a storage deficit in the Noblesville High Pressure gradient. The project scope also includes replacement or upgrades to existing pumps and related electrical gear at the Conner St. and Stoney Creek pump stations. The new EST overflow elevation will raise the hydraulic grade line in the High Gradient, enabling adequate service at higher ground elevations.

Background

Significant growth has been occurring within INAW's Noblesville system and is projected to continue. Maximum day demands have ranged from 6.6 MGD to 8.5 MGD over the past 10 years and are projected to increase to approximately 11.0 MGD by 2035. The projected growth in the system is predicted to limit the ability to provide adequate levels of service by as early as 2025. Pressure in the High Gradient during peak demand periods in 2025 are predicted to be less than 30 psi in some areas. There is currently no elevated storage within the High Gradient and the current storage deficit is 0.9 MG. The storage deficit is projected to increase to 1.24 MG by 2035.

Alternatives

There are no practicable alternatives to construction of new storage facilities to address the deficit. There is no floating storage available in the High Gradient, so it is currently operated as a closed system. Careful monitoring and control of the pumps at the Conner Street and Stoney Creek Pump Stations and at the Marilyn Road Pumped Storage Facility is required to avoid over pressurizing the system, and provision of an elevated storage tank will eliminate this risk. Additionally, elevated storage provides more reliable service than ground storage because it does not rely on mechanical pumping of water and on reliable electric power supply. Additionally filling large ground storage tanks without an elevated tank in the zone can be challenging or infeasible while providing adequate system pressures. The project scope also includes replacement or upgrades of pumps and related electrical gear at the Conner St. and Stoney Creek pump stations. The new tank overflow elevation will raise the hydraulic grade line in the High Gradient, enabling adequate service at higher ground elevations. The recommended transmission mains balance the pressures in the High Gradient. Providing adequate transmission capacity reduces headloss through the mains, lowering the high pressures that would be experienced near the Connor Street booster discharge. Storage, pumping, and transmission improvements are recommended to provide a minimum normal working pressure of 35 psi and to provide adequate levels of service in the High Gradient.

Recommended Solution
The recommended solution is to construct a new 1.25-1.5 MG EST, approximately 11,000 feet of transmission main, and booster station pump improvements as required. An approximately 3 acre site on Olio Road, previously owned by the Noblesville Fire Department, has been acquired. It is recommended to construct the EST with an overflow elevation of 990 feet, raising the hydraulic grade line in the high gradient. The route for transmission mains may change if the recommended route is not feasible. Changes to the route will be evaluated to determine if they provide adequate hydraulic benefits.

Benefits
Adequate storage in the Noblesville High Pressure gradient through 2035.

Property and/ or easements acquired: Yes.

Pipeline project: 11,000 feet

Pipeline project: 16-inch and 12-inch

Pipeline project: Retired pipe diameters (N/A)

Pipeline project: Vintage of pipe retired (N/A)

Supplemental Workpapers:
Workpaper MHH-7 - Technical Memorandum - High Gradient Phase 1 Improvements - Kurtz Engineering, 2023

Project Name: Noblesville Operations Center
Project Number: I10-600022
CPS Number: N/A
Project Location: Noblesville
Estimated Construction Start Date: TBD
Projected In-Service Date: December 31, 2024

Estimated Cost:

Contingency	$650,000
Non-Construction	200,000
Construction	3,001,844
Removals	0
Total	$3,851,844

Project Description
The project scope is to build a new Operations Center in Noblesville, Indiana with appropriate space for operations administration, field operations, storage, asset maintenance, and related activities, along with garage space for storage, parking and maintenance which will also provide adequate parking for operations, business partners, and visitors.

Background
The existing Operations facility and property have inadequate space for vehicles, material storage. The existing location also lacks space for adequate covered storage. Consequently, materials are stored at three different locations in the operations, resulting in operational inefficiencies. Inadequate space at the existing location also presents increased safety risks for employees and visitors as relates to personnel and vehicle traffic, material loading and unloading, and other site activities.

Alternatives
Option No. 1: Build a new Operations Center at the Allisonville Rd. Water Treatment Facility.

Option No. 2: Purchase property elsewhere in Noblesville and build a new Operations Center on that property.

Option No. 3: Leasing/purchasing other locations.

Recommended Solution
A recommended solution will be determined upon completion of the site evaluation and detailed scope of work development.

Benefits
The new Operations center will provide adequate space for vehicles, material storage, loading and unloading activities, safe employee, visitor and vehicle movement, and adequate space for maintenance activities. The new Operations center will improve site safety for employees,

business partners, and visitors, and will also enhance operational efficiency and management with material storage at a single location.

Property and/ or easements acquired: Dependent on Selected Alternative

Pipeline project: N/A

Project Name: Noblesville White River North Chlorine Conversion
Project Number: I10-600023
CPS Number: N/A
Project Location: Noblesville
Estimated Construction Start Date: July 2023
Projected In-Service Date: February 29, 2024

Estimated Cost:

Contingency	$300,000
Non-Construction	471,441
Construction	2,202,931
Removals	50,089
Total	$3,024,460

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system.

Benefits
Elimination of hazardous chlorine gas.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Shelbyville Blue River Well #5 & #6, Retire #1 & #4
Project Number: I10-650011
CPS Number: N/A
Project Location: Shelbyville
Estimated Construction Start Date: April 2023
Projected In-Service Date: September 30, 2023

Estimated Cost:

Contingency	$150,000
Non-Construction	483,725
Construction	1,010,730
Removals	10,000
Total	$1,654,455

Project Description
The project includes the replacement of wells 1 and 4 with new wells 5 and 6 at the Blue River wellfield. Additionally, existing wells 2 and 3 will be equipped with smaller pumps and motors after production rates for the new wells 5 and 6 are determined. This is intended to extend the service life of wells 2 and 3 and to reduce the potential for these wells to be pumped above optimal rates.

Background
Existing wells 1 and 4 production rates have declined over many years due to aquifer formation clogging leading to the well screens despite continued well cleanings. This is not uncommon in certain aquifers and can also be localized phenomena within larger wellfields. The loss in production rates must be replaced with new wells to maintain adequate source capacity for projected system demands. Wells 1 and 4 will be retired with construction of the new wells. Existing wells 2 and 3 have experienced some production rate declines. Installing smaller capacity pumps and motors in these wells is expected to extend the life for these two wells while also reducing the potential for them to be pumped at higher than optimal rates given their declines.

Alternatives
Investigated alternatives include:

Option No. 1: Replacement of existing wells 1 and 4 with new wells 5 and 6. Install smaller capacity pumps and motors in wells 2 and 3 to extend their lives and to reduce the potential for them to be pumped at higher than optimal rates given their declines. The size of the new pumps and motors for wells 2 and 3 will be determined after completion of new wells 5 and 6.

Option No. 2: Expand the London Rd. source of supply to offset continuing declines at the Blue River wellfield. This is not an option because the London Rd. wellfield is already planned for complete build-out under a separate project (I10-550022) to meet projected demands for Johnson County and Shelbyville. This capacity analysis includes maintaining the design supply capacity at the Blue River wellfield which requires replacement of declining wells 1 and 4.

Recommended Solution
Option No. 1: It is recommended to replace Blue River wells 1 and 4, and to install smaller pumps and motors in Blue River wells 2 and 3 to extend their service life, and to reduce the potential for wells 2 and 3 to be pumped at higher than optimal rates given their declines. Option No. 1 is required to maintain the production needed at both the Blue River wellfield and London Road as these districts are interconnected with both the Johnson County and Shelbyville Districts.

Benefits
This project is one of two near-term projects that will ensure provision of adequate source capacity to meet projected demands in the Shelbyville and Johnson County systems through 2025. The other near-term project is buildout of the London Rd. wellfield, as referenced in the previous project description, and will be managed separately.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Shelbyville Blue River Chlorine Conversion
Project Number: I10-650013
CPS Number: N/A
Project Location: Shelbyville
Estimated Construction Start Date: June 2023
Projected In-Service Date: April 30, 2024

Estimated Cost:

Contingency	$300,000
Non-Construction	877,391
Construction	1,954,537
Removals	22,500
Total	$3,154,427

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system.

Benefits
Eliminate hazardous chlorine gas.

Property and/ or easements acquired: No

Pipeline project: N/A

Project Name: Terre Haute Replacement Electric Gear & HSP 14
Project Number: I10-700011
CPS Number: 2011 TER CPS A-3
Project Location: Terre Haute
Estimated Construction Start Date: July 2024
Projected In-Service Date: March 31, 2025

Estimated Cost:

Contingency	$600,000
Non-Construction	300,000
Construction	2,140,890
Removals	10,000
Total	$3,050,890

Project Description
High service Pump No. 14 is aging and becoming more inefficient as it nears the end of its useful life. The motor control center (MCC) equipment for all four high service pumps is becoming obsolete and replacement parts are becoming difficult to source.

Background
Four high service pumps located in the Control Building, utilize suction from Clearwell No. 3. All consist of horizontal split case pumps with constant speed electric motors, installed in 1966. Efficiency tests have been performed on all the pumps in the past. The results showed that most of the pumps are operating efficiently except for Pump No. 14. The MCC equipment for all four high service pumps is obsolete and replacement parts are becoming difficult to source. Additionally, the equipment does not meet current safety standards and present reliability risks.

Alternatives
The only viable option is replacement. Doing nothing puts the pumps and their electrical equipment at risk for failure which would impact the Company's ability to provide sufficient supply to meet customer demands.

Recommended Solution
Replace the existing electrical gear and high service pump No. 14.

Benefits
Reduce safety risk of the existing aged and obsolete electrical gear. Improve reliability of the electrical gear and improve operation flexibility for high service pumping in different demand conditions.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-27 CONFIDENTIAL - I10-700011 - 2011 TER Comprehensive Planning Study, Project A-3

Project Name: Terre Haute Merom EST
Project Number: I10-700013
CPS Number: N/A
Project Location: Terre Haute
Estimated Construction Start Date: March 2023
Projected In-Service Date: November 30, 2023

Estimated Cost:

Contingency	$300,000
Non-Construction	379,021
Construction	1,326,545
Removals	50,000
Total	$2,055,565

Project Description
The project scope is the installation of a proposed 50,000-gallon elevated storage tank (EST) to replace the existing 50,000-gallon elevated storage tank. The existing tank is at the end of its useful life and will be retired and demolished.

Background
The existing Merom elevated storage tank is at the end of its useful life. The existing riveted steel tank was constructed in 1950. It has had multiple failures due to poor condition, including two failures in 2019 that required the tank to be taken out of service for repair. Future failures are anticipated to continue due to metal loss on the interior of the tank. The tank is at the end of its useful life.

Alternatives
Rehabilitation of the existing tank and construction of a replacement tank were considered. Tank Industry Consultants (TIC) completed a study titled "Evaluation of the 50,000 Gallon Steel Elevated Water Tank", in 2014. Additional condition assessment was performed in 2019 by TIC. The TIC evaluation stated that a complete rehabilitation would approach the cost of a replacement tank. The evaluation also stated the replacement option would provide a significantly greater useful life than rehabilitation. TIC further reinforced the same considerations for tank replacement in 2019 with a memorandum following further inspection during one of the tank failures. INAW's draft comprehensive planning study (CPS) is in progress, and it currently recommends the new replacement tank be sized the same as the existing tank, at 50,000 gallons.

Recommended Solution
The recommended solution is to construct a new 50,000-gallon EST to replace the existing 50,000-gallon tank. The existing tank is at the end of its useful life and will be retired and demolished. The proposed tank site property currently owned by Indiana American Water. The preliminary stage of the project will include evaluation of the Proposed site and proposed tank specifications to meet engineering, water quality, and system requirements.

Benefits
The proposed elevated storage tank will replace the existing tank at the end of its useful life. It will provide service reliability.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-23 - I10-700013 - Terre Haute Merom EST - TIC Evaluation, 2014

Workpaper MHH-24 - I10-700013 - Terre Haute Merom EST - TIC Condition Assessments, 2019

Project Name: Terre Haute Mecca East Pressure Zone Improvements
Project Number: I10-700014
CPS Number: N/A
Project Location: Terre Haute
Estimated Construction Start Date: April 2023
Projected In-Service Date: May 31, 2024

Estimated Cost:

Contingency	$504,997
Non-Construction	416,804
Construction	1,475,257
Removals	65,000
Total	$2,462,058

Project Description
The project scope includes replacement of approximately 8,400 feet of small diameter water mains with new 8-inch main, and replacement of the Mecca East booster station to improve pressure in the Mecca east pressure zone. The scope for the booster station replacement includes purchase of real estate for construction of the new booster station at a lower elevation. The project is eligible for a SWIF grant from the Indiana Finance Authority (IFA) in the amount of $950,000.

Background
The existing booster station was constructed in 1982 and sits at an elevation which results in pressures below 20 psi in distribution system piping on the suction side of the booster station. In addition, customers in the southern portion of the east pressure zone experience pressures below 35 psi during peak demand periods. 327 Ind. Admin. Code 8-3.2-11(b) states, "The normal operating pressure in the water main shall not be less than twenty (20) pounds per square inch (psi) under all conditions of flow at the ground level at all points in the water main...". Furthermore, section 8.2.1 of the "Recommended Standards for Water Works" as established by the Great Lakes - Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, which is also known as the "Ten State Standards", states: "The system shall be designed to maintain pressure of 20 psi (140kPa) at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be 60 to 80 psi (410-550 kPa) and shall not be less than 35 psi (240kPa) unless otherwise approved by the reviewing authority." Indiana American's standard practice is to maintain a normal working pressures of 35 psi or greater and a minimum of 20 psi during fire flow events in compliance with the Indiana Administrative Code and Ten States Standards. The existing water system assets don't enable the Company to maintain this practice.

Alternatives
Option No. 1: includes replacing approximately 8,400 feet of small diameter main with new 8-inch diameter main and replacing the existing booster station with a new booster station at a lower elevation. Future small diameter water main replacements may be considered in future projects to further improve pressures in the Mecca system.

Option No. 2: includes maintaining the existing system without replacing the inadequate assets. This option would not result in improving system pressures or complying with the Indiana Administrative Code and Ten States Standards.

Recommended Solution
Option No. 1, replace approximately 8,400 feet of small diameter water mains with new 8-inch main and replace the Mecca East booster station to improve pressures in the Mecca east pressure zone. The scope for the booster station replacement includes purchase of real estate for construction of the new booster station at a lower elevation. Future small diameter main replacements may be considered in future projects to further improve pressures in the Mecca system.

Benefits
Compliance with the Indiana Administrative Code and Ten States Standards for system pressures.

Property and/ or easements acquired: Yes.

Pipeline project: 8,400 feet

Pipeline project: 8-inch

Pipeline project: Retired pipe diameters (2 and 3-inch)

Pipeline project: Vintage of pipe retired (1964 and 1969)

Project Name: Terre Haute Water Treatment Facility Chlorine Conversion
Project Number: I10-700015
CPS Number: N/A
Project Location: Terre Haute
Estimated Construction Start Date: July 2023
Projected In-Service Date: April 30, 2024

Estimated Cost:

Contingency	$469,637
Non-Construction	700,602
Construction	1,158,206
Removals	22,500
Total	$2,350,945

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system.

Benefits
Eliminates hazards of chlorine gas.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Terre Haute Reinforcement Airport Main
Project Number: I10-700016
CPS Number: N/A
Project Location: Terre Haute
Estimated Construction Start Date: October 2023
Projected In-Service Date: March 31, 2024

Estimated Cost:

Contingency	$250,000
Non-Construction	321,877
Construction	1,421,985
Removals	0
Total	$1,993,862

Project Description
The proposed project scope is a water main reinforcement to connect existing mains on SR46/US40 and Hunt Road in Terre Haute near the Terre Haute Regional Airport. The proposed installation will be approximately 7,400 feet of 16-in water main. The proposed route follows a proposed roadway project adjacent to the airport. The project will increase the available fire flow in the area. This reinforcement along with a planned developer installed water main at a different location along Margaret Avenue near Fruitridge Drive together are modeled to improve public fire protection at the Terre Haute Regional Airport from 700 gpm to the recommended 2,250 gpm as requested by the City of Terre Haute and its fire department.

Background
The area near the Terre Haute Airport has low public fire protection flow availability due to long runs of smaller diameter mains. The City of Terre Haute and its fire department have requested Indiana American Water to reinforce the water distribution system to improve public fire protection availability at the Terre Haute Regional Airport and surrounding area. The recommended public fire protection flow availability for the area is 2,250-gpm at 20-psi. The existing system provides less than 700-gpm at 20-psi due to the existing long run of smaller diameter mains to the area.

Alternatives
Multiple alternatives, as part of a technical memorandum, were considered to evaluate available fire flow improvements at the Terre Haute Regional Airport. The alternatives involved various water main improvement combinations. The alternatives were evaluated based on resulting public fire protection flow availability at the airport.

Recommended Solution
The recommended solution is installing about 7,400 feet of 16-in water main reinforcement. The reinforcement will connect existing mains along SR46/US40 and Hunt Road. The proposed route follows a proposed roadway project adjacent to the airport. This reinforcement combined with the planned developer installed 5,300 feet of 12-in water main along Margaret Avenue are estimated to satisfy the recommended public fire protection flow availability at the airport. The planned developer installed main was included in all alternatives.

Benefits
The proposed project in conjunction with the developer installed main along Margaret Avenue will increase public fire flow availability at the Terre Haute regional airport fire flow to the recommended 2,250-gpm at 20-psi.

Property and/ or easements acquired: Yes.

Pipeline project: 7,400 ft

Pipeline project: 16-inch

Supplemental Workpapers:

Workpaper MHH-22 - I10-700016 - Terre Haute Reinforcement Airport Main, Kurtz Engineering, 2022

Project Name: Southern IN REI Veterans Parkway to Blackiston Mill
Project Number: I10-750018
CPS Number: 2011 SIO CPS B-5
Project Location: Southern IN
Estimated Construction Start Date: July 2023
Projected In-Service Date: February 29, 2024, and February 28, 2025

Estimated Cost:

Contingency	$800,000
Non-Construction	1,945,049
Construction	6,436,240
Removals	100,000
Total	$9,281,290

Project Description
The project includes installation of 8,500 ft. of new 24-inch transmission main with connections to adjacent mains between Veterans Parkway at Bass Pro Drive and Blackiston Mill Rd. The main will be installed in easements and right-of-way.

Background
The new 24-inch main will reinforce the distribution system as part of a larger multi-phase plan by providing transmission capacity to New Albany and other parts of the service area in the event of failures to the sole existing 36-inch transmission main supplying water from Jeffersonville to New Albany. It also provides distribution system reinforcement and reliability in the event of failures of the existing mains in this area. The 1990s 36-inch transmission main has experienced five failures which have resulted in significant risks to sustaining water service to large portions of the service area. The new 24-inch main along with other phases of the plan will provide system resiliency for maintaining service to customers during failures on the 36-inch transmission main. The new 24-inch main will also enable replacements or lining of portions of the failing 36-inch transmission mains while maintaining service to customers.

Alternatives
Option No. 1: From the intersection of Bass Pro Dr. & Veterans Parkway west along Veterans to Byron Dr. on west to Marlow Dr. to Blackiston Mill. within existing easements if possible, and in new easements. Challenges may include potentially insufficient space installation and future maintenance in existing easements or R/W with other utilities occupying the area. This route also includes multiple sewer and road crossings.

Option No. 2: From the intersection of Bass Pro Dr. & Veterans Parkway west along Veterans to Lombardy Dr., north along Lombardy to Spicewood Dr. then west to Blackiston Mill within existing easement if possible, and in new easements. Challenges include potential insufficient space in existing easements or R/W with other utilities occupying the same area and may require additional easements in developed areas where routing room may not exist for a 24-inch main. Multiple sewer and road crossings are along this route.

Option No. 3: From the intersection of Bass Pro Dr. & Veterans Parkway west along Veterans to Lombardy Dr., north along Lombardy to Parkwood Dr. then west to Blackiston Mill. within existing easement if possible, or easement acquisitions when necessary. Challenges would include finding a suitable corridor in the existing easements or R/W with all the other utilities occupying the area. Multiple sewer and road crossings are in this route. Option 4: From the intersection of Broadway St. & Veterans Parkway north along Broadway St. to Potters Lane, north along Lombardy to Parkwood Dr. then west to Blackiston Mill. within an existing easement if possible, or in a new easement. Challenges include potential insufficient space in existing easements or R/W with other utilities occupying the area. Multiple sewer and road crossings are in this route. All options are being evaluated with consideration given to adequacy of space for installation and future maintenance.

Recommended Solution
All options are being evaluated with consideration given to adequacy of space for installation and future maintenance. A final recommendation for route layout will be identified as part of the preliminary planning and design activities.

Benefits
Improved service reliability and distribution system resiliency.

Property and/ or easements acquired: Yes, where feasible

Pipeline project: 8,500 feet

Pipeline project: 24-inch

Pipeline project: Retired pipe diameters (N/A)

Pipeline project: Vintage of pipe retired (N/A)

Supplemental Workpapers:
Workpaper MHH-8 - 2011 SIO Comprehensive Planning Study, Project B-5

Workpaper MHH-9 - Technical Memorandum - New Albany System Reliability Evaluation, INAW 2023

Project Name: REP SIO Veterans Parkway Phase 2
Project Number: I10-750021-02
CPS Number: N/A
Project Location: Southern IN
Estimated Construction Start Date: April 2023
Projected In-Service Date: June 30, 2023

Estimated Cost:

Contingency	$90,000
Non-Construction	295,432
Construction	2,008,462
Removals	0
Total	$2,393,894

Project Description
The project scope includes installation of 770 feet 36-inch casing with 24-inch transmission main along Veterans Parkway at I-65, with tie ins to existing mains east and west of I-65 installed as part of Phase I of Veteran's Parkway to replace existing failing 16 inch main under I-65 at Progress Parkway. New main will be installed in the Right-of-Way.

Background
The existing 16-inch main was installed in the 1950's is failing and results in disruption of water service and boil advisories across the service area.

Alternatives
Alternate routing of new Transmission Main along Veteran's was investigated.

Option No. 1: Follow the existing route, within existing easement, if possible. Challenges would include a wetland crossing, two creek/stream crossings, and multiple sewer line crossings. The existing main is also routed through the rear lots of a developed subdivision, which would be very difficult to access. Additionally, this route would require the Company to cross the railroad outside of the public right-of-way.

Option No. 2: Follow original route to Crums Lane, north long Hamburg Pike, across Coopers Lane to Progress Parkway staying along roadways. May require additional easements in developed areas where routing room does not easily exist for a 24-inch main and would likely include several sanitary sewer conflicts.

Option No. 3: Connect to 16-inch main at Veterans Parkway and Woehlre Rd. on the east side of the area and follow Veterans Parkway west to connect into the 12-inch main west of the interstate. Route eliminates wetland routing, crossing multiple sewer lines, 2 creek/stream crossings, and reduces the number of non-right-of-way railroad crossings.

Recommended Solution
Based on the investigated options, Option No. 3 is the most practical and economical. This option would eliminate the need to cross streams/creeks, install the main through rear lots of the

adjacent subdivision, undeveloped wetlands, and large diameter sewer infrastructure, including various lift stations. This option also allows reduction of the number of problematic rail crossings by providing an option that crosses any railroads within the public right-of-way.

Benefits

Replacing the failing main will improve service reliability to customers. Sizing the new main at 24-inch, along with prior and future planned main replacements will also enable repair and rehabilitation of the single 36-inch transmission main extending from the plant across the service area to New Albany, while maintaining service to customers.

Property and/ or easements acquired: No

Pipeline project: 770 feet

Pipeline project: 24-inch

Pipeline project: Retired pipe diameters (16-inch)

Pipeline project: Vintage of pipe retired (1959)

Supplemental Workpapers:

Workpaper MHH-26 - I10-750021-02 - REP SIO Veterans Parkway Phase 2 Reliability Evaluation

Project Name: Southern Indiana Ops & Treatment Center Chlorine Conversion
Project Number: I10-750022
CPS Number: N/A
Project Location: Southern IN
Estimated Construction Start Date: July 2023
Projected In-Service Date: February 29, 2024

Estimated Cost:

Contingency	$532,500
Non-Construction	414,295
Construction	846,957
Removals	75,000
Total	$1,868,752

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system.

Benefits
Eliminate hazardous chlorine gas.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Northwest Borman Park LAS & Fluoride
Project Number: I10-900049-05
CPS Number: N/A
Project Location: Northwest
Estimated Construction Start Date: November 2022
Projected In-Service Date: March 31, 2023

Estimated Cost:

Contingency	$0
Non-Construction	50,000
Construction	1,395,806
Removals	18,825
Total	$1,464,631

Project Description
The project scope includes switching from Ammonia to Liquid Ammonia Sulfate (LAS) at the Borman Park Water Treatment Plant and rehabilitation of both the Ammonia and Fluoride bulk storage and chemical feed rooms. The proposed improvements include the installation of new floor coatings, bulk tanks, piping, fittings, valves, transfer pumps, metering pumps, instrumentation, and chemical day tanks.

Background
The existing Ammonia and Fluoride bulk tanks were installed in 2003 and are approaching the end of their useful life. The floor coatings, piping, valves, and fittings are in poor condition and need replacement. The existing exhaust system in the Ammonia room does not provide adequate air exchange for the chemical so operations personnel must take precautions when working in that room. Replacing Ammonia with LAS will eliminate the strong fumes and the need to replace the exhaust system. LAS is a replacement for ammonia and will not require any other chemical changes.

The Borman Park Water Treatment Plant and the Ammonia system cannot be shut down for any length of time, so the construction must be done so that there is a seamless transition between Ammonia and LAS. Fluoride can be shut down for a period during construction so the Fluoride room will be demoed first and will become the new LAS room. This will allow construction of the LAS system while keeping the Ammonia system in service. It will also eliminate the need to construct a temporary system. Following completion of the LAS room, the Ammonia room will house the new Fluoride equipment.

Alternatives
Option No. 1: Replace the bulk tanks and replace them one at a time to allow the chemical systems to stay in service. Rehabilitate the exhaust system so that the Ammonia room is properly exhausted. The proposed improvements include the installation of new floor coatings, bulk tanks, piping, fittings, valves, transfer pumps, metering pumps, instrumentation, and chemical day tanks.

Option No. 2: Rehabilitate the bulk and day tank rooms and switch from Ammonia to LAS.

Recommended Solution
Option No. 1 is recommended.

Project Benefits
Benefits include no longer having to work with and around Ammonia. Replacing Ammonia with LAS eliminates operations having to work in and around the fumes that come from Ammonia. Rehabilitating the bulk and day tank rooms gives an opportunity to replace and repair floor coatings in all rooms. Replacing all the piping, valves, fittings, pumps, and tanks eliminate the constant repairs that would be needed soon due to the age and condition of the assets.

Property and/ or easements: No.

New Pipe Length: N/A

Project Name: Northwest Borman Park Electrical Gear Replacement
Project Number: I10-900050
CPS Number: 2017 NWIO CPS A-2
Project Location: Northwest
Estimated Construction Start Date: July 2022
Projected In-Service Date: June 30, 2023

Estimated Cost:

Contingency	$200,000
Non-Construction	776,880
Construction	2,685,626
Removals	40,000
Total	$3,702,506

Project Description
Replace the main electrical switchgear, the pump motor starters, and the four (4) 700 HP synchronous motors for the high service pumps at the Borman Park Water Treatment Plant.

Background
The existing electrical switchgear at the Borman Park Water Treatment Plant is obsolete and does not meet current safety standards. The age and condition of the 70-year-old electrical equipment also presents significant concern regarding service reliability.

Alternatives
Option No. 1: A feasibility study completed in 2018, investigated installing the new equipment in the same area as the existing operating equipment. This involved shutting down and removing half the equipment to install the new electrical switchgear near the existing operating electrical equipment. Once half the new equipment was operational, the other half could then be replaced. This option required numerous short-term shutdowns and created both operational and safety risks during installation.

Option No. 2: Construct a new building structure to house the new switchgear equipment and make one planned switch over that can be accomplished in a controlled and safe manner. The full voltage synchronous motor starters on the 4 high service pumps also requires replacement for reliability and obsolescence. New soft start motor starters for the existing synchronous motors were considered. Operating multiple synchronous motors on the standby generator has not been successful in the past. This option also considers replacement of both the motor starters and 70-year-old synchronous motors with new induction motors and starters.

Recommended Solution
Option No. 2: The recommended option is to construct a new building structure to house the new electrical switchgear equipment and make one planned switch over that can be accomplished in a controlled and safe manner. Replace the 70-year-old synchronous motors with full voltage starters with new premium efficient induction motors and soft start motor starters.

Benefits
Replacing the 70-year-old equipment and synchronous motors and starters will improve future service reliability at Indiana-American's largest treatment facility. Eliminate safety concerns of repairs and maintenance of the existing 70-year-old obsolete switchgear, 700 HP synchronous motors and full voltage motor starters.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-19 CONFIDENTIAL - I10-900050 - Northwest Borman Park Electrical Gear Replacement Feasibility Study, 2018

Workpaper MHH-20 CONFIDENTIAL - I10-900050 - 2017 NWIO Comprehensive Planning Study, Project A-2

Project Name: NWI Winfield EST & Pump Station
Project Number: I10-900061
CPS Number: 2017 NWI CPS B-9
Project Location: Winfield
Estimated Construction Start Date: September 2023
Projected In-Service Date: November 30, 2024

Estimated Cost:

Contingency	$0
Non-Construction	2,006,439
Construction	6,330,984
Removals	0
Total	$8,337,423

Project Description
The project scope includes real estate acquisition, construction of a new 1.0 MG elevated storage tank (EST), and replacement of the existing Randolph St. booster pumps and electrical gear serving the Winfield service area. The project will enable adequate pumping service to the area including filling the elevated storage tank at the hydraulic grade line established by the tank. The project provides adequate storage volume and improves public fire protection for the Winfield service area.

Background
The Winfield service area is currently served by variable frequency drives (VFD), driven pumps in the Randolph Street booster station without any water storage in the Winfield service area. The Randolph St. booster station serves both the Winfield service area and the Shorewood service area.

The 2017 comprehensive planning study (CPS) combines references to both service areas to the single name of "Shorewood gradient". Although the Shorewood service area and the Winfield service area are connected and the Shorewood service area includes an existing 0.25 MG pumped-storage tank, the Shorewood tank's small size and long distance from the Winfield service area renders the small Shorewood tank of no benefit for Winfield equalization storage or public fire protection. Therefore, although the CPS distribution chapter combines the storage analysis for both service areas and identified a net storage deficit of 0.58 MG, the storage analysis for the Winfield service must be evaluated independently of Shorewood service area because the Shorewood tank provides no service to the Winfield area for the reasons already stated.

For this reason, the CPS recommendation section provides more detailed analysis of the Winfield storage analysis, identifying Winfield storage sizing based on equalization storage of 0.15 MG and public fire protection of 0.63 MG based on Company practice and Insurance Service Office (ISO) recommendations, totaling a total projected storage deficit of 0.78 MG. Elevated storage tank manufacturer standard sizes around this volume are 0.75 MG and 1.0 MG. The recommended Winfield storage tank volume is 1.0 MG.

Alternatives

A smaller tank of 0.75 MG could be constructed for less public fire protection volume, however that would not be consistent with Company design practice and ISO recommendation. In addition to Company design practice, given elevated storage tank manufacturer standard sizes of 0.75 MG and 1.0 MG, the relatively small cost difference between the two size increments, the expected continued growth of the Winfield service area beyond the planning period in the 2017 CPS, and the expected long life of storage tank assets, the recommended Winfield storage tank volume is 1.0 MG.

Recommended Solution

Construct a 1.0 MG elevated tank in Winfield at an overflow elevation of approximately 890 ft msl. Additionally, replacement of pumps at the Randolph Street booster station is recommended to enable separate pumping to the Winfield and Shorewood service areas. One set of pumps will deliver water to the Winfield service area and the second set of pumps will deliver water to Shorewood service area. This will provide adequate pumping service to the Winfield area including filling of the elevated storage tank at the hydraulic grade line established by the tank, while also providing continuing adequate pumping service to the Shorewood service area.

Benefits

Equalization storage and public fire protection storage for the Winfield service area, improved fire flows, and enhanced system service reliability during power outages and distribution system events.

Property and/ or easements acquired: Yes.

Pipeline project: N/A

Supplemental Workpapers:

Workpaper MHH-11 CONFIDENTIAL - 2017 NWIO Comprehensive Planning Study, Project B-9

Project Name: Northwest Ogden Dunes Water Treatment Facility Chlorine Conversion
Project Number: I10-900069
CPS Number: 2017 NWIO CPS A-4
Project Location: Northwest
Estimated Construction Start Date: July 2023
Projected In-Service Date: February 29, 2024

Estimated Cost:

Contingency	$337,294
Non-Construction	1,322,663
Construction	3,818,510
Removals	0
Total	$5,478,467

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system. The project also includes replacing the current fluoride and ammonia bulk tanks which are at the end of their useful lives. The existing aqua ammonia feed system will also be replaced as it is at the end of its useful life and a new liquid ammonium sulfate feed system will be installed.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public, including a nearby school. The existing bulk ammonia and fluoride tanks are also at the end of their useful lives and require replacement. The aqua ammonia feed system at the end of its useful life will be replaced with a liquid ammonium sulfate (LAS) system to eliminate the off-gassing safety hazard that occurs with aqua ammonia.

Alternatives
Consideration of options to replace the chlorine gas system along with the replacement of fluoride and ammonia bulk tanks at the end of their useful lives included:

Option No. 1: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 2: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 2) is to convert from gas chlorine to bulk sodium hypochlorite and to replace the ammonia and fluoride bulk tanks. The implementation of hypochlorite reduces the risk of large-scale release of gaseous chlorine, has reduced cost for

safety training and compliance, and reduced risk to employees, neighbors, and the adjacent school. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system. The fluoride and ammonia bulk tanks are at the end of their useful lives and will be replaced.

It is also recommended that the aqua ammonia feed system at the end of its useful life with an LAS feed system.

Benefits
Eliminate hazardous chlorine gas and replace ammonia and fluoride bulk tanks and the ammonia feed system at the end of their useful lives.

Property and/ or easements acquired: No.

Pipeline project: N/A

Supplemental Workpapers:
Workpaper MHH-14 CONFIDENTIAL - 2017 NWIO Comprehensive Planning Study, Project A-4

Workpaper MHH-15 CONFIDENTIAL - Design-Build Request for Proposals with Addenda 1 and 2

Workpaper MHH-16 CONFIDENTIAL - Design-Build Proposal - Bowen (Awarded)

Workpaper MHH-17 CONFIDENTIAL - Design-Build Proposal - Reynolds

Workpaper MHH-18 CONFIDENTIAL - Design-Build Proposal - Thieneman

Project Name: Northwest Ogden Dunes Low Service Pump REP
Project Number: I10-900070
CPS Number: N/A
Project Location: Northwest
Estimated Construction Start Date: June 2023
Projected In-Service Date: November 30, 2024

Estimated Cost:

Contingency	$0
Non-Construction	228,609
Construction	755,393
Removals	50,000
Total	$1,034,002

Project Description
Replace the low service pump isolation valves and make upgrades within the station to allow the valves and sluice gates to be safely operated and maintained in the future.

Background
The low service pumps are below lake level so the pumps must be isolated to perform any maintenance. There are four low service pumps each with a valve on the suction side and a valve on the discharge side. It is known that at least one of the four suction valves do not hold water back from the pump when shut. The valve cannot be replaced without first removing the pump and the concrete pump stand surrounding the valve. To perform any maintenance or repairs on the existing valves and low service pumps the wet well needs to be isolated, by shutting sluice gates, so the water can be pumped below the floor level. The zebra chlorine gas line currently runs through the west sluice gate which makes it impossible to close without a diver going down to disconnect the zebra chlorine gas line.

Alternatives
Option No. 1, includes replacing the valves on the suction and discharge side of the low service pumps, rerouting the zebra chlorine line, and making upgrades to move actuators and controls above lake level.

Option No. 2, includes replacing the existing low service pumping equipment, control valves, and discharge piping with new equipment on the upper floor. This would include additional investigation into what structural and architectural improvements would be necessary.

Recommended Solution
Option No. 1: The recommended solution is to replace the valves on the suction and discharge side of the existing low service pumps, reroute the zebra chlorine line, and make upgrades to move actuators and controls above lake level. Option No. 1 is the lower cost option and can be accomplished with no additional investigation into structural and architectural improvements.

Benefits
Reliability and safety are improved. Employees will be able to properly and safely isolate low service pumps to perform recommended maintenance. The entire plant will no longer need to be shut down every time routine maintenance or repairs are needed on the low service pumps.

Property and/ or easements acquired: No.

Pipeline project: N/A

Project Name: Northwest Office Facility Upgrades
Project Number: I10-900072
CPS Number: N/A
Project Location: Northwest
Estimated Construction Start Date: February 2024
Projected In-Service Date: March 31, 2025

Estimated Cost:

Contingency	$0
Non-Construction	175,074
Construction	2,728,485
Removals	100,000
Total	$3,003,559

Project Description
Complete repairs and upgrades to office portions, parking lot, and entrances of the NWI Borman Park facility.

Background
The existing office areas within the Borman Park facility need repairs and upgrades. There are several safety concerns such as mold and water damage, as well as unusable space that costs the company to keep lighted and conditioned. Historically, the existing facility housed several departments of employees, including payment acceptance from customers. Payment is no longer accepted at Company facilities so there is no longer a need to have a payment acceptance center or cash vault.

The facility entrance needs rehabilitated to allow contractors, vendors, or local partners easy and safe access to the facility for meetings. Local supervisors, operation specialists, water quality, engineering, IT, and HR employees report to the Borman Park facility daily. The office space is not currently configured correctly for the work and storage that occurs in the current facility space, creating safety concerns. Additionally, office furniture and cubicles are past their useful life and failing There is water damage and mold seen throughout the existing office spaces causing discomfort to employees. There is a change in elevation throughout the office space that has been a tripping hazard. The office area sits above water treatment basins. Proper dehumidification and conditioning are not currently installed which causes discomfort to employees during certain times of the year.

Alternatives
Option No 1, includes making repairs to eliminate leaks and water from entering the office spaces, upgrading HVAC system to better control the humidity and temperature throughout the office spaces, lighting improvements, reconfiguration and rehabilitation of entrance, parking lot updates, updates to office, storage, and collaborative spaces, secure storage for IT and HR, and elimination of any potential safety hazards.

Option No 2, includes making repairs to eliminate leaks and water from entering the office spaces, replacing flooring, ceiling, and walls with water damage and elimination of any potential safety hazards throughout the property.

Recommended Solution
The recommended solution is Option No 1. Option 2 would not eliminate the concerns with future mold as it would not address the humidity and temperature issues with the HVAC due to the offices being located above the treatment basins. Additionally, the parking lot is not adequately size for the training/meetings that occur there.

Benefits
Energy savings are expected with updated lighting and HVAC controls. A more collaborative, safe, and comfortable workspace is expected for all employees.

Property and/ or easements acquired: No

Pipeline Project: No

Project Name: Lowell Water Treatment Facility Chlorine Conversion
Project Number: I10-920001
CPS Number: N/A
Project Location: Lowell
Estimated Construction Start Date: July 2023
Projected In-Service Date: April 30, 2024

Estimated Cost:

Contingency	$300,000
Non-Construction	1,154,698
Construction	2,408,000
Removals	50,000
Total	$3,912,698

Project Description
The project scope includes replacing the existing chlorine gas disinfectant system with a new liquid sodium hypochlorite disinfectant system. A new chemical feed building will be constructed to house the new bulk liquid sodium hypochlorite system.

Background
The existing gaseous chlorine system presents safety and health risks to employees and the public through the supply chain and at the treatment facility. Exposure to chlorine gas stored at the site is irritating to the eyes, nose, and throat and, at high levels, could cause serious injury or death within the plant or even downwind of the facility with the potential for a chlorine gas release. Replacing the gaseous chlorine system with a safer liquid sodium disinfection system will reduce the safety and health risks to employees and the public.

Alternatives
Option No. 1: Proposed installation of a scrubber system, which would require INAW to keep the existing gaseous chlorine system.

Option No. 2: an on-site sodium hypochlorite generation (OSHG) system.

Option No. 3: a bulk sodium hypochlorite system.

Recommended Solution
The recommended solution (Option No. 3) is to convert from gas chlorine to bulk sodium hypochlorite. The implementation of hypochlorite reduces the risk of release of gaseous chlorine, has reduced cost for safety training and compliance, and reduced risk to employees and neighbors. The consideration concluded that the bulk sodium hypochlorite option is likely to be lower in capital cost and life cycle cost compared with an OSHG system. The bulk hypochlorite system is also easier to operate and maintain than the OSHG system. A new chemical feed building will be constructed to house the new bulk liquid sodium hypochlorite system.

Benefits
Eliminate hazardous chlorine gas.

Property and/ or easements acquired: No.

Pipeline project: N/A

ATTACHMENT MHH-5 IS FILED
AS AN EXCEL ATTACHMENT

ATTACHMENT MHH-6 IS FILED
AS AN EXCEL ATTACHMENT

INDIANA AMERICAN WATER
WINCHESTER

Project A-1

INSTALL NEW FILTRATION CAPACITY

Design and Permitting: 9 months
Construction: 6 months

Cost Estimate: $[redacted]

Project Driver:

The firm filtration capacity of 0.72 mgd with two filter cells out of service in the Aeralator unit is not adequate to meet the maximum day demands in the system. With two filter cells out of service, it is not possible to perform filter backwashing. It is anticipated that the Aeralator will need to be taken out of service within the next few years for an extended period for interior and exterior painting of the detention tank and other repairs and maintenance. In addition, the Aeralator is nearing the end of its useful life.

Background:

The Aeralator installed at the Winchester WTF in 2001 is a packaged iron and manganese filtration system that combines aeration, detention, and filtration in a single unit. The raw water from the supply wells is discharged into the aerator at the top of the unit. From the aerator, it flows into the detention tank before entering one of four filter cells at the bottom of the unit. Two 8-inch discharge pipes each collect water from two of the four filter cells then connect to the 10-inch pipe that delivers the water to the three high service pumps. A butterfly valve on each 8-inch discharge pipe can be closed to isolate two of the filter cells at a time.

The total filtration capacity of the four filter cells on the Aeralator unit is 1.44 mgd at a filter loading rate of 3 gpm/ft^2. However, two cells must be taken out of service to perform maintenance and repair on any one cell, which limits the firm filtration capacity to 0.72 mgd. Recent maximum day demands have been as high as 0.90 mgd. Although the demands are projected to decrease slightly through the planning horizon, the 2035 projected maximum day demand at the 95 percent confidence interval is 0.85 mgd. This remains higher than the firm filtration capacity.

Typically, the three in-service cells are used to backwash one cell. If only two filter cells are in service, it is not possible to backwash a filter cell from the remaining in-service cell due to an inadequate backwash flow rate from just one cell. Therefore, an alternate backwash supply would be needed to maintain service and adequate water quality when two cells are out of service for more than 24 hours.

A recent evaluation of the Aeralator in December 2020 by Tank Industry Consultants found the exterior of the Aeralator to be in fair to poor overall condition and the interior to be in poor overall condition, with pitting observed on the bottom plate and layered rust located on the interior roof rafters. The recommendation from the evaluation is that the Aeralator should be rehabilitated within the next two years. This would require the Aeralator to be out of service for an extended period of time. The Aeralator unit can be taken out of service for approximately one-half day to be drained and fully inspected, with supply coming from the elevated tank, but it cannot be taken out of service for longer periods of time.

The Aeralator is nearly 20 years old. Information provided by Bastin Logan Water Services, the fabricator and installer of the existing Aeralator unit, indicates that the life expectancy of the Aeralator can range from 25 to 35 years. Therefore, the Aeralator is expected to reach the end of its useful life within the planning horizon.

Recommended Solution:

Install new filtration capacity at the Winchester WTF. The primary recommendation is to install vertical or horizontal pressure filters, with an aerator/detention tank prior to the filters. With this configuration, the process flow would be as follows: wells → aerator/detention tank → high service pumps → pressure filters → distribution system. The backwash supply for the filters would be from the effluent of the in-service filter cells. It may also be possible to locate the high service pumps after the pressure filters.

This process flow is similar to the current process flow at the WTF, with the exception being the pressure filters may be located after rather than prior to the high service pumps. With this configuration, it is expected that the current high service pumps and building can continue to be used. The aerator/detention tank can be piped to the existing high service pump building, with the pump discharge piping routed to the new filter building. Additional components would include the necessary sitework, filter gallery piping, yard and connecting piping and valves, electrical, instrumentation, SCADA, and removal of the existing Aeralator unit.

Output and Benefits:

The new filtration system will provide improved service reliability by providing adequate firm treatment capacity to meet the maximum day demands. It will enable the WTF to continue to meet all water quality standards.

The new filtration capacity will replace the existing Aeralator that is in need of painting and maintenance and also nearing the end of its expected useful life. This avoids the cost associated with painting and maintaining the existing Aeralator, the cost of providing temporary treatment during the painting and maintenance, and the cost of providing an alternative backwash supply from the distribution main, as discussed under Options.

Options:

The following alternatives can be considered in lieu of the primary recommendation.

Alternative 1: Install vertical or horizontal pressure filters as described in the primary recommendations, but with a different process flow design to include a clearwell tank and new high service pump station, as follows: wells → aerator/detention tank OR in-line aerator → pressure filters → clearwell tank → high service pumps → distribution system. Backwash pumps could be provided to deliver the filter backwash supply from the clearwell. In this configuration, the well pumps provide the pumping head needed to deliver the water through the process components to the clearwell, and then the high service pumps are needed to deliver the water to the distribution system.

It is noted that a clearwell tank and new high service pump station is recommended in Project B-4. If the above process flow was chosen for the project, then Project B-4 would be combined with this project.

Alternative 2: Install a similar Aeralator unit to replace the existing Aeralator. This alternative would maintain the current process flow. An Aeralator can be an effective option when space is limited; however, adequate space is available at the plant site for the components described in the primary recommendation. An Aeralator can add operational complexity and provide more challenging maintenance procedures without the ability to take the entire unit out of service, and the installation of two units is not considered cost effective and would add to the operational complexity. Thus, this alternative is not considered the best primary recommendation. However, if this alternative is implemented, the Aeralator should be sized and configured to provide adequate firm filtration capacity.

Alternative 3: Perform a study to determine if a higher loading rate up to approximately 3.75 to 4 gpm/ft^2 can be applied on the filters when two filter cells need to be taken out of service; Install piping, valves, a flow meter, and controls to enable filter backwashing of the existing Aeralator unit from the finished water distribution main. If only two of the four filter cells are in service, it may be an option to operate the in-service filter cells at a slightly higher loading rate of approximately 3.75 gpm/ft^2, which corresponds to a firm filtration capacity of approximately 625 gpm, or 0.90 mgd. This is adequate to meet the projected maximum day demands. It is noted that the loading rate on the filter is determined by the high service pump flow, which draws directly from the filter. Therefore, the pump flow rate can be controlled through the VFD motors to provide the desired filter loading rate when two filter cells are out of service. Because the higher loading rate will remain under 4 gpm/ft^2, and it would be operated in this manner only during emergencies and planned maintenance, this may not require regulatory approval. Operating the filter at the higher loading rate when two filter cells are out of service will enable the firm filtration capacity of the aeralator filter to meet the current and projected maximum day demands.

To enable filter backwashing of the Aeralator unit from the finished water distribution main, a connecting pipeline will need to be installed from the plant discharge main to the underdrain pipe below the filter cells, along with the necessary valves, meter, and control strategy set up in the SCADA system. Backwashing of the filter cells from the finished water distribution main will enable the desired water quality goals to be met when two filter cells are out of service for more than 24 hours.

It is noted that this alternative does not address the condition or age of the Aeralator unit, so it will still be necessary to perform painting and maintenance on the unit. In order to do this, it is expected that a temporary treatment unit will need to be installed to enable the Aeralator to be taken out of service because bypassing of the Aeralator will not enable finished water quality standards to be met. The feasibility of this alternative may depend largely on the remaining life of the Aeralator, which can be determined closer to the time of the project. It is recommended to perform a life cycle cost comparison of this alternative with the primary recommendation to install new filtration capacity prior to proceeding with the project.

Consideration may be given to completing all the recommended projects at the WTF under one project, as an opportunity for design and construction cost savings. This would include combining projects A-1, A-2, A-3, and B-4.

Budget Discussion:

The planning level estimate for the primary recommendation to install pressure filters along with an aerator/detention tank ranges from $1,500,000 to $3,000,000.

Alternative 1. The planning level cost estimate for Alternative 1 with the addition of the clearwell and new pump station ranges from $2,500,000 to $5,000,000. As noted, this option includes Project B-4, which has a stand-alone estimate ranging from $1,500,000 to $2,500,000. Therefore, a cost savings of approximately $500,000 may be realized with Alternative 1, compared to completing the primary recommendation and later completing Project B-4.

Alternative 2. The planning level cost estimate for the construction of a new Aeralator unit ranges from $1,500,000 to $3,000,000.

Alternative 3. The estimated cost for a filter loading rate study, filter backwashing of the existing Aeralator unit from the finished water distribution main, temporary treatment unit, and maintenance on the existing Aeralator unit may range from $1,500,000 to $2,500,000.

Cost estimates are provided in **Appendix B**.

Purpose Code and Drivers:

Asset Code	Purpose Code
320 – WATER TREATMENT PLANT EQUIP	REL/QUAL IMPROVED TECHNOLOGY

INDIANA AMERICAN WATER
WINCHESTER

Project A-2

CONSTRUCT NEW BACKWASH HOLDING TANK

Design and Permitting: 6 months	Cost Estimate:
Construction: 3 months	$[redacted]

Project Driver:

The existing backwash holding tank is in poor condition, creating a potential reliability and safety issue.

Background:

Filter backwash water from the Winchester WTF is discharged to a 40,000 gallon in-ground concrete holding tank located next to the treatment building. From the holding tank, the backwash water is discharged to the sanitary sewer. Two of the four filter cells are normally backwashed each day, producing a daily backwash volume of approximately 12,000 gallons.

There is visible concrete deterioration on the tank, which is thought to be constructed around 1960. Inflow from the tank to an adjacent cell has been observed, which may be a result of the concrete cracking and deterioration. The leaking water may potentially cause damage to the treatment building due to its proximity to the building. Depending on the extent of the leakage and the possibility that leakage rates may increase with further deterioration, this could undermine the foundation and structural integrity of the building. There could be potential safety issues if further deterioration occurs, such as collapse of the concrete lid if a person walks on it. Treatment reliability will be negatively impacted if the backwash holding tank were to fail because filter backwashing could not continue, and finished water quality standards may not be met. In addition, if there is ground infiltration, this could lead to an IDEM complaint or possible notice of violation if it were to continue unresolved.

Recommended Solution:

Construct a new backwash holding tank at a volume designed to hold one complete backwash of a filter, plus a 25 percent safety factor. With the existing Aeralator filter unit, this would correspond to a volume of approximately 50,000 gallons. However, the final volume should be determined following the design of the filter improvements as part of Project A-1.

With the existing Aeralator filter, two of the four filter cells are typically backwashed each day for a daily backwash volume of 12,000 gallons. Each cell is backwashed at a flow rate of approximately 1,000 gpm for six minutes. However, the original design and operation manual indicates a flow of 1,000 gpm for 10 minutes, which totals 40,000 gallons for all four cells. With 10,000 gallons added for the 25 percent safety factor, the total tank volume would be approximately 50,000 gallons. A shorter duration may currently be adequate for achieving the desired backwash water quality results; however, this could change in the future and thus the design is based on the original design manual recommendations.

Output and Benefits:

A new tank will eliminate safety and treatment reliability concerns with the existing tank. It will also eliminate any potential damage to the main treatment building due to water leakage and infiltration. The design volume enables the full design backwash volume to be contained in the tank.

Options:

The existing backwash holding tank may be repaired if further investigation determines that repairing the tank is feasible and cost effective; however, this may not provide adequate volume for the proposed filter improvement in Project A-1.

The option of constructing two backwash lagoons on the WTF property has been considered in the past, and this may again be considered as an option. An NPDES permit would be needed to discharge supernatant from the lagoons to the adjacent Sugar Creek, and it would no longer be necessary to discharge to the sanitary sewer. However, the use of lagoons would require more regulatory reporting, maintenance, and operational oversight.

A preliminary life cycle cost analysis (LCC) was performed to compare a new backwash holding tank versus the construction of two lagoons, and the net present value of both options is similar. The capital cost of two lagoons is estimated to be higher, ranging from $450,000 to $730,000, but the annual costs are expected to be significantly lower. This is because the annual cost of discharging to the sanitary sewer is nearly $30,000.

It is recommended to perform a more rigorous LCC analysis during the preliminary design phase of this project, with updated cost data. Initial assumptions have been made in the operation and maintenance costs, plus the planning level capital costs are considered preliminary. In addition, the current inflation and interest rates should be used in the analysis.

Budget Discussion:

The planning level estimate for the new backwash tank ranges from $300,000 to $500,000. The cost estimate is provided in **Appendix B**.

Purpose Code and Drivers:

Asset Code	Purpose Code
320 – WATER TREATMENT PLANT EQUIP	ASSET RENEWAL POOR CONDITION

INDIANA AMERICAN WATER
WINCHESTER

Project A-3

CONSTRUCT NEW CHEMICAL BUILDING

Design and Permitting: 9 months
Construction: 6 months

Cost Estimate: $[redacted]

Project Driver:

The existing building that houses the chemical facilities has structural concerns and is an aging facility. There exist safety concerns with the current chemical handling as well as some other issues with the chemical facilities that cannot be properly addressed in their current location. In addition, some of the chemical facilities do not currently meet all American Water guidelines for chemical feed, storage, and containment.

Background:

The chemicals utilized at the Winchester WTF include sodium hypochlorite for disinfection, fluoride for dental protection, and orthophosphate for corrosion control. The chemical feed rooms are located in the south wing of the treatment building, which is thought to have been constructed in 1953. The north wing of the building, which includes the garage and bulk storage of the 15-gallon chemical drums, is thought to have been constructed in 1970.

The installation of the orthophosphate chemical system was completed in 2019 as a proactive measure to assist with lead concerns in the system. During this project, work was performed to remediate asbestos found in the south wing of the structure, specifically cementitious wall panels as well as contaminated insulation. When the western exterior load bearing wall was exposed as part of this work, it was found that the steel paneling of the wall had rusted and deteriorated to the point that the structural integrity of the wall was compromised. Several sections of vertical rib of the wall panels had significant metal loss. The western exterior wall structure was reinforced during this project. However, no additional exterior walls were exposed or repaired at the time because it was beyond the scope of work. The same steel panels are used around most of the south wing of the building. Therefore, it is likely that a similar condition may be prevalent along the remaining exterior walls. In addition, the repairs made to the western wall of the south wing were intended to provide a temporary fix, and they were not designed to prevent water intrusion or further degradation in areas not directly addressed. Additional information on the building assessment, including photos and drawings, are included in **Appendix C**.

Other recent minor improvements in the treatment building include the installation of a garage door between the two main areas of the building and further enclosure, insulation, and temperature regulation of the chemical storage area.

There are still some safety concerns with the need to transport chemicals within the building with only one operator at the facility at a given time. For the sodium hypochlorite and fluoride systems, the 15-gallon drums are transported on a cart from the storage area to each respective chemical room, where they are pumped into each respective day tank. For the orthophosphate system, the 15-gallon drums are also transported to the chemical room on a cart, but the metering pump delivers the solution directly from the 15-gallon drums. In addition to the chemical handling concerns, other issues include: 1) no secondary containment is provided for fluoride; 2) no back-up metering pumps are provided for sodium hypochlorite and fluoride; 3) there is poor ventilation and no eye wash in the chemical storage area; and 4) the long chemical feed lines to the high service pump building are sometimes problematic.

Some of these issues could be addressed in the current location. However, to address the safety concern with the chemical handling and transport, the delivery and use of chemical totes is recommended. The current building layout and available space does not allow for the delivery of totes. Also, the long chemical feed lines cannot be addressed in the current location. In addition, given the condition and age of the current building, it may be prudent to house the chemical facilities in a more secure and safe structure.

<u>Recommended Solution:</u>

Construct a new chemical building close to the high service pump building with separate rooms for sodium hypochlorite, fluoride, and orthophosphate. Provide for the use of chemical totes and install the necessary chemical feed equipment, containment, electric, instrumentation, and controls.

The decision on whether the existing treatment building, or portions of the treatment building, should remain or be demolished can be made during the preliminary design phase of the project or combination of projects recommended at the plant. Some of the existing space within the building may continue to serve a useful function.

Output and Benefits:

A new chemical building addresses the issues with the current chemical facilities as noted above, most notably the safe handling of chemicals by the plant operator and meeting all T-2 standards. A new building provides a long-term solution for the plant and avoids potential costly repairs to the existing building. Overall service and operational reliability will be improved.

Options:

Minor improvements to the chemical facilities at their current location can be performed to address some of the issues, as follows: 1) provide secondary containment for the fluoride facilities; 2) provide back-up metering pumps for fluoride and sodium hypochlorite; and 3) provide improved ventilation and an eye wash station in the chemical storage area. However, these improvements would not address the safety issues with chemical handling or the structural concerns with the building.

Budget Discussion:

The planning level estimate for a new chemical building ranges from $1,500,000 to $3,000,000. The cost estimate is provided in **Appendix B**.

Purpose Code and Drivers:

Asset Code	Purpose Code
320 – WATER TREATMENT PLANT EQUIP	ASSET RENEWAL POOR CONDITION

INDIANA AMERICAN WATER
WINCHESTER

Project B-1
INSTALL 190'-16" DISCHARGE MAIN FROM THE PLANT HIGH SERVICE PUMP STATION

Design and Permitting: 4 months	Cost Estimate:
Construction: 2 months	$[redacted]

Project Driver:

Improved service reliability will be achieved with the installation of a new and larger plant discharge main to replace the existing 12-inch cast iron main installed in 1959. A hydraulic restriction in the plant discharge main causes significant headloss of more than 20 feet. This leads to a higher required pumping head and increased energy consumption.

Background:

Field testing during the model calibration indicated that excessive headloss occurs in the plant discharge piping. The pressure reading from the data logger at hydrant HWI-112 just outside the plant property as compared to the discharge pressure reading at the high service pump station showed a headloss of more than 20 feet in the plant discharge piping when pump 2 is operating and more than 25 feet when pump 3 is operating. AWWA Manual M32 has established design criteria for headloss in a distribution system. A pipe or network of pipe could be considered deficient if under normal operating conditions the headloss in a transmission pipe is more than 3 ft/1,000 ft. When the headloss is approximately 25 feet across this section of main, that corresponds to a headloss of approximately 130 ft/1000 ft, which is significantly higher than the design criteria.

Additional field testing with data loggers installed at a few locations along the plant discharge main was performed. This testing confirmed that the excessive headloss is occurring between the meter pit outside the pump station and before hydrant HWI-112. Plant personnel indicate that there are no known partially closed valves. The source of the hydraulic restriction is not known at this time. Though it may be possible to find and fix the hydraulic restriction, significant additional work may have to be performed to achieve this. The discharge main is cast iron originally installed in 1959. Some piping modification were made during the 2001 plant improvements, but minimal records are available. Therefore, it may be necessary to dig up large portions of the main and possibly perform addition monitoring to locate the restriction.

This is not considered to be an efficient use of capital. The recommendation included here assumes that it is most feasible to install new main due to a restriction in the existing main.

Recommended Solution:

Install approximately 190 feet of 16-inch main from the 12-inch main leaving the plant pump station extending east and then south on the plant property to the existing 12-inch main that extends west on SR 32.

Output and Benefits:

Service reliability is improved with the new main, which replaces a cast iron main installed in 1959. The larger 16-inch main also supports future recommended projects at the plant, which includes the recommendation to install a clearwell tank with the ability to deliver higher fire flows from the plant high service pumps.

There is a significant reduction in headloss. The total headloss across the section of new main is less than 0.2 feet with the largest pump 3 on, down from more than 25 feet before the improvement. This results in a lower required pumping head and higher flow rates from the high service pumps. Preliminary modeled energy analysis indicates that the lower pumping head results in a cost savings of approximately $700 annually, assuming a constant price of $0.10/kWh.

Options:

If further field investigations determine the cause of the hydraulic restriction in the plant piping, and a cost-effective solution can be achieved, then this solution may be implemented in lieu of installing the 16-inch plant discharge main, or at least a portion of this segment.

Budget Discussion:

The planning level cost estimate for the pipeline improvement ranges from $50,000 to $100,000, at a cost of $260/LF to $520/LF.

Purpose Code and Drivers:

Asset Code	Purpose Code
331 TRANS & DISTRIBUTION MAINS	REL/QUAL CUSTOMER (PRES TASTE ETC)

INDIANA AMERICAN WATER
WINCHESTER

Project B-2

INSTALL 375'-16" MAIN FROM PLANT EXTENDING EAST ALONG SR 32

Design and Permitting: 6 months Construction: 2 months	Cost Estimate: $[redacted]

Project Driver:

An increase in service reliability is desired through replacement of the 1939 cast iron main extending east from the plant. Excessive headloss is realized in the 10-inch main.

Background:

Records indicate that the 10-inch main that extends east from the plant on SR 32 is unlined cast iron installed in 1939. The 10-inch main and the 8-inch main extending to Franklin Street, also an unlined cast iron main installed in 1939, are the only mains delivering water east of the WTF, where a majority of the customers are located. Both mains cross under Sugar Creek.

The headloss through the 10-inch main varies depending on which pump is on and the flow from the plant. With pump 1 on, the headloss gradient in the 10-inch main is approximately 5.7 ft/1,000 ft and the total headloss across the 380 feet of 10-inch main until it connects to the 12-inch main is approximately 2.2 feet. With pump 2 on, the headloss gradient is approximately 10.2 ft/1,000 ft and the total headloss is approximately 3.9 feet. With pump 3 on, the headloss gradient is approximately 12.4 ft/1,000 ft and the total headloss is approximately 4.7 feet. AWWA Manual M32 has established design criteria for headloss in a distribution system. A pipe or network of pipe could be considered deficient if under normal operating conditions the headloss in a transmission pipe is more than 3 ft/1,000 ft.

Recommended Solution:

Install approximately 340 feet of 16-inch main from the new 16-inch main on the plant property extending east and under Sugar Creek and connecting to the existing 12-inch main north of SR 32.

Output and Benefits:

Service reliability is improved with the new main. A failure in the existing 10-inch main would result in all the flow traveling east from the plant being delivered through the 1939 8-inch cast iron main. Both the 8-inch and 10-inch mains extending east from the plant are approximately 80 years old and likely have a higher risk of failure.

There is a significant reduction in headloss. The total headloss across the section of new main is less than 0.2 feet with the largest pump 3 on, down from approximately 4.7 feet before the improvement. This results in a lower required pumping head and higher flow rates from the high service pumps.

The larger 16-inch main also supports future recommended projects at the plant, which includes the recommendation to install a clearwell tank with the ability to deliver higher fire flows from the plant high service pumps.

Options:

The existing 10-inch main along SR 32 may remain in service until the end of its useful life or until there are known issues with leaks or breaks. If there are existing concerns with the main, it can be retired.

Budget Discussion:

The planning level estimate for the pipeline improvement ranges from $100,000 to $200,000 at a cost of $270 to $540/LF for the 16-inch main, which includes the work of horizontal directional drilling under the creek.

Purpose Code and Drivers:

Asset Code	Purpose Code
331 TRANS & DISTRIBUTION MAINS	REL/QUAL CUSTOMER (PRES TASTE ETC)

INDIANA AMERICAN WATER
WINCHESTER

Project B-4

CONSTRUCT PLANT CLEARWELL TANK & PUMP STATION

Design and Permitting: 9 months	Cost Estimate:
Construction: 6 months	$[redacted]

Project Driver:

This project will provide the recommended fire storage volume in the system which will enable the delivery of fire flows up to 3,500 gpm for a 3-hour duration. It will also provide clearwell storage and additional reliability at the WTF and enable adequate chlorine contact time (CT) for continuous treatment to 4-log inactivation of viruses.

Background:

The 0.40 MG Short Street elevated tank is the only storage facility in the Winchester system. It provides adequate equalization storage capacity. However, the available fire reserve, along with the current capacity from the WTF, is only adequate for meeting a fire flow demand of up to 2,500 gpm for the recommended 2-hour duration. Higher fire flows of 3,000 gpm to 3,500 gpm could not be sustained for the recommended 3-hour duration. A fire flow demand of 3,500 gpm could be sustained for only approximately one hour before emptying the elevated tank. There exist a significant number of commercial and industrial sites around the system that have an ISO fire flow guideline of 3,500 gpm for a 3-hour duration.

No clearwell storage is provided at the Winchester WTF. Water is pumped from the wells into the Aeralator filter unit, which includes an 18,500-gallon detention tank above the filter cells. From the filter cells, water flows through a pipe gallery to the high service pumps. Without any storage following the filter unit, the WTF pumping capacity is limited to the rated filtration capacity of 1.44 mgd. In addition, the WTF is not able to deliver any water to the system when the entire Aeralator unit is out of service for inspection or repairs. In the past, operations staff have taken the Aeralator unit out of service for up to approximately eight hours while supplying the system from the elevated tank.

Clearwell storage following the filter unit would allow the high service pumps to deliver higher flows during fire and emergency events for the recommended duration, while providing additional service reliability. Additional storage volume at the WTF would also increase the chlorine contact time and provide the ability to continuously treat to 4-log inactivation of viruses according to the Ground Water Rule guidelines.

Chlorine is applied both at the detention tank of the Aeralator unit and prior to the high service pumps. The chlorine residual is currently monitored only after the second feed point. Thus, the chlorine contact time (CT) can only be counted after the second feed point. This does not allow the 4-log inactivation of viruses to be met. Even if the chlorine residual is also monitored with SCADA before the second feed point, and credit for CT through the entire treatment process from the detention tank could be applied, treatment to 4-log inactivation of viruses cannot continuously be achieved. This is because the chlorine residual sometimes drops to as low as 0.2 mg/L when the high service pumps are off and water is not flowing through the filters. An increased chlorine dose is applied at the second feed point after the high service pumps are turned on again to increase the chlorine residual, and once operating, 4-log inactivation of viruses can be achieved through the plant with chlorine residuals maintained above 0.54 mg/L

Recommended Solution:

Construct a storage tank (clearwell) at the WTF with a volume of approximately 0.45 MG. Install station piping to route the filtered water to the proposed tank. Construct a new high service pump station adjacent to the proposed tank with the capacity to deliver domestic and fire flows to the system.

Storage Tank

An above ground tank with a height up to approximately 14 feet will enable water to flow from the Aeralator unit to the tank by gravity. A total tank volume of 0.45 MG will provide an effective volume of approximately 0.40 MG, thus providing an effective fire reserve volume of 0.80 MG in the system. The recommended system storage volume for providing equalization flows and fire flows for a 3,500 gpm fire demand for a 3-hour duration is 0.74 MG. Depending on the design considerations for the new filtration capacity in Project A-1, it may be beneficial to utilize the new tank for filter backwash supply. In this case, a higher tank volume may be considered. However, it will be important to balance the impact of a larger tank with potential water quality concerns and available space at the plant site.

A circular tank with a diameter of 74 feet and a height of 14 feet is provided as a guideline for the dimensions of the tank. Space is available on the existing WTF property on the southwest side of the Aeralator unit. An alternate location is on the northwest side of the Aeralator unit. However, this may restrict the available space for the construction of backwash lagoons, which may be a possibility at some point in the future. The site plan drawings do not show any underground utilities in these areas, but the Water Company will need to confirm the location of any utilities prior to project design.

Pump Station

It is considered most feasible to construct a new high service pump station next to the proposed tank. The chemical feed points will need to be routed to the proposed tank and pump station.

This method of construction will enable the tank and pump station to be built without disruption of the current plant operation and will provide for an easy transition to the new facilities.

The new pumps should be sized to enable the delivery of higher fire flows to the system from the WTF to supplement the flows from the elevated tank. Based on the recommended operating range in the elevated tank from approximately 22 ft to 33 ft, a volume of approximately 259,000 gallons is available as fire reserve at the low water level. During a 3,500 gpm fire demand for a 3-hour duration, a flow rate of just over 1,400 gpm can be delivered from the elevated tank. The WTF will need to deliver the remaining 2,100 gpm fire flow demand, plus the projected maximum day demand of nearly 600 gpm, for a total flow requirement of approximately 2,700 gpm from the WTF during a fire event. High service pumps with the following design capacities could meet this flow requirement.

- Pump no. 1: 500 gpm at 125 feet TDH
- Pump no. 2: 700 gpm at 125 feet TDH
- Pump no. 3: 2,000 gpm at 140 feet TDH

Pump nos. 1 and 2 have similar design flows to the existing pumps, but with a lower pumping head. The proposed 16-inch plant discharge piping (Project B-1) and the proposed 16-inch main on Washington Street (Project B-2) will reduce the required pumping head and enable more efficient pump operation. However, if these pipeline projects are not completed, then pumps with a higher TDH should be considered. Pump no. 3 will be used almost exclusively for emergency and fire flows. Model results indicate that with all three pumps on, the station can deliver approximately 3,000 gpm to the system during a maximum day fire event. The exact flow amount will vary depending on the location of the fire demand.

Output and Benefits:

The full equalization and fire storage guideline can be met, which provides for the delivery of fire flows up to 3,500 gpm for a 3-hour duration.

The clearwell storage at the WTF enables additional operational flexibility, improved chemical feed reliability, and the ability to deliver higher pumped flows from the plant for emergency and fire demands.

The tank can be constructed on existing INAW property, reducing the cost of new land purchase.

The WTF ground storage increases service reliability by enabling the delivery of water to the system even with the wells or treatment units out of service. The combined storage from the proposed WTF tank and existing elevated tank could provide over 24 hours of service under average demand conditions.

The proposed tank at the WTF increases the chlorine contact time and provides the ability to continuously treat to 4-log inactivation of viruses.

Options:

A fourth pump sized at 700 gpm at 125 ft TDH can be considered to provide additional firm capacity during a fire event. With only three pumps, all three pumps may need to be on to meet the necessary demands during a fire event. A fourth pump enables one of the three domestic pumps to be out of service during a fire event.

Another pumping option is to consider three similarly sized pumps. This avoids the issue of infrequent use of the larger fire pump. In this case, each pump could have a design capacity of approximately 1,000 gpm at 130 ft TDH. The use of VFD motors is recommended with this option.

The option of utilizing the existing high service pump building may be considered if it is possible to install the necessary piping connections and pump replacements while maintaining service to the customers. If the existing building is used, it may be possible to use the existing pumps 1 and 2, with only pump 3 being replaced with a larger fire pump.

One option is to construct a 0.75 MG elevated tank in the distribution system to replace the Short Street tank. Another option would be to construct a smaller elevated tank with a volume of approximately 0.40 MG in the distribution system in addition to the Short Street Tank, which would allow for continued use of the existing tank. For this option, consideration would need to be given to the operational controls to ensure adequate tank turnover. Both options would satisfy the full fire flow guidelines; however, the other benefits of having clearwell storage at the WTF would not be realized. For this reason, along with the operational complexity of maintaining two elevated tanks in the distribution system, these options are not considered the primary recommendation.

Budget Discussion:

The planning level estimate for this project ranges from $1,500,000 to $2,500,000. This includes the cost for the tank, pump station, yard piping, electrical, instrumentation and controls. The cost estimate is provided in **Appendix B**.

Purpose Code and Drivers:

Asset Code	Purpose Code
320 – WATER TREATMENT PLANT EQUIP	REL/QUAL IMPROVED TECHNOLOGY

TANK INDUSTRY CONSULTANTS

EVALUATION OF THE

AERALATOR

WINCHESTER, INDIANA

FOR

INDIANA-AMERICAN WATER COMPANY, INC

December 16, 2020

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January 4, 2021

SUBJECT:

The subject of this report is the field evaluation of the aeralator in Winchester, Indiana. The tank was owned by Indiana-American Water Company, Inc. The field evaluation was performed on December 16, 2020 by Jesse A. Jenkins and Davon L. Van Doren of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was David Newman. The aeralator was previously evaluated by Tank Industry Consultants on December 14, 2010. The aeralator was of welded steel construction.

OBJECTIVE:

The purpose of this evaluation was to determine the condition of the tank interior, exterior, exposed foundation, and accessories. The purpose of this report is to present the findings of the evaluation to identify sanitary and safety deficiencies, and to make recommendations for recoating, repairing, corrosion protection, and maintenance.

AUTHORIZATION:

This evaluation and report were authorized in Task Order No. 21899 signed by Gregory R. Stein and David Elmer on June 3, 2020.

EXECUTIVE SUMMARY:

The exterior of the aeralator appeared to be in fair to poor overall condition. The interior of the aeralator appeared to be in poor overall condition with pitting observed on the bottom plate and layered rust located on the interior roof rafters. Tank Industry Consultants believes the aeralator should be rehabilitated within the next 2 years.

TIC 40th ANNIVERSARY

ANSI/OSHA and Safety-Related Deficiencies: There were OSHA and safety-related deficiencies observed on this tank. These deficiencies included:

- the roof accesses were not equipped with safety railing to deter personnel from inadvertently falling from the roof (29 CFR 1910.28(b)(1)),
- the roof manholes were not locked, and
- the toe room on the exterior shell ladders did not precisely meet the minimum toe room required (29 CFR 1910.23(d)(2)).

It is recommended that safety deficiencies be corrected for compliance with OSHA and safety-related standards. If these deficiencies are not corrected, TIC recommends that no personnel, contractors, or services providers are allowed access to the tank without a detailed safety plan that mitigates the noted safety-related deficiencies.

The safety-related deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications that may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the site, foundation, the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations. Photographs taken from the ROV video are included as a part of this report.

NOMENCLATURE:

Each horizontal row of steel plates on the tank is referred to as a "shell ring" or "ring." To aid in referencing the shell rings, the bottom ring is referred to as shell ring 1. **Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment**.

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report following the sketch of the tank.

HEAVY METALS TESTS:

A sample of the interior coating system was sent to a laboratory for inductively coupled plasma-atomic emission spectrometry analyses at the time of the evaluation in 2010. The test results were as follows:

	Cadmium		Chromium		Lead	
	mg/kg	percent	mg/kg	percent	mg/kg	percent
Interior	<25	<0.0025%	<250	<0.025%	<250	<0.025%

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

ULTRASONIC STEEL THICKNESS MEASUREMENTS:

(all readings were taken through coating)

Tank Section:
- Roof Plates: 0.203 in. to 0.209 in.
- Shell: 0.287 in. to 0.291 in.

Middle Tank Section:
- Roof Plates: 0.287 in. to 0.293 in.
- Shell:
  - Ring #2: 0.280 in. to 0.285 in.
  - Ring #1: 0.259 in. to 0.262 in., bottom
- Bottom Plate: 0.343 in. to 0.348 in.

Bottom Tank Section:
- Roof Plates: 0.269 in. to 0.273 in.
- Shell: 0.260 in. to 0.264 in.
- Bottom Plate: 0.411 in. to 0.415 in.

OBSERVATIONS:

A. Foundation and Site

SITE:
- Size: approx. 230 ft x 420 ft
- Fence:
  - Type: chain link, with 3 strands of barbed wire
  - Height: 6 ft
- Gate:
  - Location: east side of site
  - Width: 11 ft
  - Locked: yes

- Adjacent Structures:
  - Type: pump house
  - Direction: east
  - Distance: attached to tank

  - Type: building
  - Direction: southeast
  - Distance: approx. 48 ft

  - Type: backwash pit
  - Direction: east
  - Distance: approx. 49 ft

  - Type: office
  - Direction: east
  - Distance: approx. 91 ft

- Nearest Overhead Power Lines:
  - Direction: south
  - Distance: approx. 100 ft

FOUNDATION:
- Type: concrete ringwall
- Projection Above Grade:
  - North: 7 in.
  - South: 12 in.
  - West: 10 in.
- Grout: 3/4 in. to 1-1/2 in.
- Sealant: none visible

1. **Site Location**: The tank was located at 870 State Road 32 in Winchester, Indiana. Residences and businesses were located adjacent to the tank site. Overhead power lines were located at the south side of the site. Access to the site was through a gate on the east side of the site. (See photo 1)

2. **Site Conditions**: The tank site was covered with grass and was graded to provide adequate drainage away from the foundation. The tank site was fenced. The chain link fence was topped with barbed wire and was equipped with a gate on the east side of the site. Barricades were located along the inside of the fence. Motion sensors were located on the site. The proper operation of the motion detectors was not verified at the time of the field evaluation. An office and backwash pit were located on site east of the tank; and a siren, generator, and two small buildings were located on site south of the tank. Site lighting was observed adjacent to the tank. Pine tree saplings were located along the west side of the site. (See photos 1)

3. **Foundation**: The tank foundation appeared to be a concrete ringwall. Except for cracking and the section of foundation undercut on the west side, the exposed surface of the foundation appeared to be in nearly its original structural condition at the time of this field evaluation. The foundation exhibited the AWWA recommended 6 in. minimum projection above grade. No coating was visible on the exposed concrete surfaces at the time of this field evaluation. (See photos 3-5)

4. **Grout**: There was a pad of grout between the tank bottom plate and the concrete foundation. The grout had popped out and undercut on the west side. The chipped out grout had exposed steel shim plates. There was no sealant located at the grout-to-bottom plate interface. (See photos 3, 5)

B. Exterior Surfaces

DESCRIPTION:
- Construction: welded steel
- Bottom Tank Section:
  - Diameter: approx. 26 ft
  - Height: approx. 8 ft
  - Shell Rings: 1
- Middle Tank Section:
  - Diameter: approx. 15 ft
  - Height: approx. 16 ft 8 in.
  - Shell Rings: 2
- Top Tank Section:
  - Height: approx. 7 ft 9 in.
  - Shell Rings: 1

BOTTOM PLATE PROJECTION: 1-1/2 in. to 1-5/8 in. from shell

SHELL MANHOLES:
- Bottom Tank Section:
  - Number: 4
  - Type: double-crab
  - Size: 18 in. x 14-1/2 in.
  - Neck: 1 in. to 1-3/8 in. projection from shell x 3/4 in. thick
  - Bolts:
    - Number: 2
    - Size: 1 in. diameter x 5-1/2 in. long
  - Hinged: no

Middle Tank Section:
- Number: 2
- Type: double-crab
- Size: 18 in. x 14-1/2 in.
- Neck: 1 in. to 1-1/2 in. projection from shell x 3/4 in. thick
- Bolts:
  - Number: 2
  - Size: 1 in. diameter x 5-1/2 in. long
- Hinged: no

- Type: circular manhole with hinged cover including 9 latches
- Size: 24 in. diameter
- Neck: 4 in. x 1/4 in. thick

OVERFLOW PIPE:
- Size: 6 in. diameter
- Visible Air Break Above Grade: 20 in.
- Protective Screen: 10 x 10 mesh
- Flap Gate: yes
- Brackets: 6 in. x 3-1/2 in. x 3/8 in., angle x 12 in. long with 1-5/8 in. diameter U-bolt

SHELL LADDERS:

Middle Tank Section Shell Ladder:
- Number of Rungs: 16
- Width: 20 in.
- Side Rails: 2 in. square
- Rung Size: 1 in. diameter
- Spacing: 12 in. on center
- Toe Room: 6-3/4 in.
- Brackets:
  - Bottom Brackets Size: 8 in. x 3/8 in., fiberglass plate x 8 in. long bolted to 3 in. x 2-1/2 in. x 1/4 in., steel angle x 3 in. long welded to shell
  - Other Brackets Size: 3 in. x 3/8 in., fiberglass plate x 8 in. long bolted to 3 in. x 2-1/2 in. x 1/4 in., steel angle x 3 in. long welded to shell
- Safe-Climbing Device: aluminum notched-tubular rail

Top Tank Section Shell Ladder:
- Number of Rungs: 7
- Width: 20 in.
- Side Rails: 2 in. square
- Rung Size: 1 in. diameter
- Spacing: 12 in. on center
- Toe Room: 6-3/4 in.

Brackets:
Bottom Brackets Size: 8 in. x 3/8 in., fiberglass plate x 8 in. long bolted to 3 in. x 2-1/2 in. x 1/4 in., steel angle x 3 in. long welded to shell
Other Brackets Size: 3 in. x 3/8 in., fiberglass plate x 8 in. long bolted to 3 in. x 2-1/2 in. x 1/4 in., steel angle x 3 in. long welded to shell
Safe-Climbing Device: aluminum notched-tubular rail

ROOF OPENINGS:
Bottom Tank Section Roof Manholes:
Number: 4
Location: north and south
Type: circular manhole with hinged cover including 9 latches
Size: 24 in. diameter
Neck: 3-1/4 in. x 1/4 in. thick
Locked: no

Top Tank Section Roof Manhole:
Size: 17-3/4 in. diameter
Type: circular manhole with cover including two side bolts and chains
Neck: 1-1/2 in. to 6 in. x 3/16 in. thick
Overlap: 1 in.
Locked: no

SHROUD OVER AERATOR BLOWER:
Height: 37 in.
Screens:
Orientation: vertical
Size: 8 x 8 mesh
Cover: 44-1/2 in. diameter

EXTERIOR COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Underlying Coating	Rust		Typical	Deepest
Shell Bottom	4.9 mils to 11.2 mils	7.6 mils	approx. 1%	< 1%	3 S	Neg.	Neg.
Shell Middle	4 mils to 17 mils	10 mils					
Shell Top	6.5 mils to 21 mils	14 mils					
Roof	8.3 mils to 16.0 mils	10 mils	< 3%	3%	3 S	Neg.	Neg.

Key to Table

Adhesion 5 (very good) T = Topcoat to Underlying Coating Neg. = negligible
4 (good)
3 (fair) S = Primer to Steel
2 (poor)
1 (very poor)
0 (very poor)

1. **Exterior Coating Condition**: The white coating on the exterior of the tank appeared to be in fair to poor condition. The exterior coating had fair adhesion to the steel.

2. **Bottom Plate**: Corrosion and coating failures were observed along the edge of the bottom plate. There was corrosion and a gap at the bottom plate seam. (See photos 5-6)

3. **Bottom Tank Section**: **There were safety-related and operational deficiencies noted: (1) the roof access was not equipped with safety railing to deter personnel from inadvertently falling from the roof, and (2) the roof manholes were not locked**. The bottom tank section consisted of two filter areas and a center dry area containing piping and valves. The filter areas contained media and were not accessed during the field evaluation. The bottom tank section was equipped with four double-crab shell manholes and four roof manholes. The roof manholes were equipped with latched covers with 9 latches each. Corrosion and coating failure were observed on the manholes. The gaskets were in poor condition. Significant corrosion was observed on the manhole cover latches. Mildew and rust staining were observed on the upper shell in areas. The coating on the bottom tank section appeared to be in fair to poor condition. There was a vertical section of cracked coating observed on the shell. Deteriorated sealant was observed along the vertical shell seams on the east and west sides. The vertical shell seams were not welded. The deteriorated sealant resulted in holes in the roof seam. Erection lugs were located at the top of the shell and bracket remains were observed on the lower shell. **It is the opinion of Tank Industry Consultants that the erection lugs should not be used for rigging purposes**. (See photos 7-12, 14-23)

4. **Middle Tank Section**: **There was a safety-related deficiency noted: the roof access was not equipped with safety railing to deter personnel from inadvertently falling from the roof**. The middle tank section was equipped with one double-crab manhole and one circular manhole with a latched cover. Corrosion and coating failure were observed on the manholes. The gaskets were in poor condition. Significant corrosion was observed on the manhole cover latches. One of the manhole cover latches was detached from the roof. The coating on the middle tank section appeared to be in fair to poor condition. Pin rust, rust staining, and coating failure were observed on the shell. Rust staining was observed at overflow pipe brackets and at the intersection of the middle tank section roof to the top tank section shell. A lug was located on the roof. **It is the opinion of Tank Industry Consultants that the lug should not be used for rigging purposes**. (See photos 24-26, 29-34)

5. **Top Tank Section**: **There were safety-related and operational deficiencies noted: (1) the roof access was not equipped with safety railing to deter personnel from inadvertently falling from the roof, and (2) the roof manhole was not locked**. The top tank section was an aerator. There were 3 in. x 17 in. screened air intake openings located in the bottom of the shell. Significant coating failure and corrosion were observed around these openings. A roof manhole and an induced draft blower were located on the roof. The roof manhole cover was equipped with two bolts through the cover overlap and two chains but was not locked. The blower on the roof was located inside an aluminum security shroud bolted to the roof. The aluminum security shroud extended over the edge of the roof manhole cover. Corrosion was observed along the blower flanged connection. An area of coating failure and corrosion was observed adjacent to the roof manhole under the edge of the aluminum shroud. Coating failure and corrosion were noted at the bolted connection of the roof to the shell. Lugs were located on the roof. **It is the opinion of Tank Industry Consultants that the lugs should not be used for rigging purposes**. (See photos 37-38, 51)

6. **Overflow Pipe:** The overflow pipe exited through the roof of the middle tank section and extended down the shell of the middle tank section, across the roof of the bottom tank section, and down the shell of the bottom tank section to near grade. The PVC overflow pipe was U-bolted to brackets welded to the shells. Coating failure and corrosion were observed on the overflow pipe brackets. The overflow pipe was equipped with an above-ground air break and discharged onto a 2 ft x

3 ft area of eroded rip rap. The discharge end of the overflow pipe was equipped with a 10 x 10 mesh screen and a flap gate. There were two icicles observed on the overflow pipe. (See photos 13, 35-36)

7. **Exterior Ladders: There was a safety and ANSI/OSHA deficiency noted: the 6-3/4 in. toe room did not meet the required 7 in. minimum**. The middle tank section and top tank section were equipped with fiberglass ladders. The ladders were equipped with slip-resistant rungs. The exterior shell ladders fiberglass brackets were bolted to steel brackets which were welded to the shells. The exterior shell ladders and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. The ladders were equipped with aluminum notched-tubular safe-climbing devices. The ladder was not equipped with a vandal deterrent. (See photos 27-28, 39)

C. Interior Surfaces

ROOF SUPPORT SYSTEM:
Rafters:
Number: 4
Size: 7 in. x 8 in., beam

CATHODIC PROTECTION: none

OVERFLOW:
Inlet Type: open pipe
Location: flush with roof

INTERIOR PIPING:
Center Inlet Pipe:
Size: 10 in. diameter
Projection: from floor up to and through roof

Inlet/Outlet Pipes:
Number: 4
Size: 8 in. diameter
Projection: 8-1/2 in. to 9-1/2 in. above floor

Drain Pipe:
Size: 3 in. diameter
Projection: 1 in. above floor

Aerator Effluent Pipe:
Size: 15 in. diameter
Projection: 12 in. down from roof

INTERIOR COATING AND METAL CONDITION:

	Coating Thickness		% Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Roof	14 mils to 21 mils	-	Neg.	5%	-	Neg.	Neg.
Shell	14 mils to 21.0 mils	16.0 mils	< 1%	< 1%	0 S	Neg.	Neg.
Floor	8 mils to 14 mils	11 mils	< 1%	5%	0 S	1/32 in.	<3/32 in.

Key to Table

Adhesion	5 (very good)	T = Topcoat to Underlying Coating	Neg. = negligible
	4 (good)		
	3 (fair)	S = Primer to Steel	
	2 (poor)		
	1 (very poor)		
	0 (very poor)		

1. **Interior Coating Condition**: The bottom tank section consisted of two filter areas and a center dry area containing piping and valves. The dry area coating appeared to be in generally fair condition. Corrosion was observed on the drain pipe fittings. The filter areas contained media and were not accessed during the field evaluation. The top tank section/aerator was not accessed during the field evaluation. The middle tank section was the main area of the aeralator and was drained for the field evaluation. The coating on the interior surfaces of the middle tank section appeared to be in poor condition and exhibited very poor adhesion to the steel. The coating appeared to be an epoxy coating system.

2. **Roof Condition**: The coating on the roof plates of the middle tank section appeared to be in poor overall condition. The interior roof support structure consisted of four beam rafters. The rafter ends were welded to the shell. Rust was observed along the plate edges, and layered rust was observed on the rafters. Coating failure was observed around one of the openings in the roof. An inlet pipe from the floor of the tank to the aerator penetrated through the roof, and two pipes from the aerator penetrated through the roof. (See photos 57-59)

3. **Shell Condition**: The coating on the shell interior appeared to be in fair overall condition with no significant corrosion noted. The shell coating was discolored due to mineral staining from the water. (See photos 60)

4. **Overflow Pipe**: The overflow pipe was equipped with an open pipe inlet which penetrated through and was flush with the roof. The location of the overflow inlet was such that the top capacity level was at the roof of the middle tank section.

5. **Bottom Plate Condition**: The coating on the tank bottom appeared to be in poor condition. Approximately ten pits were noted in the bottom of the middle tank section. Pit depth measurements of 1/32 in. were typical, and the deepest pit depth measured approximately 3/32 in. deep. Eight radial stiffeners were located on the tank bottom. The stiffeners did not appear to be seal welded to the floor. Coating failures were located on the stiffeners primarily at the 16 in. at the center of the tank bottom. The pits were also located primarily at this center area. (See photos 61-63)

6. **Interior Piping**: A 10 in. diameter inlet pipe extended up through the bottom of the middle tank section and through the roof into the aerator. There were 3/4 in. thick bars welded around this inlet pipe. A 15 in. diameter pipe and a 6 in. diameter pipe were located in the roof of the middle

tank section. Four 8 in. diameter pipes were located in the bottom of the middle tank section. The interior piping appeared to be in fair condition. (See photos 61-62, 64-66)

RECOMMENDATIONS:

A. Foundation and Site

1. **Site Maintenance**: The site should continue to be maintained so that the top of the foundation projects a minimum of 6 in. above grade and so that proper drainage away from the foundation continues. Site maintenance should be performed with the mower discharge directed away from the base of the tank to prevent rock chips in the coating and the accumulation of grass on the bottom plate and shell bottom. The gate should be locked at all times to deter unauthorized entry and limit liability for the Owner.

2. **Site Access and Restoration**: The fenced, open field adjacent to the site should be adequate for a contractor to stage equipment. Provisions should be included in the specifications for the restoration of any fences, sod, or other surfaces and structures disturbed by the contractor’s work.

3. **Tank and Site Security**: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner’s security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all manholes and gates are locked, and all exterior ladders have suitable deterrents. Other security measures might include verifying the proper operation of the existing motion detectors on the site, installing surveillance cameras, installing alarms on gates and tank manholes, and arranging more frequent site visits by law enforcement agencies.

4. **Foundation**: When the tank exterior is repainted, any unsound concrete should be chipped to sound material and the concrete should be brush-off blasted. Any deteriorated areas or voids found should have a bonding agent and a vinyl emollient modified concrete patching mortar applied to build up the surface to its original contour. The concrete should then be painted with a concrete sealer.

5. **Grout Maintenance**: All loose grout should be chipped away to solid material when the tank is empty. Any shim plates that can be easily removed should be taken out. Any voids in the grout should be filled with a nonshrinking, nonstaining, structural grout material. The grout should be placed as far back under the bottom plate as possible and squared off vertically with the edge of the bottom plate. Any gap between the steel bottom plate and the grout should be filled with a flexible sealant.

B. Exterior Surfaces

1. **Life of the Exterior Coating**: The exterior coating system appeared to be in fair to poor condition. Tank Industry Consultants believes that the exterior of the tank should be painted within the

next 2 years from a corrosion standpoint. Due to the fair adhesion of the existing exterior coating, spot cleaning and topcoating the existing system appears to be a viable option. The exterior coating system should be evaluated immediately prior to preparing specifications to determine if the coating adhesion is still adequate to accept a topcoat.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients that may at that time be subject to regulations concerning their handling and disposal.

3. **Cleaning**: Containment of the wind-blown debris spent cleaning and paint overspray will be required due to the proximity of the adjacent facilities.

4. **Recommended Coating System**:

a. **Spot Clean and Topcoat**: If the exterior is to be repainted within the next few years, then spot cleaning and topcoating the tank appears to be the recommended option. The typical life of a spot cleaned and topcoated system is approximately 7 to 8 years, but is highly dependent on previous surface preparation and the condition of the underlying coating system.

b. **Coating Application**: The entire exterior surfaces of the tank should be high-pressure washed to remove chalked coating, mildew, and contaminants. After washing, the damaged and rusted areas should be spot cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning, or SSPC-SP 11, Power Tool Cleaning to Bare Metal. All areas of excessive coating thickness and runs in the coating should be cleaned to the equivalent of an SSPC-SP 7, Brush-Off Blast Cleaning, to remove the excessive mils. The spot cleaned areas should receive a spot prime coat compatible with the present coating system. The entire exterior surfaces should then be intermediate coated and topcoated with a compatible coating system.

5. **Alternative Coating System**:

a. **Complete Cleaning and Repainting**: The most economical, long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 15 to 20 years. These coatings are also presently manufactured to meet current VOC requirements.

b. **Coating Application**: The entire tank exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

6. **Effective Service Life**: Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of

weathering, and possibly some rust staining. Future touch-up may be required on isolated coating failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

7. **Other Systems**: With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available that would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

8. **Coating Curing**: It would be more economical to paint the tank exterior at the same time the interior wet is painted, since the tank should be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

9. **Rehabilitation Schedule**: To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the spring, with the work scheduled to start in early summer, if possible.

10. **Grinding and Bracket Removal**: Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off the exterior and interior to provide a smooth surface for the application of the coating.

11. **Electrical Apparatus**: All unused electrical conduit and fixtures should be removed from the tank and tank site. All required equipment should be repaired and maintained in accordance with the National Electric Code (NEC).

12. **Bottom Plate**: The hole in the bottom plate projection should be repaired.

13. **Existing Shell Manholes**: At the time of recoating and repairs, the gaskets for the shell manholes should be replaced and cover clasps should be replaced. The double-crab manhole covers should be equipped with hinge supports.

14. **Overflow Pipe**: The discharge end of the overflow pipe should be equipped with a new screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of birds, small animals and insects into the tank.

15. **Exterior Ladders**: The exterior ladders should be replaced with ladders that meet current OSHA requirements for adequate toe room.

16. **Vandal Deterrent**: Installing a vandal deterrent with side plates on both sides of the ladder would offer the Owner further protection from unauthorized access to the ladder and tank.

17. **Roof Safety Railing**: Safety railing that meets current OSHA dimensional requirements should be installed at the roofs accesses and adjacent to the roof manholes. The access openings should be equipped with self-closing gates as is now required by OSHA.

18. **Roof Manhole**: The gaskets for the roof manholes should be replaced. The roof manholes and covers should be locked to improve water system security. The broken manhole cover latch should be replaced.

19. **Roof Seam**: The hole in the weld seam in the bottom section roof should be repaired.

C. Interior Surfaces

Preface to Interior Recommendations: The interior surfaces of the bottom tank section and top tank section could not be accessed for evaluation. Therefore, the following recommendations are based on the condition of the surfaces of the middle tank section. A complete evaluation of the interior would reduce the number of potential change orders, and reduce the overall amount of the bids by eliminating uncertainty about the condition of the coating and steel. An evaluation of interior surfaces and rehabilitation of the tank could be scheduled in conjunction with removal and maintenance of the filter media to reduce out of service time and observe areas covered by the filter media.

1. **Life of the Interior Coating**: The interior coating system appeared to be in generally poor condition with pitting observed on the bottom plate. Tank Industry Consultants recommends that the interior surfaces of this tank should be recoated within 2 years. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the interior of the tank, samples of the interior coating system should be subjected to laboratory analysis to test for ingredients that may at that time be subject to regulations concerning their handling and disposal.

3. **Recommended Interior Coating System**:

   a. **Epoxy Coating System**: The optimum long-life coating system presently available for the interior of water tanks is a two-component epoxy coating system. A three-coat epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

   b. **Coating Application**: When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

   c. **Service Life**: The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas that have experienced coating failure.

4. **Pit Welding and Pit Filling**: After initial cleaning, all significant pitting that is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer.

5. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating.

6. **Seal Welding**: The rafter and stiffeners should be seal welded to the roof and floor respectively.

CLOSURE:

Brief Summation: Indiana-American Water Company, Inc. owns and operates an aeralator in Winchester, Indiana. The coating on the exterior of the aeralator appeared to be in fair to poor overall condition. The interior coating appeared to be in poor overall condition with pitting observed on the bottom plate and layered rust located on the interior roof rafters. Tank Industry Consultants believes the aeralator should be rehabilitated within the next 2 years. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work and coatings applied should be in accordance with ANSI/NSF Standard 61, the coating manufacturer's recommendation, AWWA D100, AWWA D102, and specified standards of NACE International and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every 3 to 5 years.

Time Frame: If the work is not performed within the next 12 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.

Seismic Loadings: This tank is located in or near a region of moderate seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications that may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards that have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

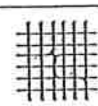
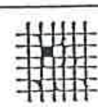
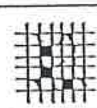
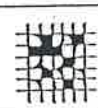
Colleen Burrows
Project Engineer

GREGORY R. STEIN
REGISTERED
PE920018
STATE OF
INDIANA
PROFESSIONAL ENGINEER

Gregory R. "Chip" Stein, P.E.
Managing Principal

Classification of Adhesion Test Results

Method A -- X Cut Tape Test Approx 1.5 in. long cuts at 30 deg. to 45 deg apart	Surface	Classification
No peeling or removal		5
Trace peeling or removal along incisions.		4
Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.		3
Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.		2
Removal from most of the area of the X under the tape.		1
Removal beyond the area of the X.		0

Method B — Lattice Cut Tape Test Six parallel cuts at 2mm apart.	Surface	Classification
The edges of the cuts are completely smooth; none of the squares of the lattice are detached.	No Failure	5
Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.		4
Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.		3
The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.		2
The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.		1
Flaking and detachment worse than grade 1.		0

ASTM 3359 Standard Test Methods for Measuring Adhesion by Tape Test

Tank Industry Consultants

7740 West New York Street
Indianapolis, Indiana 46214

Telephone — 317/271-3100
FAX — 317/271-3300

1. Aeralator, Winchester, Indiana.

2. Gap between bottom plate and foundation.

3. Gap between bottom plate and foundation.

4. Crack in foundation.

5. Corrosion and coating failure along bottom plate edge.

6. Gap in bottom plate.

7. Vertical shell seam.

8. Crack in shell coating.

9. Crack in shell coating.

10. Corrosion on shell manhole in bottom tank section.

11. Coating failure and corrosion on shell coating.

12. Coating failure on shell coating.

13. Overflow pipe and flap gate.

14. Corrosion on shell near lug at top of shell for bottom tank section.

15. Roof manhole on bottom tank section roof.

16. Corrosion on interior of bottom tank section roof manhole

17. Roof manhole on bottom tank section roof.

18. Roof manhole on bottom tank section roof.

19. Corrosion along bottom-to-middle tank section connection.

20. Coating failure on bottom tank section roof.

21. Coating failure on bottom tank section roof.

22. Coating failure on bottom tank section roof.

23. Hole in bottom plate roof seam.

24. Shell manhole in middle section.

25. Shell manhole in middle section.

26. Rust staining on middle tank section.

27. Middle tank section ladder bracket.

28. Middle tank section ladder and safe-climbing device.

29. Corrosion on middle section roof manhole cover latch.

30. Corrosion on middle section roof manhole cover latch.

31. Corrosion on middle section roof manhole cover.

32. Corrosion on middle section roof manhole interior curb.

33. Corrosion on middle section roof manhole cover latch.

34. Detached manhole cover latch.

35. Overflow pipe projection and icicle.

36. Overflow pipe and icicle.

37. Corrosion around air intake in shell of top tank section.

38. Corrosion around air intake in shell of top tank section.

39. Top tank section ladder and safe-climbing device.

40. Coating failure and corrosion along top tank section roof-to-shell connection.

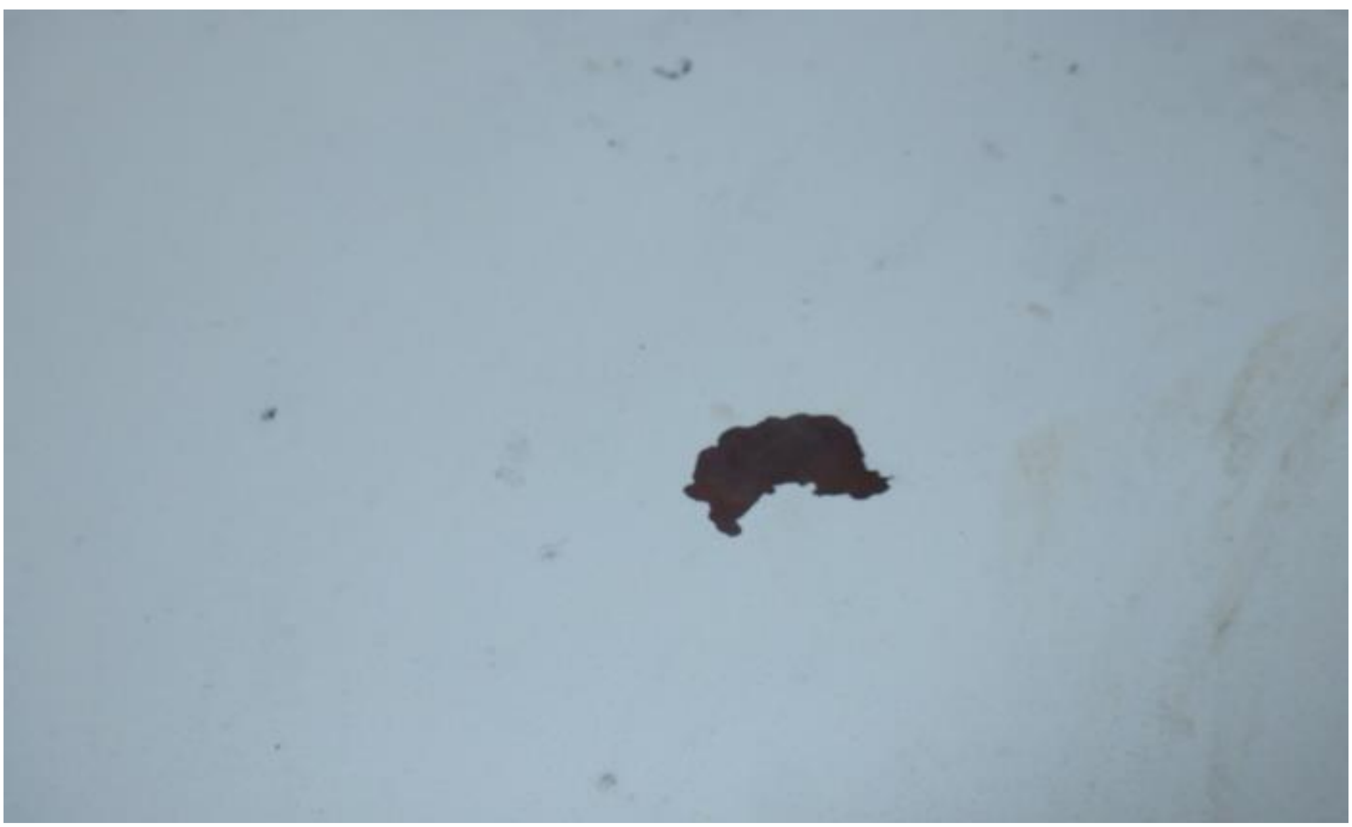
41. Coating failure and corrosion along top tank section roof-to-shell connection.

42. Coating failure and corrosion along roof perimeter of top tank section.

43. Top tank section roof access.

44. Top section roof manhole.

45. Lug on top tank section roof.



46. Coating failure on top tank section roof.

47. Conduit and lug on top tank section roof.

48. Conduit extending to blower on top tank section roof.

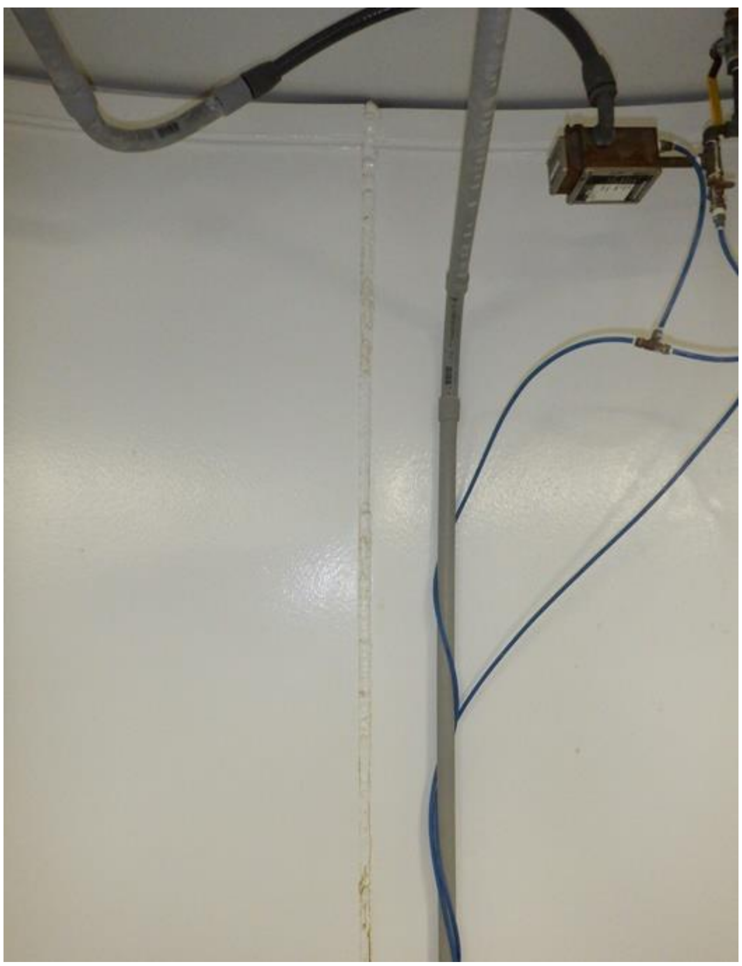
49. Blower with shroud on top tank section roof.

50. Blower-to-roof connection on top tank section roof.

51. Corrosion along blower flanged connection.

52. Piping in bottom tank section interior dry.

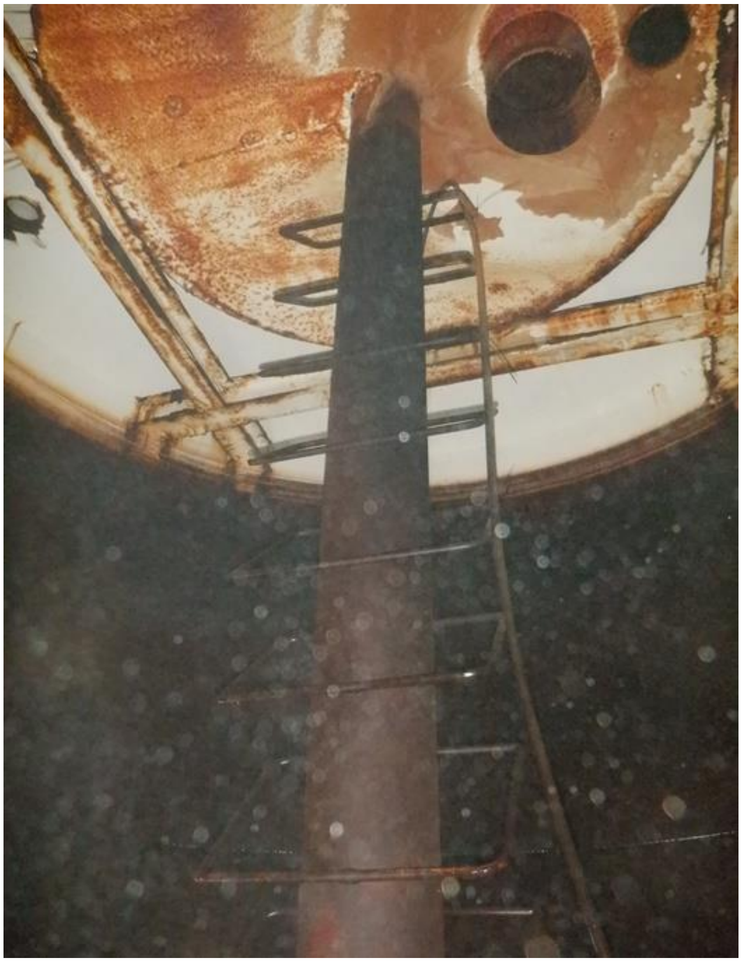
53. Rust staining on piping in bottom tank section interior dry.



54. Conduits in bottom tank section interior dry.

55. Corrosion on piping in bottom tank section interior dry.

56. Corrosion on piping in bottom tank section interior dry.



57. Inlet pipe, aerator effluent pipe, and interior roof of middle section.

58. Corrosion on middle tank section interior roof support structure.

59. Corrosion and coating failure around middle tank section roof manhole opening.

60. Mineral staining on middle section shell manhole cover.

61. Pipe in bottom of middle tank section.

62. Pipe in bottom of middle tank section.

63. Inlet pipe and stiffeners at bottom of middle tank section.

64. Pipe opening in middle tank section floor.

65. Pipe and stiffener at bottom of middle tank section.

66. Pipe and stiffener at bottom of middle tank section.

APPENDIX C

WINCHESTER WATER TREATMENT FACILITY
STRUCTURAL ASSESSMENT SUMMARY MEMO

STRUCTURAL ASSESSMENT SUMMARY MEMO

To: Steve Anderson, Engineering Project Manager

From: David J. Elmer, P.E., Engineering Manager

Date: September 22, 2020

Project: WIN Comprehensive Planning Study

Subject: Winchester Chemical Building Structural Repairs & Condition Summary

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In 2018, INAW proceeded with a capital project to install a phosphate chemical system at the Winchester Water Treatment Facility. The project involved constructing a dedicated phosphate feed room in the south wing of the existing chemical building, as well as a drum storage area adjacent to existing storage bays for sodium hypochlorite and HFS acid in the garage. The layout for the chemical building can be seen in Exhibit 1-2. The south wing includes storage, other chemical feed rooms, the laboratory, and the office area, and is thought to have been constructed in 1953. The north wing of the structure includes the garage and is thought to have been constructed in 1970.

In coordination with this project, work was performed to remediate asbestos found in the south wing of the structure, specifically cementitious wall panels identified in a report by Pinnacle Environmental Consultants, Inc., as well as contaminated insulation found around the chemical feed room and laboratory area (Exhibit 1-3 shows the main area highlighted for remediation in the report). In the process of this remediation effort, after the asbestos-containing panels had been removed and the western exterior load bearing wall had been exposed, it was found that the steel paneling of the wall had rusted and deteriorated to the point that the structural integrity of the wall was compromised. Several sections of vertical rib of the wall panels had significant metal loss (Refer to Exhibit 1-4).

The contractor responsible for installation of the phosphate chemical system was tasked with demo and reinforcement of the exposed western exterior wall structure. A detail for the wall repair was provided to the contractor by INAW (Exhibit 1-6). No additional exterior walls were exposed or repaired, as it was not within the scope of the initial project, however the steel panels are used around most of the south wing of the building. Given the age of the south wing, and with no known renovations to the load bearing components of the structure, it is believed that a similar condition may be prevalent along the remaining exterior walls. The repairs made to the western wall of the south wing were intended to temporary shoring of the structure in this area, however the repairs were not designed to prevent water intrusion or further degradation in areas not directly addressed.

The following exhibits contain a high-level overview of the building, details from the asbestos inspection report, as well as images from the exposed exterior wall panels and the subsequent repairs. This memo is intended to provide a summary of the work performed and a reasonable expectation of the structural condition of the remaining south wing exterior walls.

Exhibit 1-1: Winchester WTP chemical building exterior (looking at south wing)

Exhibit 1-2: Chemical building layout after completion of 2018 cap. ex. project

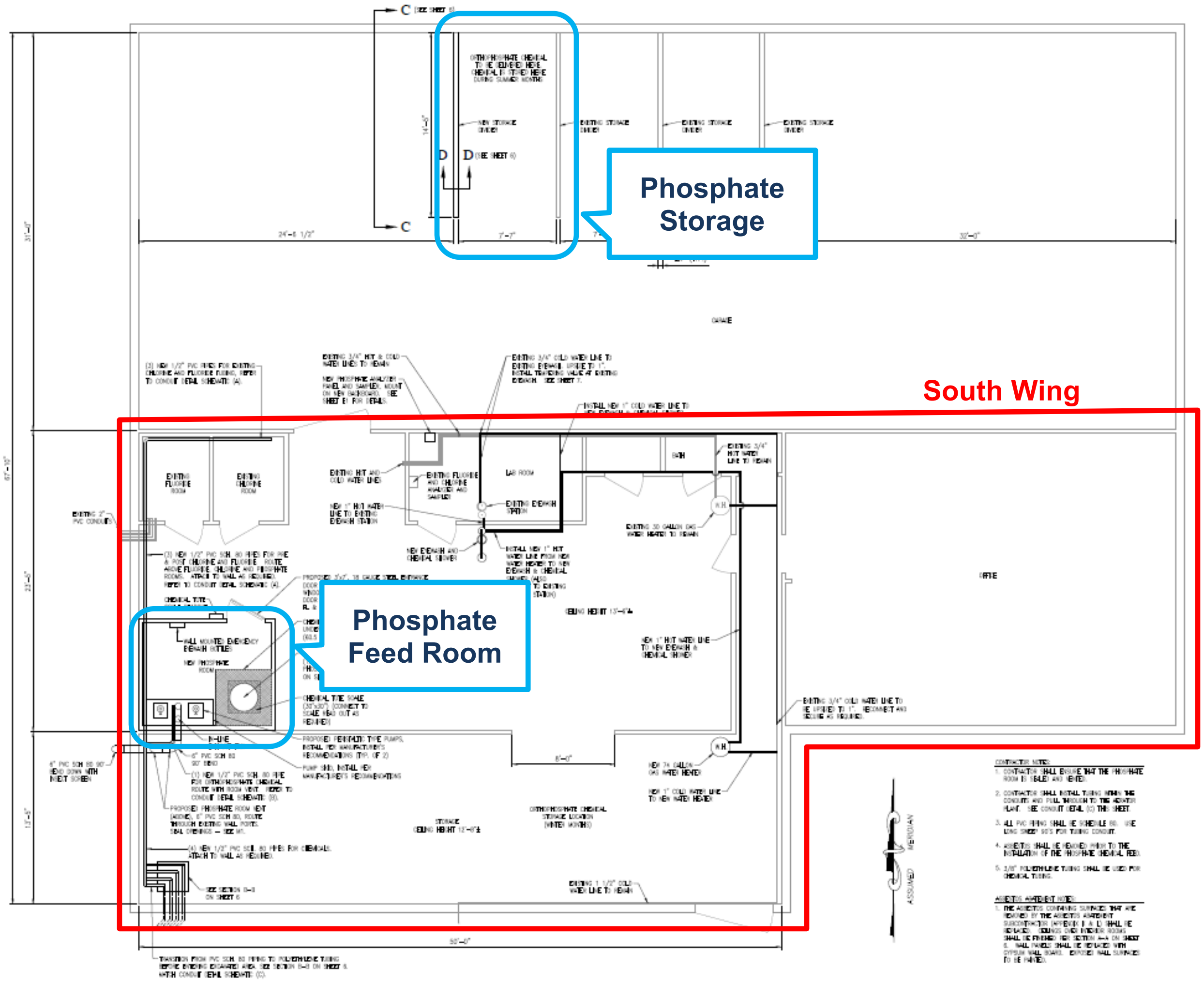


Exhibit 1-3: Areas identified for asbestos remediation in Pinnacle Environmental inspection report (December 29, 2017)

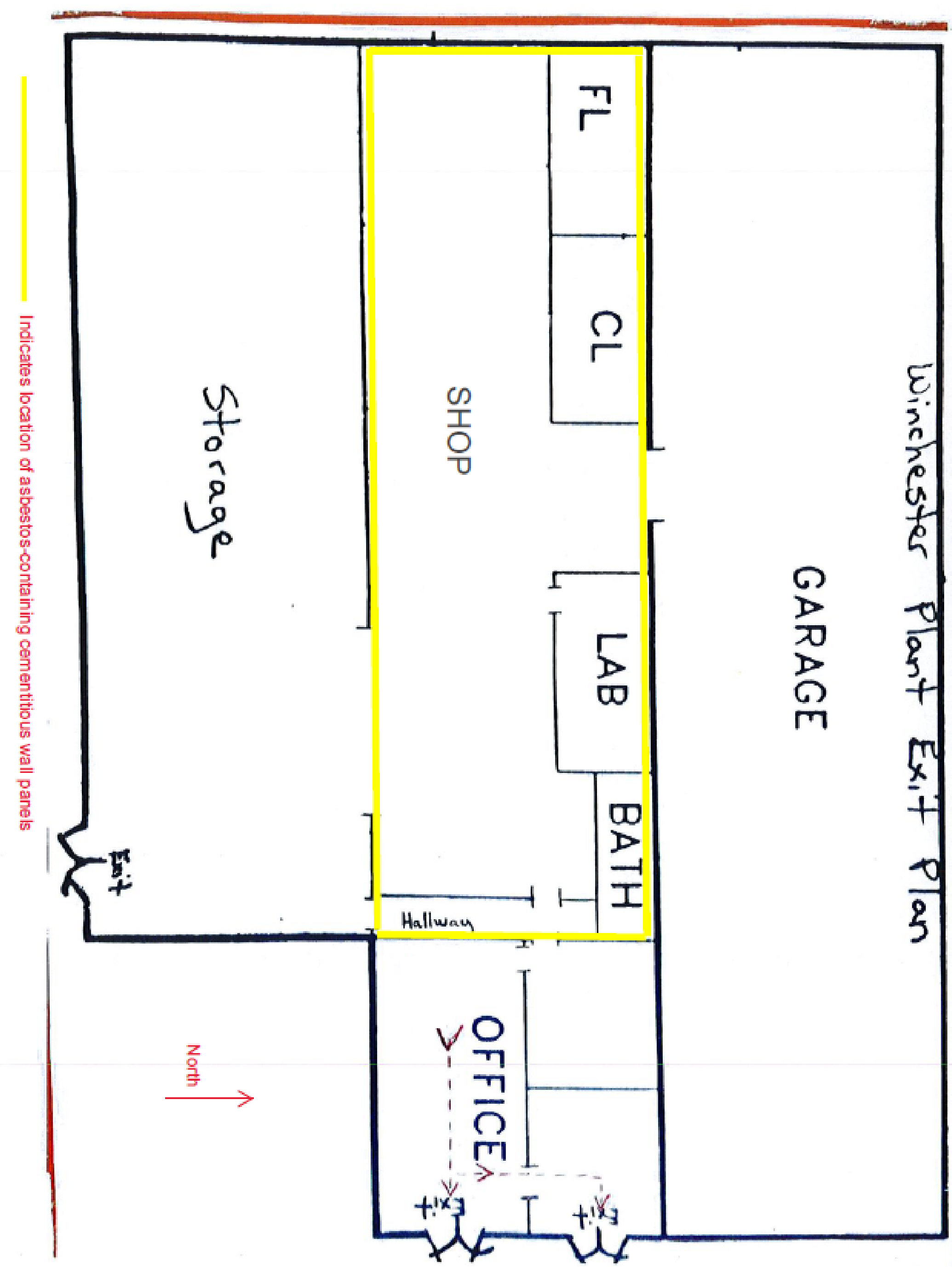


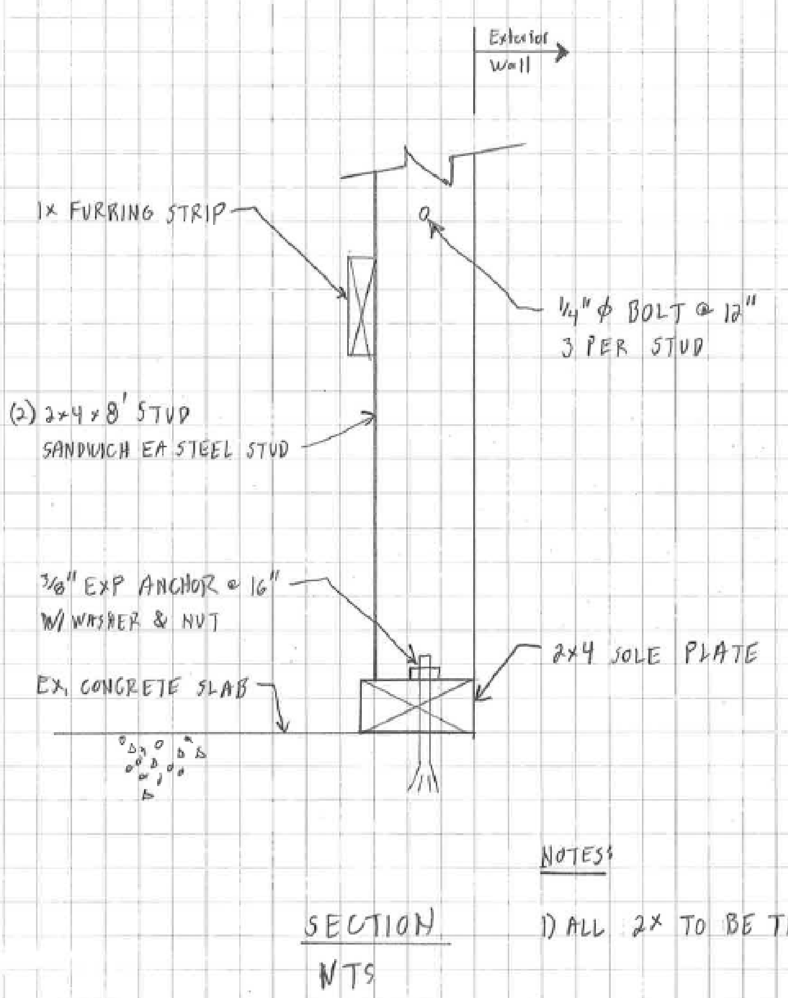
Exhibit 1-4: Photo of deterioration on exposed interior of western wall

Exhibit 1-5: Photo from exterior of western wall

Exhibit 1-6: Repair detail provided by INAW

INDIANA-AMERICAN WATER COMPANY, INC.
Greenwood, Indiana

Calc. by From DJE Date 8-20-18
Check by To ______ Date ______
PROJECT WINCHESTER WTF W.O. No. ______ Sheet ______ of ___



NOTES:

1) ALL 2X TO BE TREATED.

Exhibit 1-7: Photo of interior western wall reinforcement/repair

INDIANA
AMERICAN WATER

Winchester Water Treatment Facility (WTF) Improvements
Design Build Project
Winchester, Indiana

DESIGN/BUILD
REQUEST FOR PROPOSAL

February 2023

AMERICAN WATER WORKS SERVICE COMPANY, INC.
One Water Engineering
1 Water Street
Camden, New Jersey 08102

INDIANA-AMERICAN WATER COMPANY
Winchester, Indiana
Winchester Water Treatment Facility Improvements

DESIGN/BUILD REQUEST FOR PROPOSAL

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I. REQUEST FOR PROPOSAL INSTRUCTIONS

ARTICLE 1 – DEFINITIONS; RFP DOCUMENTS

1.01 Definitions

A. Terms used in this Request for Proposals (RFP) have the meanings assigned to them as defined in the **American Water Standard General Conditions of the Design-Build Contract 2023 Edition,** and Supplementary Conditions. Additional terms have the meanings indicated below:

1. RFP Documents – This Request for Proposal; Proposal Form; Project information, technical information, site information, and proposed Contract Documents or other documents issued with or incorporated by the RFP.

2. Proposer - One who submits a Proposal directly to Owner.

3. Successful Proposer - The Proposer to whom Owner (based on Owner's evaluation as hereinafter provided) makes an award.

4. Technical Exhibits - Documents prepared by Design-Builder that demonstrate the Proposer's plan for meeting the Owner's requirements as set forth in the Conceptual Documents.

5. Target Cost – The Successful Proposer will provide a Target Cost for the Work with the Design Memorandum and upon completion of 60% design. Further definition of Target Cost is provided in the Supplementary Conditions definitions.

1.02 Obtaining and Using RFP Documents

A. Owner has established a Coupa sourcing event for this RPF. Proposers will receive an email from do_not_reply@amwater-ccc.coupahost.com to participate in the sourcing event from our Coupa e-procurement system. Owner recommends that Proposers check quarantine or spam mail if email with link is not received in a timely manner. Once Proposer receives the email, Proposer will receive Addenda issued by Owner. Coupa will be the primary channel for all communications from Owner to Proposer and Proposer to Owner.]

B. Complete sets of the RFP Documents must be used in preparing Proposals. Owner does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

C. Copies of RFP Documents available on the above terms are only for the purpose of obtaining Proposals for the Work and do not confer a license or grant to Proposers for any other use.

1.03 Identification of Conceptual Documents

A. Conceptual Documents include Part III, Scope of Design Services and Part IV Attachments

ARTICLE 2 - PRE-PROPOSAL CONFERENCE

2.01 *Date, Location, and Terms of Pre-Proposal Conference*

A. A Pre-Proposal Conference will be held at **9:00 AM on February 21, 2023, at 870 IN-32, Winchester, IN 47394** Representatives of Owner and Owner's Consultant will be present to discuss the Project. Proposers are **required to attend and participate in the conference.** Owner will transmit to all prospective Proposers of record such Addenda as Owner considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective. Following the Pre-Proposal Conference, Proposers will have the opportunity to tour the site/plant, and representatives of Owner will be present to discuss the Project.

ARTICLE 3 – PROPOSER'S REPRESENTATION

3.01 Representations: It is the responsibility of each Proposer before submitting a Proposal to:

A. Examine and carefully study the RFP Documents and other related data identified in the RFP Documents.

B. Visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work. See Division 1- General Requirements for limitations on the time and access to the site during construction.

C. Become familiar with all federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work;

D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site, and all drawings of physical conditions relating to existing surface or subsurface structures at the Site, if any, that Owner has identified or made available to Proposer's, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that Owner has identified or made available to Proposer, especially with respect to Technical Data in such reports and drawings.

E. Consider the information known to Proposer itself, and to members of Proposer's design-build team; information commonly known to design professionals, design-builders, and contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the RFP Documents; and the Site-related reports and drawings (if any) identified in the RFP Documents or otherwise made available to Proposer, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the project design; (3) the means, methods, techniques, sequences, and procedures of construction to be employed by Proposer; and (4) Proposer's safety precautions and programs.

F. Agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Proposal no further examinations, investigations, explorations, tests, studies, or data are necessary for the preparation of its Proposal for performance of the Work at the prices stated and within the times required, and in accordance with the other terms and conditions of the RFP Documents.

G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the RFP Documents.

H. Promptly give Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Proposer discovers in the RFP Documents, and confirm that the written response from Owner is acceptable to Proposer.

I. Determine that the RFP Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. Agree that the submission of a Proposal will constitute an incontrovertible representation by Proposer that Proposer has complied with every requirement of this Article, that without exception the Proposal and all prices in the Proposal are premised upon performing and furnishing the Work required by the RFP Documents.

ARTICLE 4 – EXAMINATION OF SITE AND SITE-RELATED DOCUMENTS; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 Site and Other Areas

A. The Site is identified in the RFP Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Design-Builder. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Design-Builder.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions.

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Proposer on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Proposer is entitled to rely, as provided in the General Conditions, has been

identified and established in the Supplementary Conditions. Proposer is responsible for any interpretation or conclusion Proposer draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

4.03 *Site Visit and Testing by Proposers*

A. Proposer shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

B. Proposer is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Proposer access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Proposer deems necessary for preparing and submitting a successful Proposal. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

D. Proposer shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

E. Proposer shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 *Other Work at the Site*

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these RFP Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Proposer access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 - INTERPRETATIONS AND ADDENDA

5.01 All questions about the meaning or intent of the Proposal Documents are to be directed to American Water in writing. **Send questions to the attention of Dante Alday at e-mail address Dante.Alday@amwater.com.** Interpretations or clarifications considered necessary by Owner in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Owner as having received the Proposal Documents. Questions received less than seven (**7**) days prior to the date for opening of Proposals may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

5.02 Addenda may be issued to clarify, correct, or change the Proposal Documents as deemed advisable by Owner.

ARTICLE 6 - TECHNICAL PROPOSAL

6.01 *Technical Proposal Criteria*

A. Proposers shall submit with their Proposals the following Technical Exhibits:
   1. See Part II of this RFP, Information to be Submitted with the Proposal.

6.02 *Ownership Rights*

A. An unsuccessful Proposer shall retain an ownership and property interest in the Technical Proposer. Owner may retain a record copy for information purposes; however, such documents are not intended or represented to be suitable for reuse by Owner or others on the Project or on any other project. Any such use or reuse will be at Owner's sole risk and without liability or legal exposure to unsuccessful Proposer, and Owner shall indemnify and hold harmless Proposer from all claims, damages, losses and expenses including attorneys' fees arising out of or resulting there from.

6.03 *Deviations from Conceptual Documents*

A. Technical Exhibits may include alternatives and/or deviations from the Conceptual Documents provided that such alternatives and/or deviations are called to the Owner's attention in separate written documentation to be submitted with the Proposal.

ARTICLE 7 – PROPOSAL PRICE

7.01 Lump Sum

A. Proposers shall submit a Proposal on a lump sum basis as set forth in the Proposal Form Lump sum costs include design fees, Design-Builder's fee, construction superintendence, and bond costs. The cost of construction activities is not included in the RFP phase, however, in Section II Information to be Submitted with the Proposal, Proposer is asked to provide a construction cost estimate of the Work.

B. The Proposal price shall include such amounts as the Proposer deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 12.02 of the General Conditions.

ARTICLE 8 – PROPOSAL SECURITY

None Required

ARTICLE 9 – CONTRACT TIMES

9.01 The Owner desires to achieve substantial completion and readiness for final payment by **April 30, 2025, and June 15, 2025,** respectively.

9.02 The actual times for Substantial Completion and readiness for final payment shall be those times offered by the Proposer and entered into the Agreement upon award of the contract. These times will be taken into consideration by Owner during the evaluation of Proposals, and it will be necessary for the apparent Successful Proposer to satisfy Owner that they will be able to achieve Substantial Completion and be ready for final payment within the times specified or provide substantive reasoning why the times cannot be met.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – FORMAL REQUIREMENTS

11.01 *Proposal Execution Requirements*

A. A Proposal by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

B. A Proposal by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

C. A Proposal by an individual shall show the Proposer's name and official address.

D. A Proposal by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Proposal Form. The official address of the joint venture shall be shown.

E. All names shall be printed in ink below the signatures.

F. The Proposal shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Proposal Form.

G. Postal and e-mail addresses and telephone number for communications regarding the Proposal shall be shown.

ARTICLE 12 – QUALIFICATIONS OF PROPOSERS

12.01 Proposer's Qualifications

A. Proposer shall supplement its Statement of Qualification, if any, by furnishing the names and relevant information regarding proposed additions or changes to the design-build team.

B. Each Proposal must contain evidence of Proposer's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the contract.

12.02 Contractor/Subcontractor

A. Furnish the names, titles, their role in the project and qualifications of the key individuals that will be providing Construction Administration and Startup Services.

12.03 Designation of Engineer

A. The individual or entity that will be providing Design Professional Services shall be listed in the Proposal. If more than one entity will be responsible for providing the Design Professional Services list all of these in the Proposal. For each entity furnish the names, titles, their role in the Project and qualifications of the key individuals that will be providing Design Professional Services.

ARTICLE 13 – SUBMITTAL OF PROPOSALS

13.02 An Electronic (PDF format) copy of the proposal shall be submitted **via American Water Coupa e-Procurement system no later than 2:00 PM, March 21, 2023.**

13.03 Proposals received after the date and time prescribed for the opening of Proposals, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Proposer unopened.

ARTICLE 14 – MODIFICATON AND WITHDRAWAL OF PROPOSAL

14.01 A Proposal may be withdrawn by an appropriate document duly executed in the same manner that a Proposal must be executed and delivered to the place where Proposals are to be submitted prior to the date and time for the opening of Proposals. Upon receipt of such notice, the unopened Proposal will be returned to the Proposer.

14.02 If a Proposer wishes to modify its Proposal prior to Proposal opening, Proposer must withdraw its initial Proposal in the manner specified in Paragraph 14.01 and submit a new Proposal prior to the date and time for the opening of Proposals.

14.03 If within 24 hours after Proposals are opened any Proposer files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Proposal, that Proposer may withdraw its Proposal, and the Proposal security will be returned. Thereafter, if the Work is rebid, that Proposer will be disqualified from further bidding on the Work.

ARTICLE 15 – OPENING OF PROPOSALS

15.01 Proposal will be opened privately.

ARTICLE 16 – PROPOSALS TO REMAIN SUBJECT TO ACCEPTANCE

16.01 All Proposals will remain subject to acceptance for the period of **Sixty [60] days** from the receipt of the Proposal, but Owner may, in its sole discretion, release any Proposal and return the Proposal security prior to the end of that period.

ARTICLE 17 – INTERVIEWS WITH PROPOSERS

17.01 *Interviews*

ARTICLE 18 – EVALUATION OF PROPOSALS

18.01 *Evaluation of Technical Proposals*

A. In evaluating Proposals, Owner may consider:

1. Whether the Proposals comply with the prescribed documents and other data as may be requested in the Proposal Form or prior to the Notice of Award.

2. The Proposal prices as required in the Proposal Form.

3. The innovative alternatives identified by the Proposers and opportunities the alternatives provide for reduction of capital costs and operating and maintenance costs. Innovative alternatives shall meet State American Water standards.

4. The qualifications of Proposers and the qualifications and experience of Subcontractors (including engineer), Suppliers, and other individuals and entities proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other individuals and entities must be submitted as provided in the Supplementary Conditions and as may be requested in the Proposal Form, Information to Be Submitted with the Proposal, Scope of Design Services, or prior to the Notice of Award.

5. The extent to which the Technical Exhibits demonstrate the Proposer's plan for meeting of the Owner's requirements set forth in the Conceptual Documents and design solutions contained therein.

6. The operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

H. The Proposals will be evaluated based upon five criteria as listed below. For the purpose of evaluating Proposals, these evaluation criteria will be given the following weights:

1. **Technical Submission** **[30%]**
2. **Commercial** **[25%]**

3. **Schedule & Work Plan** **[20%]**
4. **Qualifications and experience** **[15%]**
5. **Resources** **[10%]**

I. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Proposal and to establish the responsibility, qualifications and financial ability of Proposers and proposed engineers, Subcontractors, Suppliers, and other individuals and entities to perform and furnish the Work in accordance with the Contract Documents.

ARTICLE 19 – REJECTION OF ALL PROPOSALS; DISCREPANCIES

19.01 Owner reserves the right to reject any or all Proposals, including without limitation nonconforming, non-responsive, unbalanced, or conditional Proposals. Owner further reserves the right to reject the Proposal of any Proposer whom it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner may also reject the Proposal of any Proposer if Owner believes that it would not be in the best interest of the Project to make an award to that Proposer. Owner also reserves the right to waive all informalities not involving price, time or changes in the Work and to negotiate contract terms with the Successful Proposer.

ARTICLE 20 – AWARD OF CONTRACT

20.01 If the Contract is awarded, Owner will award the Contract to the Proposer whose Proposal is in the best interests of the Project, and pursuant to the procedures set forth in this RFP.

20.02 If the contract is awarded, Owner will give Successful Proposer a Notice of Award within **60 days** after the day of the Proposal opening.

ARTICLE 21 – BONDS AND INSURANCE

21.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Design-Builder's requirements as to performance and payment bonds, if any and insurance. When the Successful Proposer delivers the executed Agreement to Owner, it must be accompanied by the required documentation.

ARTICLE 22 - SIGNING OF AGREEMENT

22.01 When Owner gives a Notice of Award to the Successful Proposer, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Proposer shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Proposer.

ARTICLE 23 - PROPOSAL COMPENSATION

23.01 None Provided.

ARTICLE 24 - SALES AND USE TAXES

24.01 Owner is exempt from **Indiana** Sales and Use taxes on certain installation labor, materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Proposal. Successful Proposer agrees to work with Owner or Owner's legal counsel in order to identify nontaxable labor, materials and equipment. Refer to paragraph 7.11 of the Supplementary Conditions for additional information.

ARTICLE 25 – CONTRACTS TO BE ASSIGNED

Not Applicable

ARTICLE 26 - PARTNERING

26.01 Owner intends to participate in a partnering process with Design-Builder. The process is intended to help develop better and more effective communications and mutual understanding of common goals. The objectives of the process will be to achieve effective and efficient performance of the Work and completion of the Work within the Contract Price and Contract Times, all in accordance with the Contract Documents.

26.02 Participation in the partnering process will be voluntary. To initatie the process, within [NUMBER] days after the Notice to Proceed the key personnel of Owner, Design-Builder, Designated Engineer, Contractor and Design-builder's major Subcontractors will be invited to attend a one-day seminar followed by a one-day team building workshop to develop a partnering statement. The seminar and the workshop will be conducted by a neutral facilitator at a time and location agreed to by Owner and Design-Builder in the general facility of the Site.

26.03 The facilitator will be selected by Owner, subject to approval by Design/Builder. Owner will pay costs of the facilitator and facilities. Each party will pay all costs associated with the participation of its own personnel.

26.04 A primary objective of the partnering process is to maximize the potential for resolution of disputes in a timely and non-adversarial manner. The use of alternative dispute resolution (ADR) methods will be encouraged in order to promote and maintain amicable working relationships among the parties. In the event that ADR procedures are unsuccessful, the dispute resolution provisions set forth in the Contract Documents will be employed.

26.05 These provisions express the intent and spirit of the partnering process, and nothing stated herein or in the partnering statement shall change in any way the rights, responsibilities, and obligations of the parties as set forth in the Contract Documents. **The partnering statement will not be part of the Contract Documents and will not modify any defense, claim, obligation, or right that otherwise exists.**

Indiana-American Water Company
Winchester Water Treatment Facility (WTF) Improvements
Design Build Project
Winchester, Indiana

PROPOSAL FORM

ARTICLE 1 - PROJECT IDENTIFICATION

Indiana American Water (INAW) provides water service to approximately 2,000 customers in its Winchester service area (Richmond District) in Randolph County, Indiana. The service area includes the Town of Winchester. The District obtains its water supply from four groundwater wells located at the INAW owned and operated Winchester Water Treatment Facility (WTF), located at 870 W State Road 32, Winchester, Indiana, on approximately 4.25 acres of property.

The existing water treatment facility has a firm capacity of 0.72 MGD and a rated capacity of 1.44 MGD, and employs aeration, chemical oxidation, and filtration for the removal of iron. Sodium hypochlorite is used for chemical oxidation and disinfection, hydrofluorosilicic acid is used for dental health, and blended ortho/polyphosphate is used for corrosion control.

While the Winchester WTF produces high quality finished water meeting or exceeding Indiana and Federal standards, several of the facilities and structures at the Winchester WTF are aging and in deteriorating condition. Additionally, the firm treatment capacity of the existing filters is not adequate to meet maximum day demand in the system, and the existing Aeralator unit is nearing the end of its useful life. INAW has decided to install new filtration capacity meeting maximum day demands, replace the Aeralator unit, replace the backwash holding tank, construct a new chemical building, and construct a clearwell storage tank at the WTF site. These and other major scope items for the proposed facility are listed below. The existing facility must remain in-service throughout construction of the proposed facility. The existing water treatment facility site plan drawing is included in Appendix D.

Major scope of the project includes the following:

1. Design and construct new facilities including iron and manganese filtration system, chemical storage and feed systems, electrical, instrumentation and control systems, garage, and office space.
2. Design and construct new clearwell, backwash holding tank, and high service pump station (HSPS)
3. Design and install 190-feet of 16-inch discharge main from the HSPS.
4. Design and install 375-feet of 16-inch main from plant extending east along SR32.
5. Demolition of existing facility.

A detailed description of each of the design elements is included in the Design Concept (Attachment A).

ARTICLE 2 – PROPOSAL RECEIPENT

2.01 *This Proposal is submitted via:*

AW e-Procurement system "Coupa" by 2:00 PM on March 21, 2023

2.02 The undersigned Proposer proposes and agrees, if this Proposal is accepted and Owner awards the design-build contract to Proposer, to enter into the design-build contract with Owner in the form included in the RFP Documents, to perform all Work as specified or indicated in the RFP Documents for the prices and within the times indicated in this Proposal and in accordance with the other terms and conditions of the RFP Documents.

ARTICLE 3 - PROPOSER'S ACKKNOWLEDGMENTS

3.01 **P**roposer accepts all of the terms and conditions of the Request for Proposals, including without limitation those dealing with the disposition of the Proposal security. This Proposal will remain subject to acceptance for **[60]** days after the day of Proposal opening. Proposer will sign and deliver the required number of counterparts of the Agreement with any Bonds and other documents required by the Request for Proposal and Proposal Form within 15 days after the date of Owner's Notice to Proceed.

ARTICLE 4 – PROPOSERS REPRESENTATIONS

4.01 In submitting this Proposal, Proposer represents that:

A. Proposer has examined and carefully studied the RFP Documents, and any data and reference items identified in the RFP Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

B. Proposer has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Proposer is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Proposer has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site, and all drawings (if any) of physical conditions relating to existing surface or subsurface structures at the Site, that Owner has identified or made available to Proposer, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that Owner has identified or made available to Proposer, especially with respect to Technical Data in such reports and drawings.

E. Proposer has considered the information known to Proposer itself, and to members of Proposer's design-build team; information commonly known to design professionals, design-builders, and contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the RFP Documents; and the Site-related reports and drawings (if any) identified in the RFP Documents or otherwise made available to Proposer, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the project design; (3) the means, methods, techniques, sequences, and procedures of construction to be employed by Proposer; and (4) Proposer's safety precautions and programs.

F. Proposer agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the preparation of its Proposal for performance of the Work at the prices stated and within the times required, and in accordance with the other terms and conditions of the RFP Documents.

G. Proposer is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the RFP Documents.

H. Proposer has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Proposer has discovered in the RFP Documents and confirms that the written response from Owner is acceptable to Proposer.

I. The RFP Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Proposal constitutes an incontrovertible representation by Proposer that Proposer has complied with every requirement of this Article, and that without exception the Price Proposal and all prices in the Price Proposal are premised upon performing and furnishing the Work required by the RFP Documents.

ARTICLE 5 – PROPOSER'S CERTIFICATION

5.01 Proposer certifies that:

A. This Proposal is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Proposer has not directly or indirectly induced or solicited any other Proposer to submit a false or sham Proposal;

C. Proposer has not solicited or induced any individual or entity to refrain from submitting a Proposal; and

D. Proposer has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the proposal process to the detriment of Owner, (b) to establish prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Proposers, with or without the knowledge of Owner, a purpose of which is to establish prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the proposal process or affect the execution of the Contract.

ARTICLE 6 – BASIS OF PRICE PROPOSAL

6.01 The Cost of all Work other than Unit Price Work shall be determined as provided in Paragraph 12.01 of the General Conditions, as revised or amended by the Supplementary

Conditions and shall include the following amounts subject to increases or decreases for changes in Work as provided for in Article 4 of the Agreement

6.02 *Lump Sum Fees*

A. Design Professional Services - Preliminary Design up to and Including Issuing of the Design Memorandum.

$________________________________

B. Design Professional Services – Preliminary Design Completion through Final Design Phases.

$________________________________

C. Design Professional Services – Construction/Operational Phase.

$________________________________

D. Pre-Construction Services during Design Phase.

$________________________________

E. Construction Supervision and Superintendence.

$________________________________

F. Cost of Bond Premiums (Based on construction estimate):

$________________________________

Premium unit Price $__________/$___________

Range: $_______________ to $_______________

TOTAL LUMP SUM (A. + B. + C. + D. + E. + F.):

$________________________________

6.03 *Design/Builder's Fee*

A. Lump Sum Fee $________________________________

ARTICLE 7 – CONTRACT TIMES

7.01 Proposer agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with paragraphs 14.03 and 14.05 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

7.02 *Milestones*
Proposer agrees to the below Milestones**.**

A. Design Memo Completion: ________ days

(Insert days from Notice of Award to completion of the Design Memorandum)

B. Final Design Phase Completion: ________days

(Insert days from Notice to Award to completion of the Final Design Phase)

7.03 Proposer accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified in the Agreement.

ARTICLE 8 – ATTACHMENTS TO THIS PROPOSAL FORM

8.01 The following documents are attached to and made a condition of this Proposal:

A. The individual or entity providing the Design Professional Services will be: (if more then one list all)

____
____
____
____

B. Listed below are the Exhibits the Design/Builder has attached to this proposal:

____
____
____
____

ARTICLE 9 – DEFINED TERMS

9.01 The terms used in this Proposal which are defined in the General Conditions of the Contract between Owner and Design/Builder (“General Conditions”) included as part of the Contract Documents have the meanings assigned to them in the General Conditions. Terms defined in the Request for Proposal are used with the same meaning in this Proposal.

ARTICLE 10 - SUBMISSION

SUBMITTED on ___________________________.
State Contractor License No. ________________________.

State Certificate of Authority for Corporate Engineering Practice (If Applicable):

PROPOSER: ***[Indicate correct name of proposing entity]***

____

By:
Signature: _______________________________

Printed name: _______________________________

(If Proposer is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

ARTICLE 2 – ATTEST:

Signature: _______________________________

Printed name: _______________________________

Title: _______________________________

Submittal Date: _______________________________

Address for giving notices: _______________________________

____

____

____

Telephone Number: _______________________________

Fax Number: _______________________________

Contact Name and e-mail address: _______________________________

____

Proposer's License No.: _______________________________

[Use in those states or other jurisdictions where licensing is applicable or required.]

II. INFORMATION TO BE SUBMITTED WITH THE PROPOSAL

The following minimum information must be submitted with Design-Builder's Proposal for it to be accepted.

1. Separate Lump Sum amounts for each of the following components in Article 6 of the Proposal Form.

    a. Design Professional Services –Preliminary Design up to and including issuance of the Design Memorandum. (See III. Scope of Design Services, Section A).

    b. Design Professional Services – Completion of Final Design Phases (See III. Scope of Design Services, Section A).

    c. Design Professional Services - Construction/Operational Phase (See III. Scope of Design Services, Section B).

    d. Pre-Construction Services during Design Phase - (See III. Scope of Design Services, Section B).

    e. Construction Supervision and Superintendence – See SC-12.01 Cost of the Work for a description of the costs to be included in this item.

    f. Premium for the required Bonds (based on the Design Builders estimated construction cost). Provide a premium unit price that can be used if construction cost differs from the estimated cost. Also, provide the range that unit price is valid.

    g. Design Builders Fixed Fee

2. Provide the following Design-Build Team information relative to the proposed team qualifications:

    a. Firms: Identify the companies in the design build team and any other companies you would be teaming up, partnering or associating with during the project.

    b. Design-Build/Partnering Experience: Identify the team's Design-Build and partnering experience, including experience on projects similar to the proposed. Include a brief description of the projects, their costs and the current names and telephone numbers of the owner or owner's contact.

    c. Quality Management Plan Outline: Provide an organization chart showing reporting lines and responsibilities for the team. Provide references to company procedures to be used to manage the proposed project. Provide the method of management of the subcontractors. Provide the relationship of the contractor's safety plan to the above.

3. List areas of construction work which Design-Builder desires to perform with its own forces either through negotiation or successful competitive bidding against qualified subcontractors.

4. List of suppliers and subcontractors identified and certified as Minority, Woman, Service-Disabled Veterans, SBA, or 8A, -owned and controlled Business Enterprises (MWDVBE) that Design-Builder intends to utilize for this project. The Owner's goal is that at least **20%** of the Contract Price be directed to qualified diverse subcontractors and suppliers. See Appendix A of the Supplementary Conditions for Contractor Diversity and Reporting requirements.

5. For self-performed work, provide all the classifications of labor to be employed and associated hourly unit cost inclusive of wages, fringe benefits, payroll taxes, insurance, etc.

6. Provide description of the services and facilities included in the lump sum cost of Supervision and Superintendent of Construction. Provide a Construction Phase organizational chart identifying Design-Builder Construction Supervision organization. Indicate those individuals who will be full or part-time on the project and where they will be located (i.e. on-site, office)

7. Provide a narrative description of the Design-Builder's understanding of the design concept for this facility. If the Design-Builder chooses to modify the proposed site layout included with the RFP, a drawing shall be provided to identify the proposed alternate layout. Additionally, provide specifics of any alternative design concepts, which may be proposed by the Design-Builder. The Design-Builder is encouraged to submit alternative design concepts, however, a proposal based on the defined design concept is mandatory. Should alternative proposals be submitted, preliminary sketches of the proposed facilities shall be included along with relative design and construction cost estimates comparing the alternative designs with that defined in this document.

8. Prepare a construction cost estimate of the Work, which shall be broken down by major work item, organized by Construction Specification Institute (CSI) division and major process components. This estimate will be used by the Owner to evaluate Design-Builder's understanding of the project, evaluate budget and rate impacts.

9. Prepare a Cash Flow schedule estimate. The cash flow schedule shall show the anticipated amounts of money by months, which will be required to reimburse the Design-Builder for work performed during each month of the contract time. The sum of all the monthly cash flow requirements shall equal the total contract price. The monthly cash flow requirements shall be associated with the construction schedule. The cash flow schedule will be used by Owner for budget purposes.

10. The anticipated number and depth of all soil borings, if any, required after award of contract.

11. Specifics of any exceptions, which are taken to items requested in this document. If no exceptions are taken, it is not necessary to reiterate the information in the Scope of Services Required.

12. A listing of drawings and specifications required for this project, with titles for each drawing.

13. A listing of all Federal, State, and local permits required for design, construction, and operation of the proposed facility. Identify anticipated review time for each permit and any special requirement that may delay the process.

14. A project team organizational chart headed up by the proposed project manager and including all other engineering personnel from all disciplines who are expected to be directly associated with this project and construction supervision personnel.

15. Resumes and a work experience history of each individual identified in the project team organizational chart. Identify those individuals with Design Build Institute of America (DBIA) Designated Design-Build Professional™ Certifications (and/or Associate Certifications). The resumes of those individuals to be associated with the instrumentation and controls design must demonstrate their capabilities in those areas identified in the Scope of Services required for design.

16. Specific identification of any design sub-consultants that will be utilized for this project, exclusive of soil boring and survey work. If sub-consultants will be utilized, the resumes of the specific individuals will be required as well as a work experience history of their firms, including three (3) references with specific contacts and phone numbers.

17. A preliminary schedule for design, permitting, construction, testing, startup, and commissioning of the project from date of award in Gantt chart form. If the time of completion desired by Owner is not acceptable, it shall be explicitly stated in the proposal. The schedule shall identify long lead time equipment and critical path to completion.

18. Identify a list of major and critical shutdowns anticipated to complete the project.

19. Concurrence that Design-Builder has read the Proposed Design-Builder Contract Documents included in the Attachments and are prepared to enter into this Agreement should Design-Builder's proposal be accepted by Owner.

20. Specific information describing how Design-Builder's firm plans to establish electronic communications with **Indiana-American Water** and **American Water – Corporate Engineering** if these capabilities are not already in place.

21. Evidence of Proposer's qualifications to do business in the State where the Project is located (See RFP Instructions 12.01).

III. SCOPE OF DESIGN SERVICES

A. Design Professional Services- Preliminary and Final Design

Design Professional Services shall include the work described in General Conditions 7.01 as amended by the Supplementary Conditions and work described in this Scope of Design Services including all listed Attachments.

Review of the design will be performed by American Water engineering personnel. Any changes in the scope of services during the design phase must be addressed by the Design-Builder before the work is performed. Changes will be made in accordance with Articles 3 and 11 of the General Conditions.

1. Preparation of a brief critique of the design concepts to determine what modifications to the concepts may result in a more cost-effective project, simplified construction, and/or improved operating procedures. This document shall be submitted prior to the initial design meeting.

2. Attendance at periodic meetings with the Owner at their office or the treatment plant site located in **Winchester, Indiana**. At least ten (10) working days shall be allotted in the schedule for review of information by Owner prior to any meeting. It is expected that several one-day meetings (unless otherwise noted) will be required during the design phase including:

    1. An initial conference (this will include review of the design critique and alternative concepts and be coupled with a one day partnering meeting as described below and in Supplementary Conditions SC-2.05 Initial Conference),
    2. Two meetings to review the instrumentation requirements (these will be coupled with the 30% and 60% design review meetings),
    3. Meetings to review the progressive completion at **(15%, 30%, 60%, 90%, and 100%)** of design drawings and specifications and to prepare for permit submittals. The draft Design Memorandum will be submitted for review prior to the **15%** meeting. The final Design Memorandum and preliminary drawings will be reviewed at the 30% meeting.

    The Design-Builder is responsible for preparing notes summarizing the discussions and the conclusions from the meetings and distributing the notes within 7 days following the meeting.

    The preliminary design phase will be considered complete at the 60% completion of design and upon Owner's approval of the construction cost estimate.

3. Provide all field surveys and topographic and utility mapping work as necessary to adequately complete the design, obtain easements, file permit applications and provide reference points for construction layouts. As a minimum, property lines, topographic information and location of existing structures are to be included.

4. All geotechnical investigations including soil borings, rock cores, and auger probing as necessary to adequately complete the design and estimate and plan construction earthwork.

5. All environmental activities as necessary to adequately complete the design and file permit applications.

6. Total interaction with all utility companies to design and specify proper service for the proposed improvements and to coordinate the relocation of existing utilities as required. The Design-Builder shall also determine if any additional capital or usage fees will be imposed by any specific utility.

7. Determine which Local, State, and Federal permits are required for the facility, prepare the necessary applications, and provide technical input as required in securing these permits. The Design-Builder shall also provide Owner with information regarding the approximate length of review time for each permit, and any special requirements that could delay this process (e.g., public hearings). When required by the permitting agency, the permit applications will be formally submitted by Owner.

8. Preparation of a preliminary budget construction cost estimate broken down by major work item, and a detailed construction cost estimate breakdown: (labor, materials, equipment, subcontract, temporary construction etc.) organized by Construction Specifications Institute (CSI) division and major process components. The preliminary estimate is to be submitted with the Design Memorandum. The detailed construction estimate is to be submitted in accordance with the Supplementary Conditions SC-7.01 Design Professional Services.

9. Preparation and maintenance of a Design Memorandum. The Design Memorandum is a summary of design criteria and associated data presented in outline format along with other pertinent project information. The primary intent of the memorandum is to allow Owner or Owner's Affiliate to review and comment on the design before the Design-Builder proceeds with detailed design and drafting. The memorandum shall be updated throughout the design and submitted to the Owner with each set of updated drawings. A summary of the information to be included in the memorandum is outlined in the Attachments. After completion of the draft Design Memorandum a meeting (15% completion) will be held with all parties. The purpose of the meeting will be to review the Design-Builder's Design Memorandum to determine and evaluate alternative concepts to reduce capital and operating costs and/or to improve operations. The Design Memorandum will be modified with the results of this evaluation by the Design-Builder.

10. Preparation of a narrative description of the operation of the proposed facilities to be used by plant operations personnel to familiarize themselves with the operation, capabilities, and limitations of the proposed improvements. The narrative shall be an extension of the process sections from the Design Memorandum, but in text format. It shall explain the intent and function of each unit process in addition to the system as a whole, and it shall include the detailed written control strategies (functional descriptions), which were prepared for the Design Memorandum submission. Preparation of the narrative shall not begin until the Design Memorandum is finalized and accepted. The narrative shall be submitted as a separate document for review at the final design review meeting. It shall serve as the foundation of the Operations and Maintenance Manual discussed in the Construction/Operation Phase section of this document.

11. Preparation of a complete and coordinated set of design drawings for all engineering disciplines with an adequate level of detail to allow for review/approval by permitting agencies and construction by the Design-Builder. Drawings used for permit applications and bidding require the signature and seal of a licensed professional engineer in the applicable state. The drawing sets require segregation by major discipline: site/civil, architectural, structural, mechanical, electrical, instrumentation, etc. Drawings shall reflect the scope of work for the current project and shall not contain extensive notes and written instructions that are more appropriate for the specifications. Standard detail drawings shall exclude items that are not applicable to the current project.

    a. Design-Builder shall prepare all drawings using the most current version of AutoCAD for Windows. Owner will not accept drawings created in an alternative CAD program, such as MicroStation, and "converted" to AutoCAD format. The Design-Builder shall use only AutoCAD and AutoLISP routines and no vendor-furnished or third party programs. Owner requires standard fonts, shapes, hatch patterns, line types, etc. compatible with the most current version of AutoCad for Windows.

       PLEASE REFER TO AMERICAN WATER DRAWING STANDARDS AND SAMPLES.

    b. Attachment G includes the Owner standards for drawing layers, scales, text and plotting assignments. These standards represent the minimum requirements. The Design-Builder may utilize a more sophisticated set of AutoCAD standards, include with the Design-Builders proposal, only with documented acceptance by Owner.

       It is recommended that the Design-Builder submit an early review (e.g., 15 percent complete) set of .dwg files for this project. The Owner shall review the .dwg files for conformity with the Owner's AutoCAD standards and advise the Design-Builder of any necessary changes. The Owner then shall assume that the Design-Builder completes the remainder of the design in conformity with the Owner's AutoCAD standards. If it is later found that final documents do not conform, the Design-Builder shall revise the final .dwg files at the Design-Builder's cost. The Design-Builder shall have the opportunity to discuss the Owner's AutoCAD standards with Company staff.

    c. Standards developed by the Owner, and applicable to this project, and selected drawings of the existing facilities are provided in the Attachments. The information provided in the record drawings may not represent actual field conditions. The Design-Builder has the responsibility to field verify and record the existing conditions as necessary to complete the design phase.

    d. Specific requirements for the design of instrumentation and controls for water and wastewater treatment processes, water distribution and sewage collection are:

        i. Conduct on-site investigations, interface with process engineer/designers, and review design materials and drawings to determine the type and location of primary sensors, control devices, panels and related instruments, and control equipment. The locations and mounting details for these devices shall be included on the drawings.

ii. Prepare loop drawings in accordance with ISA Standard S5.4 and P&IDs in accordance with ISA Standard S5.1.

iii. Prepare ladder diagrams to show the hard-wired logic in panels and software logic in PLCs. Drawings shall be prepared to show the general configuration of all new panels, consoles, and the wiring between interconnected hardware components.

iv. Prepare conduit and wiring drawings showing conduit and signal wire routing using scaled drawings of all facilities. Where appropriate, the conduit and wiring drawings shall be integrated into the electrical drawings.

v. Prepare an input/output point list from the P&IDs.

vi. Prepare instrument specification sheets in accordance with ISA Standard S20.

12. Prepare technical specifications, Divisions 2 through 49, as applicable, in 2004 or newer CSI Spec-Text format, including a list of required shop drawings, in final electronic form for printing, copying, and binding by the Design-Builder. Specifications shall reflect only the scope of work for the current project. Standard specifications shall be modified to exclude items not applicable to the current project.

    a. Specifications shall be prepared using the most current version of the Microsoft Word for Windows word processor. If Design-Builder standard specifications are in a format other than Microsoft Word, they must first be converted to Microsoft Word format, thoroughly checked to ensure that a complete conversion was accomplished (including all tables, charts, headers, footers, etc.), then edited for this project as appropriate within Microsoft Word. **The text shall be 11-point Arial font.** An electronic file name for each specification section shall include a descriptive name preceding a 6-digit specification section number followed by the Microsoft Word file extension (**e.g., PROJECT 11 50 00.doc)**.

    b. The American Water System Construction Contract Documents prohibit a Design-Builder from submitting substitute or "or equal" materials or equipment when a proprietary product, named manufacturer, or supplier has been specified. Provisions exist for bidders to submit alternatives to these items at bid time only. To ensure competitive pricing is being obtained for material and equipment that is not necessary to be a sole source item, it is recommended that at least three (3) acceptable manufacturers or products be listed in the specifications for each of these items. Specifying less than three (3) manufacturers is acceptable only when approved by the Owner in cases where the products of additional manufacturers are not deemed to be comparable or do not meet the project requirements. If design details have been used on the drawings that are based on one of the listed products, this should be noted in the specifications. If design revisions are necessary to accommodate the other acceptable products, additional details shall be provided for the other products to facilitate complete and accurate bidding. Where an item is to be furnished on a sole source basis, only one (1) acceptable manufacturer or product will be listed in the specifications. If common items are included in multiple specification sections, language is to be included in the specifications that the same manufacturer is to be used for these common products.

c. In general one of the two specification methods above shall be used for all process, mechanical, and electrical equipment and other materials that are unique to the design (e.g., certain piping, valve, structural, mechanical, electrical and architectural products). Specifications for other materials or products that can be written prescriptively, by performance, or by reference to applicable standards, do not need to include specific manufacturers or products unless desired by the Design-Builder or the Owner.

d. The specific items and requirements of the specifications for the electrical control circuits and the instrumentation and controls for water processes or water distribution, where applicable, are listed below. The Design-Builder shall interface closely with the Owner in the development of these items.

   i. Prepare specifications for the digital equipment and field and panel mounted instruments.

   ii. Prepare specifications for the software functions in sufficient detail to allow bidders to size the system and provide a basis for implementation. Include detailed written control strategy descriptions based on the P&IDs, graphic display descriptions, report definitions, historical database definition and related functions. The Design-Builder shall interface with the Owner before defining the displays, reports, and historical database.

   iii. Provide narrative descriptions of all electrical control circuits. These descriptions shall describe in detail the operation of these circuits in the various operating modes (manual, auto, remote, etc.) and shall provide information relating to the purpose of each device (relays, timers, lights, etc.) included in the circuit.

13. Provide electronic copies of design memoranda, drawings, and specifications to be used during the design period for review purposes prior to each meeting. This same distribution of final drawings and specifications along with all final design information shall be made at the completion of design. The information shall include all design notes and calculations, the design memorandum, drawings, and specifications. Electronic information, submitted at the end of (or during) the project, shall be on USB Flash Drive. Provide one set of full-size plans at the completion of final design phase, along with an electronic PDF format set.

14. Performance of a constructability and Value Engineering review by the Design-Builder with participation of Owner. Review each element of construction work with consideration given to feasible methods of construction, constraints to construction (materials, labor, specialty construction, weather, plant operations, other, etc.), design details, time required to complete each element of work, and possible alternatives which would reduce costs.

B. Pre-Construction Services

Pre-Construction Services shall include but not be limited to the following:

1. Make arrangements, schedule, chair and take minutes for all meetings during the design phase portion of the project.

2. Preparation and maintenance of a progress schedule throughout the duration of the design and construction phases is required. The schedule requirements are described in the General Conditions and Section 01 33 00 of the Specifications. The initial schedule for this project must focus on completing work necessary to file the necessary permit applications and procurement of necessary equipment and materials to meet the Contract Times.

3. Preparation and agreement of the Target Cost of Construction. The Target Cost is to be mutually agreed between the Owner and Design-Builder on an open book basis (with costs established upon the principles of Cost of Work under paragraphs 12.01 to 12.03 of the General Conditions) during the course of the design development. Upon reaching stated percentage completion of the design, including reconciliation of Owner's comments, the Design-Builder shall prepare and present the Target Cost for Owner's agreement.

    a. Target Cost Development:

       General: As a minimum, the Target Cost shall be prepared and presented in general conformance with the Sixteen (16) or Forty-Nine (49) Division Format of the Construction Specifications Institute (CSI) and/or by Area of Work as defined in the Estimated Cost of Construction template form; the final content and format is to be agreed with the Owner. Full description of the Target Cost arrangement is provided in the Supplementary Conditions and the Agreement.

       A minimum of three (3) quotations or proposal from Owner-approved suppliers, vendors, manufacturers, subcontractors, etc. shall be obtained to set the target cost for all equipment, materials, products, and subcontracted labor and services. Receiving less than three (3) quotations or proposals is acceptable when approved by the Owner or in cases where the products or services of additional or other suppliers, vendors, manufacturers, subcontractors, etc. are not deemed to be comparable or do not meet the project requirements. The lowest and/or most favorable responsive quotation or proposal shall be used to set the cost unless approved by the Owner. The cost for self performed work shall be agreed upon pursuant to SC 12.01. An amount for the Design-Builder's risk/contingency may be included as set forth in the Agreement.

    b. The Design-Builder shall submit the Target Cost to Owner and include a cover letter detailing the basis of the Target Cost, CSI and/or Work Area estimates and all supporting documentation that shall be clearly listed, labeled and itemized.

       Target Cost shall be developed as follows:

       i. Preliminary Target Cost shall be developed at the 30% design completion stage. Quotations and proposals shall be based on and reference the 30% design documents and shall be specific to model, size, material, etc. as applicable. "Budgetary" quotations or proposals may be used to develop costs if the design of that item or discipline has not progressed to the point where more specific quotations or proposal can be furnished.

ii. The Target Cost shall be developed upon completion of the 60% design, including incorporation of Owner's comments. Quotations and proposals shall be based on and reference the 60% design documents and shall be specific to model, size, material, etc. as applicable. The quotations and proposals shall be accurate, complete and remain valid for a minimum of 60 days and be ready for execution by the Design-Builder. "Budgetary" quotations or proposals may not be used to develop the Target Cost unless approved by the Owner. In such instances, the budgetary quotation may be used as a "place-holder" to assist in setting the Target Cost at the discretion of the Owner and will be subject to revision once appropriate quotations or proposal can be obtained.

4. Preparation of a detailed construction sequence and logistics plan describing how the proposed facilities will be constructed and placed in-service while keeping existing facilities in-service as necessary. The plan shall consider seasonal limitations and shall specifically define all partial or full outages (including electrical) with estimated time for each outage as well as details on proposed time of day (i.e. regular working hours or evening/weekend hours), proposed time of year (i.e. during peak or off-peak demand seasons) and any special precautions, actions, temporary facilities, etc, that shall be required to safely complete each outage. The plan must be reviewed and approved by Owner to ensure that operations of any existing facilities will be properly maintained during construction. The plans are to show, at a minimum, the scheduled completion of construction on a calendar quarterly basis. Cost associated with keeping the plant on-line as a result of this plan shall be included in the Cost of Construction. As a consequence, the detailed construction sequence and logistics plan must be completed as part of the 60% design.

5. Provide constructability reviews at the **15%, 30%, 60%, and 90%** of the design development phase. Review each element of construction work with consideration given to feasible methods of construction, constraints to construction (materials, labor, specialty construction, weather, plant operations, etc.) design details, time required to complete each element of work, and possible alternatives which would reduce costs, and maintain the level of quality expected by the Owner.

   The reviews shall include the appropriate designers, the Owner, and subcontractors if required as participants.

   Include providing the net cost and or time savings associated with each suggested change or modification to the design. Maintain a log tracking each suggestion with the results pertaining to cost and or time savings and acceptance/partial acceptance/rejection.

6. Performance of a bidability review with participation of Owner. Review the breakdown of the work into bid packages that will yield the most cost effective construction program with consideration given to the availability of qualified subcontractors and vendors. Develop interest in the project from prequalified subcontractors and vendors.

7. Maintain electronic communication capabilities throughout the design and construction phases of the project.

   The Web browser that you utilize must be capable of handling file attachments, and your e-mail must be MIME (Multipurpose Internet Mail Extensions) compatible in order to send file attachments without the need to encode/decode. Additionally, all electronic data files (word processing documents, spreadsheets, etc.) created by American Water will be prepared using **Microsoft Office**, and the Design-Builder must have the ability to read these file formats. It is preferred, but not mandatory, that the Design-Builder also create all data files that may need to be shared via the Web or e-mail in Microsoft Office format.

8. Identify the permits that are required for construction phase of the project, and prepare the necessary applications, and secure these permits. Provide the Owner with information regarding the approximate length of review time for each permit, and any special requirements that could delay this process. Provide all information required for the permit application and submit the fees required. The Owner will reimburse the Design-Builder for all permit application and permit fees at their direct cost. Include but not limited to the Building Permit, electrical, etc. including wastewater discharge if required.

C. Design Professional Services – Construction/Operation Phase

Design Professional Services-Construction/Operation Phase must include the following services:

1. Attendance at construction progress meetings, resolution of construction problems related to the design, and review and interpretation of the design.

2. Shop drawing review and approvals including review and approval of resubmittals, and maintenance of a shop drawing log indicating dates received, returned, and status.

3. Preparation of supplementary detailed working drawings, specifications, and written instructions or meetings as necessary throughout the construction period to interpret the contract plans and documents and to resolve changes brought about by actual field conditions encountered.

4. Provide the services of the I&C Staff Engineer or Subconsultant to witness the factory acceptance test (FAT) of the assembled I&C system prior to the system's shipment from the factory to the job site. The first goal is to ensure that the system has been assembled properly and is in proper working order. This will include testing of each individual I/O point and should be witnessed by the I&C Staff Engineer. The second goal is to simulate and test the control logic, and this portion of the FAT should be attended by the Design Project Manager/Engineer or someone familiar with the details of the process design and operation of the facility. Additionally, provide the services of the I&C Staff Engineer for site visits to review and inspect the instrumentation and wiring of field mounted instruments, resolution of problems, initial calibration and testing, and system start-up.

5. Provide the services of the Design Project Manager/Engineer who will participate in and observe each process and/or phase of initial operation of the project (start-up) and review

operation and performance tests required by the contract specifications. At least five (5) days should be allotted for on-site start-up services and resolution of initial operating problems. Engineers from all of the engineering disciplines shall be made available to resolve start-up issues as required, and also to resolve problems which may arise during the construction period allow ten (10) site visits for these services.

6. Preparation and submittal of electronic record drawings within two (2) months after start-up. The record .dwg files shall conform to the Company's AutoCAD standards. If it is found that final documents do not conform to the Company's AutoCAD standards, the Consultant shall revise the final .dwg files at the Consultant's cost. Data, information, sketches and working drawings, to be incorporated with the record drawings, shall be provided by the Design-Builder. The record drawings shall include all above and below grade changes from the original design drawings for all engineering disciplines. Changes made to reflect the as-installed conditions shall be made in the same level of detail and to the same degree of drafting quality as the original design drawings. The I&C engineer must review record drawings prepared by the wiring contractors to verify their accuracy prior to substantial completion. Reference Division 1 of the specifications for additional information.

7. Provide **four (4)** copies of an operation and maintenance manual containing operating, maintenance, and repair information from manufacturer's submittals. The O&M manual shall also contain the final narrative description of the operation of the proposed facility, and a complete description of start-up and shut-down procedures. The O&M manual shall be bound in 3-ring binders and indexed with tabs according to major process designations in the order of the treatment process. Four (4) complete electronic copies of the final O&M manual shall also be provided on /USB Flash Drive. An initial draft of the O&M manual, without manufacturer's data, shall be submitted for review at approximately the 50% point of construction completion. The complete O&M manual containing all manufacturer's data shall be submitted at the 95% point of construction completion but no later than one (1) month before scheduled start-up.

8. Provide the services of the Design Project Manager/Engineer for a one (1) day inspection of the facilities approximately twelve (12) months after they are placed into operation. The Design Project Manager/Engineer shall provide a written report summarizing warranty repairs that are necessary, as well as any operational modifications that are recommended to optimize performance.

INDIANA AMERICAN WATER COMPANY
RICHMOND DISTRICT

WINCHESTER WATER TREATMENT FACILITY

DESIGN CONCEPT

INDIANA-AMERICAN WATER COMPANY
153 N Emerson Avenue
Greenwood, Indiana 46143
February 2023

ATTACHMENT A
PROJECT BACKGROUND

A. INTRODUCTION

Indiana-American Water (INAW) provides water service to approximately 2,000 customers in its Winchester service area (Richmond District) in Randolph County, Indiana. The service area includes the Town of Winchester. The total demand averaged 0.56 million gallons per day (MGD) in 2022. The historic maximum day usage of 0.97 MGD occurred in October 2019.

The District obtains its water supply from four groundwater wells at the existing water treatment facility which is located on the west side of the Town of Winchester.

The total production capacity of the four wells is 2.0 MGD based on operating records. The firm capacity of these wells is 1.4 MGD with the largest well out of service. The groundwater is treated by aeration, chemical oxidation, and filtration. Sodium hypochlorite is used for chemical oxidation and disinfection, hydrofluorosilicic acid is used for dental health, and blended ortho/polyphosphate is used for corrosion control.

The Winchester system produces high quality water that meets or surpasses all applicable US Environmental Protection Agency (EPA) and Indiana Department of Environmental Management (IDEM) standards.

To satisfy the treatment requirements, filtration, chemical treatment and pumping are required. INAW owns property for the proposed Water Treatment Facility (WTF) at 870 W State Road 32, Winchester, Indiana. The WTF shall provide a firm treatment capacity of 1.25 MGD.

B. EXISTING SYSTEM CONFIGURATION

The existing facility has remote operation and monitoring capability through a Supervisory Control and Data Acquisition (SCADA) system. The SCADA system consists of an Allen Bradley remote telemetry unit (RTU) linked via radio telemetry to a human-machine interface (HMI) computer at the treatment facility and at the District office located in Richmond.

Company personnel perform daily laboratory analyses on grab samples to assess raw and finished water iron and manganese, pH, phosphate, as well as finished water chlorine residuals and fluoride concentrations. Weekly samples are performed for alkalinity and hardness. The analyses are performed at the laboratory located at the Winchester Water Treatment Facility.

C. WATER QUALITY

Tables 1.0 provides a summary of selected raw water quality data for the WTF supply for the period 2020 to 2022. The WTF supply is characterized by moderate pH levels, elevated levels of iron, manganese, alkalinity, and hardness.

Table 1.0

Summary of Raw Water Quality – Winchester Station

Water Quality Parameter [1]	Average	Maximum	Minimum
pH	7.3	7.8	7.1
Alkalinity (mg/L as $CaCO_3$)	325	410	300
Hardness (mg/L as $CaCO_3$)	400	450	350
Manganese (mg/L)	0.13	0.23	0.08
Iron (mg/L)	0.87	2.90	0.37

1. Raw quality data from 2020 to 2022

Additional water quality sampling and analysis may be required for design considerations of the proposed water treatment plant processes. The DESIGN/BUILDER shall be responsible for all additional water quality sampling and analysis. This may be completed during the Design Memorandum preparation phase after issuance of the Notice To Proceed.

D. TREATMENT FACILITY SITE

The proposed WTF will be located at 870 W State Road 32 on approximately 4.25 acres of property where the existing water treatment facility is also located.

The following utilities are available for the proposed site:

- Electric – Indiana Michigan Power
- Gas – Ohio Valley Gas
- Telephone – [no current service with INAW]
- Digital Data (T-1) Service – Comcast
- Sanitary Sewer – Winchester Municipal Sanitation Utility

E. EXISTING TREATMENT FACILITY

The existing water treatment facility has a firm capacity of 0.72 MGD and a rated capacity of 1.44 MGD, and employs aeration, chemical oxidation, and filtration for the removal of iron. The existing facility must remain in-service throughout construction of the proposed facility. The water treatment facility site plan drawing is included in Appendix D.

The Designer is welcome to consider alternatives that utilize the footprint of the existing chemical storage/office/lab building and backwash holding tank. Should the Designer identify that these facilities must be removed to provide space for the new treatment facility building, temporary chemical storage and feed facilities for chlorine, phosphate, and fluoride will need to be provided, and the backwash holding tank will need to be relocated. A trailer for laboratory area, office, operator control room and restroom facilities will also need to be provided. The current chemical utilization is included with the Monthly Reports of Operation in Appendix E.

The Proposal shall include a construction sequencing plan and site plan for maintaining continued operation of the existing water treatment facility. It is recommended that temporary chemical storage buildings be situated to the north of the Aeralator Unit, where direct connections to existing chemical feed lines can be made. (Refer to Sheet 4 of the Orthophosphate Feed System plans provided in Appendix D.) The site arrangement plan should also identify any relocations of the existing raw water piping necessary to accommodate the proposed construction.

Please note that the existing raw water piping is cast iron with an approximate installation date of 1959, and the onsite sewer lateral conveying residuals to the Sanitary Sewer is approximately 1 ft below grade.

F. DISTRIBUTION SYSTEM

The proposed WTF will connect to the existing distribution system at the existing water treatment facility property.

ATTACHMENT B
DESIGN SCOPE

A. INTRODUCTION

The design and construction of the proposed Winchester WTF shall be based on the background information outlined above and the following design information. In general, the scope of work shall include the following facilities:

- Raw Water Piping
- Aeration/Detention Tanks
- Horizontal Pressure Filters
- Chemical Storage and Feed Systems
    - Sodium Hypochlorite
    - Hydrofluorosilicic Acid
    - Phosphate for Corrosion Control
    - Truck Unloading Containment
- Treatment Building to House the Chemicals, Electrical Gear, and Maintenance/Parts Storage Room
- Space for Future Treatment Processes for Perfluorinated Compounds
- Finished Water Storage
- High Service Pumping Station
- Backwash Residuals/Recycle Facilities
- Residuals Management
- Office and Administrative Space
- Parking Space for Employees and Visitors
- Electrical Power Distribution Equipment
- Instrumentation and Control (I&C) Systems
- Associated Site Work

A listing of acceptable equipment manufacturers is included in Appendix A. Appendix C includes American Water's Engineering Standard for Liquid Chemical Feed Systems (T-2).

B. PERFORMANCE REQUIREMENTS

The proposed WTF shall achieve a high level of finished water quality that complies with all applicable state and federal water quality and treatment requirements. In addition to these requirements, the plant should also achieve compliance with the following:

1. Finished water free chlorine residual of between 0.8 mg/L and 1.5 mg/L suitable for the distribution system.

2. Production of a stable, non-corrosive water. Finished water must allow INAW to comply with the Lead and Copper Rule, and minimize corrosion, precipitation, and deposition within the distribution system.

3. Finished water must comply with the Stage 2 Disinfectants and Disinfection

Byproducts Rule.

4. Total finished water iron and manganese levels that are below the respective secondary maximum contaminant levels, as well as the treatment goals of ≤0.10 mg/l for iron and ≤0.02 mg/l for manganese.

5. Fully automated treatment facility capable of unattended operation.

6. Exterior architectural design that is aesthetically pleasing.

7. Minimization of total project lifecycle costs, factoring in both capital and operating costs.

C. GENERAL

Process Summary

1. It is anticipated that treatment will include aeration, detention and pressure filtration with the addition of chemicals as outlined below. Raw water will be pumped to aerators to oxidize iron, as well as strip any supersaturated gases, from the well water supply. To ensure the oxidation process is complete prior to filtration, the water will be retained in detention tanks directly below the aerators. Following aeration, the water will flow by gravity to the pressure filters. Chlorine will be added to the detention tank effluent to further promote manganese oxidation and removal with the manganese dioxide coated filter media. Effluent from the filters will then flow by gravity to a treated water storage tank prior to the distributive pumps. The distributive pumps will pump finished water from the treated water storage tank to the distribution system.

2. Dedicated pumps will provide wash water from the finished water storage tank for filter backwashing. Spent backwash water will be sent to an equalization basin and discharged to sanitary sewer.

3. Space shall be allocated in the Treatment Building for the following Chemical Feed Systems: sodium hypochlorite for disinfection, hydrofluorosilicic acid for dental health requirements, and phosphoric acid for corrosion protection in the distribution system and customer plumbing.

4. The Treatment Building will be constructed to house the filter face piping, chemical systems, distributive pumps, and ancillary electrical and I&C systems. The building will also include a small laboratory and a utility/storage room.

5. The Treatment Building will include an electrical room and new electric service. The remote telemetry unit and touch-screen interface control panel will be provided in the building.

6. The future treatment of perfluorinated compounds shall be considered with the site layout and proposed improvements. Plans submitted with the Proposal shall include conceptual building footprint for such treatment.

7. The Design/Builder should evaluate alternatives for providing the most cost-effective solution for the proposed WTF.

General Design Criteria

1. *Plant Staffing*: The WTF shall be designed for fully automatic, unattended operation. A supervisory/maintenance staff will make daily visits Monday through Friday. The plant will be unattended on Saturday and Sunday. The plant shall operate 24 hours per day and the control system shall be capable of remote access via INAW's wide area network.

2. *Input/Output Lists*: The Design/Builder is required to develop a complete I/O list based on the final design details.

3. *Acceptable Equipment Manufacturers*: Those provided in Appendix A of the Design Concept and Attachment B to the Recommended Electrical Design Criteria and Standards are manufacturers that are acceptable to INAW. This does not preclude the Design/Builder from suggesting other manufacturers of comparable or higher quality. It is also the Design/Builder's responsibility to recommend other manufacturers to facilitate competition for the specific application.

4. *Critical Equipment Procurement:* Design/Builder shall identify critical equipment with long lead times in the Proposal and will complete sufficient level of design by the 30% Design Phase to enable release for early procurement.

Common Equipment and Materials

1. *General*: Information regarding specific equipment or materials that are common to many areas of the facility is provided in this section.

2. *Process Piping*: Cement-lined ductile iron pipe unless otherwise noted. Appropriate pressure class pipe shall be provided for all above and below ground piping at the plant. Thickness class CL54 as a minimum shall be provided for all pressurized yard piping on the treatment plant site.

3. *Process Piping Joints*: All onsite below ground pressure-rated process piping shall have properly restrained joints. All onsite above ground (plant) pressure-rated process piping shall have flanged joints. Grooved or Victaulic joints are permissible for above ground piping where substantial cost savings may be achieved. Friction type restrained joints (e.g. Megalugs) are only permitted where required to accommodate buried valves or fittings. Set-screw flanges and retainer glands are not acceptable.

4. *Process Valves*: AWWA butterfly valves. Rubber seats shall be applied to the body. Rubber seats applied to the disc are not acceptable. Use plug valves for waste lines.

5. *Operators for Automatic Process Valves*: Electric operators, rated 208V.

6. *Yard Piping*: Piping to backwash residuals management system and other non-

pressure pipe may be PVC or ductile iron.

7. *Motors*: All small (fractional) and medium (integral) squirrel-cage induction motors shall be premium efficiency, “NEMA Premium” rated, and shall be designed, constructed, and tested in accordance with NEMA MG-1 and IEEE 112, Test Method B. All motors, ½ horsepower and larger, shall be rated at 480 volts, three-phase. All motors less than ½ horsepower will be rated 120 volts, single phase.

8. *In-plant Water Supply Piping*: Copper inside filter room, and Schedule 80 PVC at all other locations.

9. *In-plant Plant Water Supply Valves*: Bronze ball valves unless otherwise noted.

10. *Backflow Preventers*: Reduced pressure zone type required on all individual connections to in-plant potable water, and also for the plant water supply. Two reduced pressure zone type backflow preventers with strainers are required to be installed in parallel at all connection points.

11. *Metering*: Magnetic meters with electronic, smart-type type transmitters are preferred. Insert type and strap on type flow meters of any type are not acceptable. The manufacturer’s recommendations for minimum straight runs of pipe upstream and downstream of the meter will be strictly adhered to. Locate meters in above ground accessible building locations wherever possible. Below ground meter vaults, if required, shall provide adequate space for meter maintenance and adequate ventilation for confined space requirements.

12. *Level Monitoring*: Ultrasonic level probes for liquid level monitoring.

13. *Sampling Locations*: Specifics defined in each section below. On-line analytical instruments should be located as close as possible to the sample point. Manual taps shall be provided at all sample points to allow for a grab sample. Velocities in sample lines where pumping is required should be approximately 5 ft/sec. Provide insertion-type paddle-wheel flow sensors on the discharge of all sample pumps. Use PVC pipe for all sample lines.

14. *Painting*: All exposed metal piping to be color coded per Ten State Standard requirements. All mechanical equipment and other potentially corrosive surfaces shall be coated. PVC or other flexible piping shall either be purchased in the appropriate color (if available) or wrapped or striped with appropriate colored tape. Any and all PVC piping exposed to sunlight shall be painted to protect from UV degradation. Stainless steel is not acceptable in chlorinous atmospheres.

D. SYSTEM DEMANDS / PLANT CAPACITY

General Design Criteria

1. *Maximum Day*: 1.0 MGD (Firm Plant Capacity)

2. *Average Day*: 0.55 MGD

3. *Minimum Day*: 0.20 MGD

4. Design Flowrate: 1.5 MGD

5. *Hydraulic Capacity*: 1.5 MGD for all piping and facilities based on all present and future pressure filters simultaneously operating at design capacity.

6. *Operating Capability*: All components of the plant shall be fully capable of operating over the specified range of flows per manufacturer's recommendations.

7. *Redundancy*: Provide for all major process mechanical equipment such that the plant could continue to operate at firm capacity if a single largest process unit were out of service.

8. *Optimum Efficiency of Mechanical/Electrical Equipment*: Based on average day demand.

9. *Expandability:* The plant shall not be designed for future capacity expansion.

E. WATER TREATMENT FACILITY SITE

General Design Criteria

1. *Roadways*: Concrete paving.

2. *Entrances*: Automated sliding gate with proximity card access. Provide space for one semi-trailer to park in driveway before automated sliding gate.

3. *Parking*: Provide parking area for minimum of seven (7) passenger vehicles and four (4) utility trucks.

4. *Landscaping*: Provide landscaping plan for approval by INAW and conforming to local ordinances and standards. Landscaping shall be minimal to provide aesthetically pleasing view from frontage street.

5. *Signage*: Indiana American Water name and logo at entrance. Signage shall comply with local ordinances.

6. *Exterior Lighting*: Provide where required for security and safety purposes.

7. *Security*: See Section O – Building Requirements for additional design criteria related to site and plant security.

F. SOURCE OF SUPPLY

General Design Criteria

1. *Summary*: The DESIGN/BUILDER shall relocate Well #4R to accommodate the new treatment building and facilities. Wells #4R shall be relocated according to IDEM wellsite requirements (including setbacks). The new Well #4R shall include the following design criteria.

   a. *Type of Pumping Units*: Vertical Turbine Well pumps.

   b. *Capacity of Pumping Units*: 500 gpm

   c. *Drivers for Pumping Units*: Full voltage motor starter.

   d. *Pumping Unit Appurtenances*: Pump discharge flow meters, air and vacuum valves, and a pressure gauge on the discharge of each individual pump. Butterfly isolation valves on the discharge of each pump.

   e. *Motor Voltage Monitoring*: Motors for all major equipment shall have microprocessor based motor voltage monitors. The monitors shall protect against phase loss, phase reversal, voltage unbalance, and under voltage on any one or more phases. The monitors shall reactivate after the power line conditions return to an acceptable level. Trip and reset delays shall prevent nuisance tripping due to rapidly fluctuating power line conditions.

   f. *Well Head Enclosure*: Well heads shall be elevated to be above the 500 yr flood elevation. Well head and enclosure shall be designed to allow access for well pump removal and well maintenance activities.

<u>Raw Water Transmission Mains</u>

1. *General*: A raw water transmission main shall be installed to convey existing on-site and off-site source of supply to the new treatment facility. Provisions shall be made to extend the raw water transmission main to the southwest corner of the water treatment facility property for development of future off-site source of supply.

2. *Pipeline Size:* The transmission main shall have a carrying capacity of not less than 1.5 MGD at a maximum velocity of 6 ft/s.

3. *Material of Construction:* The pipeline shall be constructed of cement-lined ductile iron. Buried steel lugs, rods, brackets, and flanged joints are not permitted.

4. *Thrust Restraint:* Provide all plugs, caps, tees, valves and bends with mechanical restrained joint pipe; proprietary to the pipe manufacturer. Concrete thrust blocks shall be used at connections to existing piping. Thrust blocks shall be appropriately positioned so that the resultant thrust force is contained while keeping the pipe and fitting joints accessible for repair. Restrained joints shall be used within pumping station and treatment plant battery limits.

5. *Corrosion Prevention:* Wrap the pipeline with polyethylene bagging installed in accordance with the pipe manufacturer's instructions. As part of the design effort, DESIGN/BUILDER shall sample soils along the selected route and

analyze the potential for corrosion to ductile iron pipe in accordance with AWWA C105.

Chemical Application

1. *Location*: Provide chemical application prior to filtration.
2. *Water Quality Sampling*: True raw water sample taps at each wellhead.
3. *Online Monitoring*: Online sample points, which will be directed to a sample sink, shall be provided in the following locations:
   g. upstream of the filters; from the common raw water main

G. AERATION

General

1. *General:* Provide aeration for iron oxidation.

Design Criteria

1. *Type of Aerator:* Forced draft, tray type. Wood slats in the aerators are not acceptable.
2. *Minimum No. of Aerator Units:* One
3. *Location/Orientation:* Mount aerator(s) on top of a suitable sized detention tank. Detention tank shall have sufficient side water depth to allow gravity flow through the pressure filters at the maximum water level in the finished water reservoir.
4. *No. of Blowers:* 2 per aerator
5. *Drivers for Blower Unit:* Constant speed electric motors.
6. *Detention Tank Number:* One (1)
7. *Detention Tank Sizing:* 30 minutes at 1.5 MGD.
8. *Detention Tank Material:* Steel or concrete.
9. *Aeration System By-Pass:* Provide a by-pass system to allow the plant to remain in-service with chemical oxidation while the aerator and/or detention tank are out of service for maintenance/repairs.

Chemical Application

1. *Location*: An application point for sodium hypochlorite shall be provided at the top of the detention tank for chemical oxidation.

2. *Water Quality Sampling*: Provide a common raw water sample tap immediately upstream of the aerator.

3. *Online Monitoring*: Online sample points, which will be directed to a sample sink, shall be provided in the following locations:

   a. Upstream of the aerator

   b. Downstream of the sodium hypochlorite feed point.

H. FILTRATION

General Design Criteria

1. *Type of Filters*: Two-cell, horizontal pressure filters.

2. *No. of Units*: Three (3) minimum.

3. *Capacity of Each Unit*: Design/Builder shall determine the capacity of each unit.

4. *Maximum Loading Rate of Units*: In accordance with Ten States Standards, 3.0-4.0 gpm/sf with one filter cell out of service.

5. *Vessel Diameter*: 10 feet, minimum.

6. *Vessel Materials of Construction*: SA516 Grade 70 carbon steel with suitable NSF-certified epoxy lining system

7. *Pressure Rating*: 100 psi minimum. The Design/Builder shall evaluate well pump shut-off head capacities and distribution system operating pressures to determine final pressure rating requirements. Suitable pressure/air relief devices shall also be provided.

8. *Type of Underdrain*: Concrete-encased header/lateral system with nozzles. Flat plate underdrain system with stainless steel baffles will be considered as an alternate.

9. *Media*:

   a. Manganese oxide coated sand – 18 inches (to be confirmed during design phase)

   b. Anthracite – 18 inches (to be confirmed during design phase)

   Effective media size to be selected in accordance with AWWA standards to minimize head loss and ensure adequate bed expansion during filter backwashing. Pilot testing of the filter media shall be performed by the Design-Builder to determine type of manganese oxide coated filter media for optimum iron and manganese removal.

10. *Media Removal/Installation*: Provide 24" access manway for each filter section to assist in the change out of media.

11. *Location*: The pressure filters should be located outdoors, with the dished head containing the connection nozzles, valves, and vessel face-piping inside the proposed Treatment Building.

12. *Method of Operation*: Rate of flow control to match combined well production rate.

13. *Influent Metering*: Magnetic meters with electronic, smart-type type transmitters with adequate upstream and downstream straight runs of pipe.

14. *Loss of Head*: Loss of head measurement shall be provided by electronic, smart-type type differential pressure transmitters.

15. *Backwash Control Schedule*:
    - Time
    - Differential pressure (head loss)
    - Effluent turbidity
    - Filter Run Hours

16. *Water Quality Sampling*: Individual and common filter effluent sample taps.

17. *On-Line Monitoring*: One common filter effluent turbidimeter.

18. *Humidity Control in Filter Room/Gallery*: Provide dehumidification in the filter room.

<u>Backwash Capabilities</u>

1. *Method*: Means to operate in filter-to-waste mode shall also be provided.

2. *Means of Supplying Wash Water*: Supply is from wash water supply pumps drawing water from the onsite storage reservoir. The wash water supply pumps shall be co-located with and similar in style as the distributive pumps. Two wash water pumps (one duty and one stand-by) shall be provided.

3. *Capacity of Wash Water Supply System*: Adequate to provide a maximum bed expansion of at least 30% (approximately 17 gpm/ft^2 - verify with filter media supplier).

4. *Method of Backwash Rate Control*: Magnetic meter with electronic, smart-type type transmitters and globe-style rate of flow control valve.

<u>Chemical Application</u>

1. *Location*: Application points shall be provided in the following locations:

    a. On the common piping between the detention tank and the filter influent for sodium hypochlorite.

    b. On the common piping between the filter effluent and the finished water storage tank for sodium hypochlorite and phosphate for corrosion control.

2. *Water Quality Sampling*: Filter effluent prior to chemical feed points.

3. *On-Line Chemical Monitoring*: On-line sample points, which will be directed to analyzers and/or a sample sink, shall be provided in the following locations:

    a. Upstream of the finished water storage tank, downstream of the sodium hypochlorite, phosphoric acid and fluoride feed points.

I. FINISHED WATER STORAGE

General Design Criteria

1. *Summary:* Finished water storage will be provided for plant flow equalization and wash water storage.

2. *Configuration and sizing criteria*: The finished water storage tank shall be an at-grade structure sized to provide approximately 450,000 gallons of storage. Considerations for backwash must be included in clearwell sizing. Design/Builder will be responsible for final sizing of the finished water storage tank.

3. *Materials of Construction:* The tank material of construction shall be welded steel.

4. *Tank Bypass:* Provide a by-pass system to allow the plant to remain in-service while the finished water storage tank is out of service for maintenance/repairs.

Chemical Application

1. *Location*: A application point for sodium hypochlorite shall be provided downstream of the finished water storage tank.

2. *Water Quality Sampling*: Effluent from the finished water storage tank just after the sodium hypochlorite feed point.

3. *On-Line Chemical Monitoring*: On-line sample points, which will be directed to analyzers and/or a sample sink, shall be provided in the following locations:

    a. Downstream of the finished water storage tank.

J. DISTRIBUTIVE PUMPING FACILITIES

General Design Criteria

1. *Type of Pumping Units*: Can-style vertical turbine pumps. Design/Builder shall evaluate different type of pumps suitable for use in the proposed system, including recommendations for impeller materials of construction to ensure long life. However, the proposed design and pricing shall be based on Can-style vertical turbine pumps.

2. *Minimum No. of Pumping Units*: Three (3).

3. *Capacity of Pumping Units*: Provide a minimum firm capacity of 1.25 MGD with one pump out of service. The Design/Builder shall be responsible for determining the actual arrangement, capacity, and head requirements based on the hydraulics of the facility. The Design/Builder shall also consider INAW input during design phase. All pumps shall utilize variable frequency drives for flow adjustments.

    - Pump no. 1: 500 gpm at 125 feet TDH
    - Pump no. 2: 700 gpm at 125 feet TDH
    - Pump no. 3: 2,000 gpm at 140 feet TDH

4. *Drivers for Pumping Units*: Premium efficiency inverter duty electric motors and adjustable frequency drives.

5. *Pumping Unit Appurtenances*: Suction and discharge butterfly isolation valves, check valve, air release valve, and differential pressure transmitters between the suction and discharge of each individual pump as appropriate. A common pressure transmitter shall be provided on the discharge header. Design shall provide access to pump for maintenance and removal or a means of removal for maintenance purposes.

6. *Motor Monitoring Equipment*: Motors controlled by adjustable frequency drives shall be furnished with at least one automatic reset winding temperature switch per phase. Temperature switch contacts shall be normally closed and rated 5 amps at 120 volts ac. The contacts shall be wired in series with the ends leads brought out to the motor terminal box.

7. *Location*: The distributive pumps and backwash pumps shall be located within the Treatment Building. The building shall be configured to permit interior access to distributive pump room from the administrative portion of the building.

8. *Finished Water Pipeline*: Design of on-site and off-site portions of the finished water transmission mains shall be included in the Design/Builder's scope of work. The finished water transmission main will include 16-inch main from the high service pumps to the property line and 340 feet (approximately) of 16-inch main from the property line extending east and under Sugar Creek and connecting to an existing 12-inch main on the north side of SR 32.

9. *Finished Water Metering*: Provide a common magnetic flowmeter, with electronic, smart-type type transmitters.

10. *Surge Control*: Design/Builder shall perform a complete surge analysis of the distribution pumping system. Normal start/stop surge control shall be by means of pump discharge control valves while power outage transients shall be controlled by a surge anticipator valve discharging to the pump suction piping or by other means as indicated in the surge analysis. Separate, independent surge anticipator valves shall be provided for each pressure gradient. INAW will provide all information pertaining to the distribution system piping to the Design/Builder for the analysis.

<u>Finished Water Pipeline</u>

1. *General*: Finished water pipelines main shall be installed to convey the finished water from the high service pumps into the distribution system. The finished water transmission main will include 16-inch main from the high service pumps to the property line and 340 feet (approximately) of 16-inch main from the property line extending east and under Sugar Creek and connecting to an existing 12-inch main on the north side of SR 32.

2. *Permits*: The DESIGN/BUILDER shall obtain all permits necessary to install the finished water pipeline.

3. *Pipeline Size:* 16-inch ductile iron or DIPS high-density polyethylene

4. *Material of Construction:* The pipeline shall be constructed of cement-lined ductile iron. The stream crossing under Sugar Creek may be ductile iron or high-density polyethylene (HDPE).

5. *Thrust Restraint:* Provide all plugs, caps, tees, valves and bends with mechanical restrained joint pipe; proprietary to the pipe manufacturer. Concrete thrust blocks shall be used at connections to existing piping. Thrust blocks shall be appropriately positioned so that the resultant thrust force is contained while keeping the pipe and fitting joints accessible for repair. Restrained joints shall be used within pumping station and treatment plant battery limits.

6. *Corrosion Prevention:* Wrap the pipeline with polyethylene bagging installed in accordance with the pipe manufacturer's instructions. As part of the design effort, DESIGN/BUILDER shall sample soils along the selected route and analyze the potential for corrosion to ductile iron pipe in accordance with AWWA C105.

7. *Easements:* The DESIGN/BUILDER shall be responsible for communication and negotiation with property owner, title research, creation of offer letters, creation of easement documents, and recording of easement documents. INAW shall provide standard Offer Letter and Utility Easement documents. The DESIGN/BUILDER shall modify the standard document for each easement. The DESIGN/BUILDER is responsible for creation of Legal Description and Sketch by Profession Land Surveyor registered in the State of Indiana. INAW will provide initial offer amount and review any counter-offers. The INAW Project Manager will work closely with DESIGN/BUILDER regarding easement acquisition. Payment to property owners for easements will come directly from IAW.

K. CHEMICAL FEED FACILITIES

General Design Criteria

1. *Applicable American Water Engineering Standard*: T-2 (Liquid Chemical Storage, Feed, and Containment). The intent of the standard (i.e. spill containment, overfeed prevention, etc.) must be met for all designs. A copy of this standard is included in Appendix C.

2. *Dosages*: Table 2.0 provides a summary of the chemical dosages for the existing WTF. Dosage requirement shall be confirmed during the design phase by INAW.

3. *Location*: Chemicals will be stored in the proposed treatment building. The chemical feed facilities shall be located as close to the points of application as possible, and totally isolated (separated by walls) from the rest of the treatment plant. Design enclosures to provide fire rated protection if required by code.

4. *Interior Entry:* Entry to individual chemical storage rooms shall be from interior hallways.

5. *Orientation of Chemical Feed Equipment*: All rooms shall be laid out such that the need to step over piping or conduit is eliminated or minimized. All rooms shall also be oriented similarly such that safety devices (eyewashes) are located in a common place (such as near the door) in each room.

6. *Access*: All enclosed rooms with non-bulk storage shall include secure double doors for loading drums or bags into and out of the room. Access into chemical containment areas shall be by stairs with railings (no ladders) up and over the wall or down into a recessed containment area. Consideration for removal and replacement of bulk storage tanks should be provided in the design. For non-bulk storage rooms, hand truck access ramp systems shall be designed with a maximum 1:12 slope if possible. Safe access to equipment mounted to the top of any tanks shall be provided via platforms and ladders.

7. *Operating Range of Equipment*: All chemical feed equipment shall be fully capable of operating over a feed range corresponding to max day/max dosage down to min day/min dosage. If necessary, a second set of pumps shall be provided.

8. *Operation of Equipment*: All chemical feed equipment shall be flow paced. Cascade loop capabilities shall be provided as specified below. The sample supply for all analytical devices used for cascade loop control shall be minimized to prevent loop delays.

9. *Redundancy*: All chemical feed equipment shall have 100% redundancy such that one system can be isolated while the chemical continues to be fed from the redundant system under all possible flow rates and dosages. This redundancy applies to all components of the feed system including appurtenances such as pumps, anti-siphon valves, etc. but does not apply to

bulk and day tanks, drums, scales, and calibration columns.

10. *Tank Sizing*: The required day tank sizes per Engineering Standard T-2 shall consider that the bottom and top of the tanks are typically not useful storage.

11. *Chemical Bulk Storage*: Except for bulk sodium hypochlorite, shall be based on 30 days of storage at the total plant capacity of 1.5 MGD, plus a factor of safety as set forth in Engineering Standard T-2. Bulk sodium hypochlorite shall be based on 15 days of storage at the total plant capacity of 1.5 MGD, plus a factor of safety as set forth in Engineering Standard T-2. Consideration shall be given to tank volumes that will accept full load chemical deliveries.

12. *Drum Feed Systems*: Provide a single scale for mounting a suitably sized day tank.

13. *Transfer Pumps*: Sized to limit manual transfer time to no more than two minutes, where practical. The use of automatic shutoff shall be provided for large day tanks where operator fatigue could be an issue. A drum pump should be provided for transferring chemicals from portable delivery drums to a day tank.

14. *Bulk Tank Fill Connections*: Lockable with shutoff valves and appropriately labeled. Chemical spill containment during the unloading of bulk chemicals should be based on the entire tank truck volume. The largest tank truck volume is 5,000 gallons for hydrofluosilicic acid. Containment system shall be designed to allow isolation from storm water drainage during tank truck unloading operations.

15. *Metering Pumps:* Where peristaltic metering pumps are used, no pulsation dampener or back pressure/anti-siphon is required, with the exception of hydrofluosilicic acid. Indiana regulations require use of anti-siphon devices for hydrofluosilicic acid.

16. *Priming*: All metering pumps shall be oriented so that they have flooded suction. Sodium hypochlorite metering systems shall have liquid conditioning valve off-gas relief systems.

17. *Flushing Systems*: Provide flushing tap at the point of entry into the chemical piping system (downstream of all special valves) for each feed system. Provide means for flushing suction piping.

18. *Bulk Tank Access:* Design-Builder is to evaluate ability to access bulk tank level monitoring and mixing equipment. Where necessary, provide FRP platforms adjacent to each bulk tank to enable access to maintain and replace level monitoring and mixing equipment. Platforms must not obstruct ability to remove and replace bulk tanks in the future, or must be configured in a manner that allows disassembly and reassembly for tank replacement.

Table 2.0

Summary of Existing Chemical Dosage for the WTF

Treatment Chemical	Average	Maximum	Minimum
Sodium Hypochlorite (lb/MG)[1]	30	60	12
Hydrofluosilicic Acid (lb/MG)[1]	4.6	8.0	2.5
Phosphoric Acid (lb/MG)[2]	16.0	25.0	10.0

1. Dosage based on active chemical compound.
2. Dosage based on neat product solution and not on active chemical compound.

Chlorination System

1. *General*: A bulk sodium hypochlorite system shall be provided in the Treatment Building.

2. *Specific Chemical*: Sodium hypochlorite

3. *Product Form*: Liquid

4. *Product Density*: 12.5%

5. *Type of Storage Required*: 15 days of bulk storage

6. Bulk Tanks: Provide two 750-gallon bulk tanks

7. *Points of Application*:

   a. Raw water vault prior to Aeration/Detention facility, dual application points with manual flush/relief

   b. Combined filter influent, dual application points with manual flush/relief

   c. Combined filter effluent, dual application points with manual flush/relief

   d. Downstream of the finished water storage tank, prior to the distributive pumps, dual application points with manual flush/relief

8. *Feed Method*: Peristaltic metering pump(s)

9. *Cascade Loop Control*: Free chlorine residual analyzers (pre, intermediate, and post)

10. *Isolation*: Located in an isolated room with adequate ventilation and no windows. All piping and equipment in room to be suitable corrosion resistant material.

11. *HVAC:* HVAC system shall maintain room temperature between 55°F and 65°F year-round.

Fluoridation System

1. *General:* This chemical feed system will be utilized to feed fluoride.

2. *Specific Chemical:* Hydrofluosilicic Acid

3. *Product Form:* Liquid

4. *Product Density*: To be determined during the design phase and verified with product supplier.

5. *Type of Storage Required*: Bulk and Day tank.

6. *Point of Application*:

    a. Combined filter effluent

7. *Feed Form*: Liquid

8. *Feed Method*: Peristaltic metering pump(s)

9. *Isolation*: Located in an isolated room with adequate ventilation and no windows. All piping and equipment in room to be suitable corrosion resistant material. Consideration should be given to automation of exhaust system for removing built up fumes.

Corrosion Inhibitor Feed System

1. *General:* This chemical feed system will be utilized to feed phosphoric acid.

2. *Specific Chemical:* Phosphoric Acid

3. *Product Form:* Liquid

4. *Product Density*: To be determined during the design phase and verified with product supplier.

5. *Type of Storage Required*: Bulk and Day tank, with tote delivery of product.

6. *Point of Application*: Combined filter effluent

7. *Feed Form*: Liquid

8. *Feed Method*: Peristaltic metering pump

9. *Isolation*: Located in an isolated room with adequate ventilation.

L. TREATMENT RESIDUALS MANAGEMENT

Backwash Equalization

1. *General*: Spent filter backwash will be disposed of to the Sanitary Sewer.

2. *Number of Equalization Basins*: One (1)

3. *Size of New Equalization Basin*: Size basin to provide equalization of one complete backwash from all filter vessels, plus a minimum 25% factor of safety.

4. *Residuals Pump Station*: Provide a pump station and force main to route spent backwash water to the Winchester Wastewater Treatment Facility.

5. *Residuals Pump Type*: Provide redundant submersible pumps.

6. *Residuals Pump Capacity*: To be determined by Designer based on Sanitary Sewer Owner requirements.

7. *Residuals PS Appurtenances*: Provide a magnetic flow meter to measure the wastewater rates and volumes being discharged to the Sanitary Sewer. Designer shall coordinate pumping system design to satisfy Sanitary Sewer Owner requirements.

M. ELECTRICAL

General

1. *Electrical Design Criteria and Standard:* Refer to Attachment G for detailed electrical design requirements.

2. *Electric Service to the Site:* Indiana Michigan Power owns the existing electric power distribution grid in the vicinity of the proposed plant. A new electric service shall be provided based on the provisions outlined in Attachment G for the proposed facility with new transformer equipment as outlined therein. All service equipment and installations to be provided in accordance with Code and Utility Company requirements.

3. *Number of Services*: 1

4. *Type of Feed*: Indiana Michigan Power. Design/Builder shall coordinate directly with utility supplier but shall keep INAW informed of any design decisions that may have a financial impact on INAW’s electric bills. Design/Builder shall account for lightning protection for buildings and other structures as appropriate.

5. *Outdoor Transformers and other Electrical Power Distribution Equipment*: Install equipment above the greater of the 500-year flood elevation or 3 feet above the 100-year flood elevation. Provide elevated pads or bases as necessary; coordinated with facility structures and regulatory requirements

6. *Electric Meter*: Primary electric meter shall be designed in accordance with electric utility requirements. Sub-metering shall be provided to allow INAW to measure and record power usage and demand from major equipment components.

7. *Surge Suppression*: Design using the appropriate level of transient threat as defined in ANSI/I.E.E.E. Standard C62.41. All transient voltage surge suppression equipment shall be tested in accordance with the appropriate parts of ANSI/I.E.E.E. Standard C62.45 and UL Standard 1449. The Design/Builder shall review the following issues and summarize their findings to INAW: length and amplitude of spikes caused by capacitor switching, recloser switching, or other pieces of equipment that can cause problems on a customer's power system and provide the appropriate protective equipment on INAW's side of the power system.

8. *Voltage Drops*: Develop a protection scheme to ensure that the transfer switch and other items (such as induction motors) are adequately protected from under voltage, voltage unbalance, contact chatter, etc.

9. *Harmonic Evaluation*: Perform harmonic analysis in accordance with IEEE 519 at each site where variable frequency drives are used.

10. *Grounding*: The electrical system and equipment will be grounded in compliance with the National Electrical Code. Conductors shall be No. 4/0 AWG copper, minimum, for interconnecting ground rods and for connection to transformers and MCC's and other major electrical equipment. A grounding ring will be required for the proposed building and major structures. Electrical equipment, devices, panelboards, and metallic raceways will be connected to the ground conductors.

Motor Control Centers

1. *Type of Equipment*: 600V, 3-phase, 4-wire plus ground operating at 60Hz. All components are U.L. listed. MCC equipment shall consist of standardized, freestanding structures bolted together for form a single dead-front panel assembly containing combination motor control units; feeder units; metering, relaying, and interlocking and miscellaneous control devices and will be of the per definitions in the latest edition of NEMA ICS 3 and UL 845.

2. *Factory Testing of Equipment*: Witnessed by INAW or by certified test report. This will be determined during detailed design.

3. *Enclosure Type*: NEMA 1. Design/Builder shall provide HVAC equipment designed with air filtration to ensure that particulate matter cannot track on to pieces of electrical equipment.

4. *Heat Dissipation*: Design/Builder shall provide for adequate heat dissipation based on guidelines listed in I.E.E.E. Standard 141, Typical Efficiencies of Electrical equipment. Calculations shall be submitted to INAW prior to final design specification review.

5. *Main Bus Capacity*: Design for 1.1 times present connected and identified future loads for other potential future loads.

6. *Momentary and Interrupting Ratings*: Determined by the Design/Builder during detailed design. Calculations must be supplied to INAW before final specifications are approved. Calculations can be computer or other INAW approved method per the guidelines listed in I.E.E.E. 141 (latest edition). The Design/Builder shall provide documentation of all assumptions for machine impedances, cable impedances (both resistance and inductance), and transformer impedances to complete the computations. Since INAW prefers a grounded secondary service, both balanced and unbalanced fault computations will be prepared and presented to INAW for review and approval. The equipment vendor will make detailed final calculations during construction and shop drawing approval. The Design/Builder shall develop fault conditions under minimum, maximum, and average power consumption scenarios based on the way the plant is to be operated. The Design/Builder shall also develop fault scenarios with local generators used instead of the electric utility.

7. *Circuit Breaker Compartments and Circuit Breakers*: Control center disconnects shall be three-pole, single-throw, 600-volt, molded-case air circuit breakers. Circuit breakers of combination starters shall be magnetic motor circuit protector type. Feeder circuit breakers shall be thermal-magnetic type and shall be manually operated with quick-make, quick-break, trip-free toggle mechanism.

8. *Power Monitoring*: Provide microprocessor-based GE Multi-Lin unit on main incoming feed. Unit shall compute voltage, amperes, power factor, kilowatt-hour, etc. Communications will be ethernet communication back to a port on a plant remote terminal unit (RTU). Provide individual power transducers on all rotating loads larger than 25 horsepower using Load Controls Inc. PH-3A or equal. Transducers shall be wired to plant RTU for monitoring, trending and archiving.

9. *Surge Suppression*: Transient voltage surge suppressors shall be provided integral to each MCC assembly. Design using the appropriate level of transient threat as defined in ANSI/I.E.E.E. Standard C62.41. All transient voltage surge suppression equipment shall be tested in accordance with the appropriate parts of ANSI/I.E.E.E. Standard C62.45 and UL Standard 1449. The Design/Builder shall review the following issues and summarize their findings to INAW: length and amplitude of spikes caused by capacitor switching, recloser switching, or other pieces of equipment that can cause problems on a customer's power system and provide the appropriate protective equipment on INAW's side of the power system.

10. *Main Circuit Breaker*: Microprocessor based with adjustable trip and delay settings for long-time and short time tripping characteristics in addition to instantaneous and I^2t (for ground fault).

11. *Starters*: Full-Voltage combination magnetic starters shall be utilized as

required. Solid-state reduced voltage motor starters may be utilized where required due to power utility requirements and/or engine-generator sizing considerations.

12. *Power Factor Correction*: Power factor correction capacitors will be applied to correct motor power factor to within 90 to 95 percent for all motor starters rated 50 hp and larger. Capacitors will be installed at the motor. Capacitors will not be applied where the motor is served by a VFD.

13. *Variable Frequency Drives:* VFD's shall be remotely mounted and be fed from a dedicated 480 volt, three-phase MCC feeder breaker. The drives shall be 6 pulse, 18 pulse or Active Front End (AFE), fully digital, microprocessor controlled and shall incorporate a diode bridge rectifier and a transistorized inverter section. IGBT type power transistor modules shall be utilized in the inverter section to invert a fixed DC bus voltage to a symmetrical three-phase pulse-width modulated (PWM) output voltage. VFD's for motors smaller than 50 hp shall be 6 Pulse. VFD's for motors 50 hp and larger shall be 18 Pulse or Active Front End.

14. *Compartment*: Equipped with the ability to lock out the starter for testing during maintenance.

15. *Pilot Lights*: Oil, dust, and water resistant with push to test type operation.

16. *Bus*: Tin plated copper.

17. *Control Power Transformers*: Sized for at least 110% of the required load to allow for future expansion.

18. *Wiring Configuration*: NEMA Class 2B

19. *Gasketing*: Required

20. *Lightning Arrestors*: Provide on the incoming lines based on the isokeraunic number (number of thunderstorms per year).

21. *Surge Capacitors*: To be provided for steep wave transient capacitors.

22. *Basic Impulse Level (BIL) Requirements*: Design/Builder to coordinate to establish a protective margin based on the perceived transient threat caused by switching of capacitor banks.

23. *Thermostats*: Design/Builder shall evaluate the need for the use of condensation control inside each starter to prevent moisture build-up on components and install if required.

24. *Arc Flash*: Provide arc flash protection in accordance with American Water Health & Safety Procedures Manual. Refer to Attachment G for the power system & arc flash study requirements.

Miscellaneous Power Distribution

1. *Circuit Panel*: Circuit breakers will be of the bolt-on type. Push-on type circuit breakers are not allowed. Use copper type bus and ensure U.L. labeling of entire system. Provide a transient voltage surge suppresser on the main of each power distribution panel. For more specific requirements for the protection of sensitive electronic instrumentation, see Instrumentation section. All distribution panels will have hinged doors.

2. *Cables*: Those rated for 480V and below shall be dual listed as XHHW-2 type insulation listed for at least 90 degrees centigrade. In order to maintain a 90 degrees centigrade rating, all of the connectors and lugs at each end of the cable shall be U.L. listed for 90 degrees centigrade per the U.L. Green and White Books.

3. *Lighting and Power Transformers*: Dry type to limit maintenance items. A minimum of (2) taps will be provided above rated voltage (in 2.5% increments) and a minimum of (2) taps will be provided below rated voltage (in 2.5% increments). Open type transformer cases are not allowed. All units will be of sealed type construction. The Design/Builder shall examine the need to install transformers with a higher than average Basic Impulse Level (BIL) that is not normally required in the 480V class.

Lighting Fixtures

1. *LED Type Fixtures*: Units shall be sealed and water resistant, and of the highest efficiency available. In order to facilitate conformance with NFPA 101 (the Life Safety Code), the facilities shall include separate emergency lighting fixtures to ensure that all passages and exits remain illuminated in the event of a power failure. Design shall achieve adequate lighting at lowest possible energy demand.

2. *Exit Signs*: LED type and placed inside the facility per the latest requirements of NFPA 101 (the Life Safety Code). Ensure exit lights are connected to backup power with bug eye lighting.

3. *Exterior Lighting*: LED with light pollution shielding, photocell type, wall mounted, and vandal proof. Pole lighting is acceptable but must not compromise surveillance video camera effectiveness.

Automatic Transfer Switch

1. *General*: Furnish and tested by the generator set manufacturer to function as one standby power system. The transfer switch shall be UL listed per Standard 1009 and rated for total system load. The Design/Builder shall be expected to specify the close and withstand ratings of the switch components based on the available fault current at the point of installation (based on length of feeder cable run, presence of local generation, etc.). The switch shall be of the contactor type and shall be designed to carry 100% of rated current continuously based on ambient temperature of 120-degree Fahrenheit.

Transfer switches using interlocked circuit breakers or molded case switches are not acceptable. The transfer switch shall be performance tested per the requirements of IEEE-587 (latest edition) for voltage surge and withstand capability.

2. *Type of Construction*: Over center double throw. This construction allows for positive electrical and mechanical interlocking via a mechanical beam to prevent simultaneous closing (break-before make-operation).

3. *Lugs*: Double set to allow connection of a load bank to the unit for generator testing. The lugs shall be rated for normal, standby, and neutral load conductors inside the cabinet.

4. *Main Switch Contacts*: High pressure silver alloy to resist burning and pitting for long life operation.

5. *Transition*: Closed transition with storm mode.

Automatic Transfer Switch Controls

1. *General*: Solid state and accessible from the front of the lockable enclosure. The voltage rating of the transfer switch depends upon the selection of the in-plant voltage.

2. *Voltage Sensors*: Solid state and simultaneously monitoring all phases of the normal source and all phases of the standby source. The sensor pick-up settings shall be adjustable from a minimum of 85% to a maximum of 98% of nameplate voltage. Dropout settings shall be adjustable from a minimum of 75% to a maximum of 98% of the pick-up settings with a fixed dropout time delay of .5 seconds. Voltage sensors shall be temperature compensated. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase of the normal or emergency source. A reverse voltage sequence relay shall be interlocked to the operation of the transfer switch.

3. *Frequency Sensors*: Solid state and monitoring normal and emergency power sources. Sensors shall be adjustable for a pick-up of minimum of +4/-4% to a maximum of +/-20% of nominal frequency. Drop out and time delay settings shall be adjustable.

4. *Operation*: The engine-generator set shall start upon signal from normal source voltage sensors. Solid-state time delay start shall be adjustable and shall avoid nuisance start-ups on momentary voltage dips or interruptions. The switch shall transfer the load to the standby power system when the voltage and frequency are within the limits after a specified time delay. The transfer switch shall retransfer the load to the normal source after normal power restoration. An adjustable solid-state time delay retransfer and controls shall be provided to match phases and achieve seamless transfer back to normal service. The retransfer shall be interlocked with the generator to stop after the retransfer of the load to the normal source. Generator run times shall be recorded and tracked through SCADA.

5. *Built-In LED Status Indicator*: Functions to include shall consist of source 1 OK, start genset, source 2 OK, transfer timing, transfer complete, retransfer timing, retransfer complete.

6. *Auxiliary Switch*: Include a Form C 10 Amp 250 VAC auxiliary switch on both the normal and emergency side of the switch. These contacts shall be factory wired to a terminal block to allow interface to the remote telemetry unit digital inputs for transfer switch status.

7. *Test Switch*: Simulates loss of power to the control unit. Controls shall allow for a system test with or without load transfer.

8. *Normal Operating Position Switch*: Restores the load to the normal source after test and time delays.

9. *Retransfer Switch*: Momentary type to allow for a bypass of the retransfer time delays and cause immediate return to normal source after outage.

10. *Pilot Lights*: Provided on the front of the switch to indicate the switch is on normal power, the switch is on standby power, normal source available, and emergency source available.

<u>Generator Set</u>

1. *Existing Generator*: An existing 450 kW (563 kVA) generator set at the Winchester Water Treatment Facility is capable of maintaining operation of the treatment facility under all demand conditions.

N. INSTRUMENTATION

<u>General</u>

1. *Operation of the Treatment Plant*: Designed to operate in an unattended, totally automated mode. A supervisory/maintenance staff will be on site periodically; however, the plant will be unattended most of the time.

2. *Remote Control/Monitoring*: The ability to monitor/control the proposed facility, including the well pumps, from a remote site or sites by means of a wide area network (WAN) will be required as part of this project. Only designated, authorized operators and supervisors shall have remote access to control systems via laptops or otherwise. This facility will have a dedicated HMI system. An interface to Richmond will remain for management oversight and assistance from Richmond staff, as necessary. This does not preclude remote "monitoring only" access by others. Routers, firewalls, and other security functions shall be furnished to prevent unauthorized access to the plant control network.

3. *System Architecture:* The communication link between RTUs within the WTF

shall be via fiber optic cable. Provide a certified fiber optic cable test report which details the wavelength that is used to test the cable as well as the fiber optic testing equipment used. The master RTU shall communicate with the remote sites via cellular modem operating on the AW VPN. The SCADA system shall consist of a process control local area network (LAN) controlled from redundant HMI computers. The HMI software used will be Ignition Software. Ignition Software will be used to dial out alarms to local operations. System architecture shall provide for remote access from the office and business network.

4. *Conventional/Redundant Instrumentation*: Not required.

Modes of Operation

1. *Local/Remote Capabilities*: Each piece of process equipment will be equipped with a Hand-Off-Auto selector switch (at the piece of equipment) to allow the location of control to be changed. In order to ensure that the RTU in the Remote Manual or Remote Automatic Mode has control, an additional contact blocks will be added to the selector switch to monitor the Hand and Auto positions. The output of the contact block will drive a digital input that will serve as a permissive in the DCS. If the DCS attempts to control a device from the RTU when it is not in the Auto mode, a failure condition will be delineated at the operator's interface. Package systems with a local control panel may not be used.

2. *Local-Manual*: An operator at a piece of process equipment will turn the device on and off and make adjustments. Required for all equipment.

3. *Local-Automatic*: Controls are hardwired into pieces of equipment by a vendor (such as prepackaged process equipment).

4. *Remote-Manual*: An operator turns items on and off via the operator interface terminal (OIT) connected to the DCS. Required for all equipment.

5. *Remote-Automatic*: The DCS turns items on and off and performs all control. Required for equipment as necessary for overall plant coordinated control.

Remote Telemetry Units

1. *Processors*: For the treatment facility and the well pumps, two Allen Bradley Control Logix Controllers in a redundant configuration.

2. *Cabinets*: Include compact lighting fixture activated by a door switch. Each RTU shall have battery backup/DC UPS Units. RTU’s shall be located indoors in a controlled environment with fans and heaters. RTU’s for the well pumps shall be outdoor rated enclosures (NEMA 4X, SS) with sunshades, thermostatically controlled heaters and coolers.

3. *Terminal Blocks*: Multilevel terminal blocks are not permitted.

4. *Spare Wired Terminals*: Provide in each cabinet to facilitate future expansion

(10% minimum).

5. *Convenience Receptacles*: Use ground-fault interrupter type only.

6. *Separation of Power Cable and Signal Wires*: 120 VAC control cable shall be physically separated from 4-20 mA signals and DC wiring as much as practicable inside control cabinets.

7. *I/O Slots*: As required.

8. *Remote Input/Output (RIO) Boards*: Remote I/O, Flex I/O or Remote Racks will be permitted. 20% spare equipment, rounded to the higher quantity should be provided for all components.

9. *3 Wire Control*: Required for all pieces of equipment (one normally closed contact for stop and one normally open for start, etc.) except for metering pumps (which only require 1 contact for the start and the stop functions).

10. *Modulating Valves*: Analog control with full open and full closed feedback or open closed control with position feedback and full open and full closed feedback.

11. *Signal Configuration:* Analog inputs and outputs shall be 4-20 mA DC: Interrogation voltage for discrete inputs shall be 24 VDC. Isolated dry relay contacts shall be furnished for all discrete outputs – relays may be integral to the I/O module. Interposing relays shall be furnished in cases where the I/O module relay contacts do not have adequate electrical ratings.

12. *Uninterruptible Power Supply:* A smart type, ethernet connected 24VDC UPS shall be furnished to power the control room personal computers, printers, data concentrators, and other network equipment. The control room UPS shall be a floor mounted type with static bypass switch and alarms for overload, equipment over temperature, low battery and load on bypass. All RTU's and analyzers containing programming shall be powered from a battery backup. Battery backups for RTU's and field analyzers shall be mounted in the RTU panels. The UPS or battery backup shall provide a minimum of 30 minutes of backup power.

<u>Server Configuration</u>

1. Software will be a redundant Ignition package with three Stratus 4910 servers, two designated as redundant control servers and one as a database server.

2. Ignition Gateways will be configured with 4 CPUs, 16GB of RAM, and a minimum of 200 GB of Disk Space.

3. The Database Server will be configured with 4 CPUs, 32GB of RAM, a minimum of 200 GB of OS Disk Space and an additional 2 TB of Data Storage for Historical Data.

4. Synology NAS Backup Server DS1821+ with 4 TB RAID one configuration.

5. Ignition Software Modules will be configured with the following:

    - Alarm Notification
    - Voice Notification
    - SMS Notifications
    - TTS Voice_en_us_Katherine
    - SQL Bridge
    - Tag Historian
    - Enterprise Administration Agent
    - Ignition Platform
    - OPC-UA / OpcCom
    - Modbus Driver
    - Allen-Bradley Driver
    - Perspective (Unlimited)
    - Symbol Factory
    - Reporting
    - Cirrus Link MQTT Transmission
    - **Redundancy (for redundant systems)**
    - **Total-care Support (includes upgrades)**

6. The Database Server will be configured with Microsoft Sequel 2019 with a 5 CAL configuration.

<u>Operator Interface Hardware and Software</u>

1. *General*: Since computer technology rapidly changes, the DESIGN/BUILDER will specify all items listed under this section at the time of purchase.

2. *Personal Computers*: Two computers and monitors at the proposed facility to allow monitoring and control of the treatment facility and well field while an operator is on site. Users shall employ cryptic passwords complying with the American Water SCADA Acceptable Use Practice and related Company policies. INAW will purchase the computers.

    - Workstations will be Dell 7090 with two 24 inch monitors each.
    - Workstations to be configured for a total of 4 video outputs.

3. *Software*: The software shall be Ignition Software human-machine interface software. INAW will provide the software.

4. *Local Area Network*: The personal computers and printers shall be placed on a process control local area network (LAN). The LAN shall be implemented using Ethernet type cards in each operator interface personal computer. The LAN shall be interconnected to various computers using a 100-base T stackable hub. The cable between devices on the LAN shall be Category 6 type cable or fiber optic. LAN cables between devices in different buildings shall be fiber optic.

5. *LAN Connection*: Shall be provided in the filter gallery (and other strategic locations in the plant) to allow for connection of a laptop computer should an operator desire to watch a filter while it is backwashing.

Operator Interface Functions

1. *Screens*: The Design/Builder shall include paragraph descriptions of the OIT and HMI screens (including a listing of each specific I/O point required on each screen) to give the system integrators an understanding of the level of detail required. Each screen shall utilize INAW's standard color conventions for stop, run, open, closed, and intermediate conditions. Text- based screens shall be considered in the design. An operator (or supervisor only) shall have the capability to manually enter data onto the screen that is not generated by the system but is appropriate to be displayed on a screen, such as a manual valve change for a chemical feed point of application. Control programs shall include limiting parameters for operator inputs, such as chemical feed dosages, to prevent excursions. Only supervisors shall have access to modify those parameters. Provide a list of all screens to be created by the system integrator. Provide sample screens to establish the minimum acceptable level of graphic detail.

    - Screen designs and configuration to be per AW standards related to the utilization of High Performance Graphic designs designated by the company.

2. *Reports*: Reporting shall be from one Ignition Reporting System. At a minimum, the reports shall consist of Form 100, System Hydraulic, Plant Data and Well Withdrawal. Provisions shall be made for the data to be edited. The original data shall not be changed; however, additional fields shall allow a manual value to be entered into reports. User entering manual data and a comment shall be maintained to explain the reason for the change. The person logged in shall be recorded as a field. Reporting data not provided by the SCADA PLCs will have the ability to be manually entered on the Data Entry Screen. This screen shall allow operators to enter lab data and other data for use in the Form 100 and other reports as needed.

3. *Alarms*: An alarm summary table shall be developed by the Design/Builder and reviewed with INAW during design. The table shall include specific initial values for all high and low alarm set points. Analog set points are also to be configurable on the graphic displays. The specific software package that is ultimately selected must have auto dialing capabilities such that alarms conditions can notify On-Call personnel without the need for a separate auto dialer. Operators shall not have access to modify alarm set points without special authorization.

4. *Database*: Provide Ignition Database package to store process data and act as a server to database users outside the process control system. This shall be installed on an existing server and fully integrated into the existing control system. INAW will provide the software.

System Factory Test

1. INAW and Design/Builder shall witness a complete factory acceptance test (FAT) of the entire control system prior to its shipment to the job site. The Design/Builder shall provide written approval for shipment following acceptance of the factory test.

2. The factory test shall be conducted by the Systems Integrator using simulated inputs to assure all I/O are provided and all inputs, outputs and application software is functioning according to the intent of the plans and specifications. Additional distributed control units shall be provided, if necessary, to accommodate the project phasing requirements. The test procedure shall include simulated system faults and failures. The factory tests shall be staged in two parts: the first to review all I/O and hardware and the second to assure functionality of the system.

3. The factory test shall demonstrate all graphics, report generation and alarm functions of the system.

4. Provide at least a four-week written notification to INAW prior to the start of the witnessed factory test. Provide a written factory acceptance test procedure for INAW review prior to the start of the factory acceptance test.

<u>Training</u>

1. *General*: INAW shall advise the Design/Builder as to the amount of training to be performed relative to the distributed control system. It is expected that the DCS system supplier will furnish videotapes of the training. These videotapes will be turned over to INAW at the end of training program. All training received during the startup and calibration of equipment is considered incidental training and does not count for the requirements listed below.

2. *Operator Training:* Operating training has the following goals:

    a. Use workstations, touch screens, and keyboards

    b. Retrieve and interpret all standards displays including graphics, overview displays, group displays, trends, point summaries, and alarm summaries.

    c. Enter data manually

    d. Change control parameters and set points

    e. Assume manual control of equipment and control it from the HMI

    f. Print Reports

    g. Acknowledge Alarms

    h. Respond to software and hardware errors

i. Historical Data Collection, archival and retrieval

j. Capabilities and configurability: reports, alarm reporting, setting passwords, and system hardware configuration.

k. Database backup and recovery

3. *Maintenance Training*: This training equips INAW personnel with the skills required to diagnose, trouble shoot, and repair the components of the system. As a minimum, maintenance training shall provide technicians with the ability to:

    a. Power-up, boot strap, and shut down all of the hardware devices

    b. Perform scheduled maintenance functions on all components

    c. Describe the theory of operation for all circuit boards.

    d. Setup and use off-line diagnostics to determine hardware failures to the fault board or module.

    e. Use workstations, keypads, or keyboards to retrieve and interpret displays which shall provide on-line diagnostic information

    f. Remove and replace all removable boards/modules.

    g. Maintenance training shall be at least 75% hands-on instruction and shall be designed for personnel that do not have any familiarity with the equipment furnished.

4. *Supervisor Training*: This training is for personnel who will need to make access changes to the DCS. This training consists of the following basic tasks:

    a. Log-on and log-off to the HMI and OIT

    b. Setting and clearing passwords

    c. Configuring access levels for various process parameters and set points

    d. Printing and configuring reports

5. *Calibration*: It is expected that a detailed calibration plan will be developed during the construction phase of the project. The Design/Builder will review the instrumentation installed and provide guidance to INAW as to the number of follow-up visits for calibration, the type of calibration documentation to be furnished, and the calibration equipment to be furnished to allow INAW personnel to maintain the equipment after project completion.

Protection of Sensitive Electronic Equipment

1. *General*: The Design/Builder shall follow guidelines for the powering and grounding of sensitive electronic equipment listed in I.E.E.E. Standard 1100-1999. Controls and power voltage are not permitted to be mixed.

2. *Transient Voltage Surge Suppression (TVSS)*: Provide TVSS at point of use for all instrumentation loads. Required for all 4 wire instruments (such as a chlorine residual analyzer) and placed on the 120 VAC branch circuit and on the 4-20 mA portion of the circuit. The transient voltage surge suppression on the 4-20 mA wiring shall be located on the RTU end. For all two wire 4-20 mA instruments that have signal cable running from outdoor to indoor locations (or signal wire run between buildings), transient voltage surge suppression on the field side of the 4-20 mA signal is required.

3. *Grounding*: Each RTU cabinet shall be provided with a direct connection to the ground grid via a driven rod in addition to the equipment safety ground required by the National Electrical Code. Daisy chaining of grounds is not acceptable. A grounding detail showing the interface between the RTU cabinet and the proposed grounding system is required. Instrumentation shields shall be grounded at the DCS end only. The electrical grounding specifications must be cross referenced to the instrumentation and control specifications so that it is understood that the system integrator monitors the quality of system grounding. In order to facilitate an electrically conductive ground mass, provide connections to structural steel and interface them to the grounding system that results in a ground impedance of 1 ohm or less.

4. *Power Supplies*: Separate power supplies shall be provided for analog inputs and PLC's, and digital outputs.

5. *Conduit Spacing*: Required between power and signal/control cables as listed in I.E.E.E Standard 518-1982.

Communications Equipment

1. *Data Highway*: Fiber optic cable is required between RTU's. Cable runs should be installed in metal conduit.

2. *Spare Parts*: The Design/Builder shall confer with INAW for the required spare parts associated with communication cables.

    - 20% Minimum, rounding to the higher quantity, for PLC equipment.

Signal/Control Wiring for Corrosive Areas

1. Use Schedule 80 PVC conduit in all chemical storage areas. Where possible, enclosures for control and electrical components should be located outside of the chemical storage rooms. Where this is not possible, the enclosures shall be fiberglass NEMA 4X type enclosures.

O. BUILDING REQUIREMENTS

General

1. The proposed treatment building shall be as specified herein, and as determined by the Design/Builder during the design phase.

Administrative Area

1. *Office Space:* Provide two offices, a lobby with space for an operations support representative, a conference room for 12 people, a break room and restrooms. Approximately 1600 square feet. The conference and break room shall have at least one large screen monitor per room and shall be connected to the business network.

2. *Operator/lab Area*: Approximately 200 ft^2. Provide operator worktable/desk and UPS. Provide lab cabinet, counter space with sink and a service sink for samples and analyzer waste. Provide countertop space to perform routine wet chemistry. Other details to be provided by INAW during design phase.

3. *Maintenance Storage Area*: Approximately 100 ft^2. Provide space for INAW provided wall shelving units.

4. *Restroom:* One women's restroom and one men's restroom, which shall be ADA compliant

5. Furniture: Will be purchased by the Design/Builder with the exception of the maintenance shelving, which will be provided by INAW.

6. Local Area Network: The office space is to be equipped for a business services local area network (LAN2). This network will be completely separate from the process control local area network (LAN1). The LAN shall be interconnected to various devices using a 100-base T stackable hub. The cable between devices on the LAN shall be Category 6 type cable. At least two LAN connections are to be provided in each office and in the break room, and at least six LAN connections are to be provided in the conference room.

7. LAN Room: Approximately 100 ft^2.

Garage Bay

1. *Office Space:* Provide a 4 bay approximately 36 ft deep by 40 ft wide garage area for vehicles, heated storage for meters and other equipment, and a work area.

2. *Overhead Doors:* Provide two (2) 18 ft wide by 14 ft heigh overhead doors.

Utilities and HVAC

1. *Water Service*: In plant water service to be metered and individual backflow

preventers provided where necessary. Provide redundant booster pumps if distribution system pressure is not adequate for plant service needs when plant is not running. The Design/Builder shall review this requirement with the OWNER during preparation of the Design Memorandum to determine if booster pumps will be required.

2. *Sanitary Waste*: Coordinate design of sanitary sewer line with backwash waste disposal and design and construct an onsite sanitary lift station if required.

3. *Heating*: Electric heat or natural gas, if available and cost effective, for heat and hot water.

4. *Air Conditioning*: Provide air conditioning in the sodium hypochlorite room and administrative areas. Provide dehumidification equipment for all necessary spaces.

5. *Telephone Service*: Design/Builder shall coordinate with the local telephone utility to provide this connection.

6. *Broadband Internet:* Broadband internet service will be required to support the business service local area network (LAN 2), security communications and the fire alarm system.

<u>Architecture</u>

1. *Treatment Plant Layout*: A common structure is preferred.

2. *Exterior*: Exterior appearance to meet local building ordinance. Anticipate brick or color-tinted split face block; color selections by Owner.

3. *Roof*: Precast concrete panels with built up insulation and single ply membrane system. Metal deck and standing seam metal roof is acceptable provided it is cost effective and not exposed to chemical areas.

4. *Interior Walls*: The chemical areas shall have painted block. Drywall with metal frame and/or painted block in remainder areas of the plant as required.

5. *Floors*: Sealed concrete in process areas. Provide chemical resistant concrete coatings in all chemical rooms per T-2 Standard. Provide epoxy coated flooring or commercial tile in operator/lab area and restroom.

<u>Control Room / Operator's Office</u>

1. *Construction*: Totally enclosed room (no outside doors).

2. *Configuration*: Area dedicated to operator control workstations.

3. *Fire Suppression Equipment*: Include equipment such as a fire extinguisher that will not damage computer equipment in the event of a fire. Equipment to comply with the latest requirements of the National Fire Protection Association Codes and standards.

4. *Control Room Furniture*: Will be purchased by Design/Builder.

Safety/Security

1. *Smoke and Fire Alarms*: Provided in areas where fire potential is high. Suppression system(s) shall be designed only if required by code or local ordinance.

2. *Security System*: Designed by Others. Security requirements will be determined by the Owner based on the 60 percent complete design drawings. The Owner will provide the Design/Builder with details of the security system design to incorporate into the final design documents. The Design/Builder will be required to furnish and install basic electrical components, such as conduit, conductors, switches, support poles, wire, etc., to support the final installation of the security system, which shall be completed by others.

   Security system is to provide badge access and gate operator for the main gate to the treatment facility.

3. *Lighting:* Lighting will be placed on structures such that CCTV cameras are not blinded by perimeter lights.

4. *Fencing:* Fence surrounding property will be set back from property line as required by local codes. Design/Builder to verify during design. Area outside of fence will be kept clear so as to provide indication of intrusion. Fencing concept will be further developed during design phase.

5. *Site Design:* Site grading and access drives shall be sloped to facilitate drainage away from the buildings and structures.

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

1. GENERAL (Applies to More Than One Area of the Plant)

Equipment Description	Manufacturers
Ductile Iron Pipe	American Ductile Iron Pipe Griffin Pipe Products United States Pipe and Foundry
PVC Pipe 6" and larger	HD Supply (AW supplier)
PVC Pipe 4" and smaller	Certainteed
Butterfly Valves w/Electric Operators	DeZurik Valve Henry Pratt
Butterfly Valves w/Manual Operators	Henry Pratt DeZurik Clow Valve
Resilient Seat Gate Valves	Mueller Clow Valve United States Pipe and Foundry American Flow Control
Plug Valves	DeZurik Valve Keystone Valve Pratt
Check and Air Valves	Golden Anderson Cla-Val APCO Val-Matic
Pump Control Valves	Cla-Val Rodney Hunt Golden Anderson Bermad Ross Valve Henry Pratt
Sluice Gates	Mueller Rodney Hunt
Slide Gates	Golden Harvest
Pipe Expansion Joints	Red Valve Mercer
Backflow Preventers	Ames Watts Wilkins
Pressure Gauges	Ashcroft Trerice
Electric Valve Actuators	Auma Beck EIM Rotork
Pneumatic Valve Actuators	Auma Aro Pratt
Pneumatic Valve Actuators – Rotary Vane	Kinetrol K-tork

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

Rotary Lobe Blowers	Ingersoll Rand-Dresser Roots Blowers Gardner Denver Sutorbilt Duroflow MD
Centrifugal Blowers	Continental Lamson Hoffman HSI
Air Compressor	Ingersoll-Rand Champion
Static Mixers	Komax Chemineer Koch
Welded Steel Tanks D100	Advance Tanks Caldwall Chicago Bridge & Iron Hungerford & Terry
Hot Water Heaters	A O Smith
Floor Drains	Zurn
Hoist/Cranes	Harrington Yale Shaw-Box ACCO
Paint & Coatings	Tnemec Carboline Sherwin Williams MAB
Laboratory Furnishing	Celtech Duralab Equipment Fischer Hamilton Scientific Kewaunee Scientific
WW Sludge Presses	Bell Filter Press KCSF Screw Press
Gear Drives	Philadelphia Koellman

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

2. PUMPING

Equipment Description	Manufacturers
Vertical Turbine Pumps	Layne Western Flowserve Peerless/Grundfos Fairbanks Morse
Well Pumps	Bryon Jackson Grundfos Fairbanks Morse American Marsh
Horizontal Split-Case Centrifugal Pumps	Fairbanks Morse Flowserve Aurora Peerless
End Suction Pumps	Peerless Flowserve Gorman-Rupp Aurora
Sample Pumps	March Moyno Berks Netzsch
Sump Pumps	Hydromatic KSB Weil ABS
Chemical Pumps (Magnet Drive)	Iwaki Walchem March Manufacturing
Chemical Pumps (Progressive Cavity)	Moyno Netzsch
Chemical Pump (Peristatic/Hose Pump)	Watson Marlow Blue White Verder
Chemical Pumps (Hyd & Mech Diaphragm)	Milton Roy -LMI Wallace & Tiernan Pulsafeeder
Chemical Pumps (Solenoid Diaphragm)	LMI Prominent
Sludge Pumps (Water & Waste Water)	Flyght Hydromatic Yeomans ABS Weil KSB

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

3. MOTORS

Equipment Description	Manufacturers
Vertical Turbine	NIDEC/US Motors Toshiba General Electric Reliance Siemens
Horizontal	NIDEC/US Motors Toshiba General Electric Reliance Baldor Siemens
Submersible	Franklin Plueger Grundfos
C-Frame	NIDEC/US Motors Toshiba General Electric Baldor Siemens

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

4. CHEMICAL STORAGE & FEED EQUIPMENT

Equipment Description	Manufacturers
Volumetric Feeders	Merrick Acrison Chemco
Lime Slakers	Wallace & Tiernan RDP Technologies
Gaseous Chemical Feed Equipment	Wallace & Tiernan Capital Control
Chlorine Scrubber	Purafil Severn Trent
XLHDPE Chemical Storage Tanks	Poly Processing Assman Nalgene Snyder Tanks
Liquid Polymer Feed Equipment	Fluid Dynamics USGI
Batch Tank Scales	Force Flow Equipment Eaton Scales
Chemical Ball Valves	Chemtrol Hayward
Chlorination Equipment	Evoqua Capitol Controls
Bulk Bag Unloading Equipment	Flexicon Spiroflow Vibrascrew Norit

5. WATER TREATMENT PROCESSES

Equipment Description	Manufacturers
Flocculation Equipment	Philadelphia Mixer Lightnin Chemineer
UV Disinfection Systems	Wedeco Trojan Technologies Calgon Carbon
Hypochlorite Generation Systems	Process Solutions Severn Trent
Settled Solids Sludge Collection	Meurer Research (MRI)
Plate Settlers	Lamella Ecoflow Meurer Research (MRI)
Aerators	Bastin Logan Westech
Filtering Equipment – gravity filters	Roberts Filter Leopold (Xylem)
Filtering Equipment – pressure filters	Roberts Filter Hungerford & Terry Bastin Logan

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

6. SCADA & INSTRUMENTATION

Equipment Description	Manufacturers
Pressure Transmitters	Rosemont Honeywell
Turbidimeters	Hach Sigma
pH Analyzers	Hach Wallace & Tiernan
Chlorine Residual Analyzer	Hach (CL17) Evoqua Capitol
Fiber Optic Modems	Phoenix Hirschmann
Radio	Microwave Data Systems Free Wave EPROM
Antenna (Radio)	Clearwave Samco Andrew Decibel Pctel
Remote Telemetry Unit	Bristol (Control Wave & Control Wave Micro)
Programmable Logic Controller	Allen Bradley (Control Logix, Compact Logix, & Micro Logix)
Fluoride Ion Monitors	ABB ATI Orion
Particle Counters/Monitors	Chemtrac Systems, Hach
Streaming Current Detectors	Chemtrac Systems
Temperature/OPR Analyzers	Leeds & Northrup Wallace & Tiernan.
Flow Switches	Dwyer Instruments Flo-Tec Kobold
Venturi Flowmeters	Henry Pratt Primary Flow Signal Badger BIF
Magnetic Flowmeters	Endress Hauser ABB Emerson
Displacement & Turbine Flowmeters	Sensus Technologies Schlumberger Industries McCrometer
Ultrasonic Meters	Sensus Nusonics Division – Mesa Laboratories Polysonics Panametrics

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

Ultrasonic Level Probes	Endress Hauser Inventron Milltronics Flowline
Radar Level Probes	Endress Hauser Ohmart-Vega Siemens Magnetrol
Capacitance Probes	Drexelbrook Siemens
Level Instruments – RF Admittance Probe	Miltronics Drexelbrook
Auto Dialers	Raco Verbatim Win911

7. HVAC

Equipment Description	Manufacturers
Electric Heaters	Trane Indeeco
Air Conditioners	Trane Carrier
Make-up Air Units	Reznor
Exhaust Fans	Greenheck Penn Barry Loren Cook
Dehumidifiers	Dectron
Louvers and Dampers	C/S Louver System Airstream

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

8. ELECTRICAL

The following listing is intended to identify those manufacturers that are generally acceptable and capable of meeting American Water's Recommended Design Standards and provides a unified approach in design, maintenance and operation across the entire Company. Unless specifically indicated, the naming of the manufacturers outlined below is not intended to provide the specified "order" for equipment selections. The list should be reviewed with the Water Company during the initial design phase to add or eliminate any manufacturers that are preferred or rejected by the local Operations team. The Consultant may propose other suppliers/manufacturers for Owner review and acceptance based on the specific nature of the Work and site location and/or conditions. The Consultant shall include a listing of proposed major electrical equipment manufacturers with the Design Memorandum for consideration by the Owner. The Basis of Design shall be established based on the Owner's preferences.

Equipment Description	Manufacturers
MV Switchgear – Vacuum Breaker, Draw-Out	Cutler-Hammer Square D Siemens General Electric
Medium Voltage Automatic Transfer Switchgear (Circuit Breaker Transfer Equipment – Manual or Automatic)	Cutler-Hammer Square D Siemens General Electric
MV Fusible Switchgear	Cutler-Hammer Square D *(Note - HVLcc Type Equip Not Accepted)* Siemens General Electric S&C
MV Switchgear – SF6 Type	*Not Preferred Equipment*
MV Motor Control Equipment, MC Lineups (FVNR, RVSS Equipment)	Cutler-Hammer Siemens General Electric
MV Variable Frequency Drives	Toshiba Cutler-Hammer Siemens/Robicon
LV Power Distribution Equipment – (Swgr, Swbds, Panelboards, Circuit Breakers, etc.)	Cutler-Hammer Square D Siemens General Electric
Transformers – Dry Type, VPI, VPE Insulation	Cutler-Hammer Square D/Sorgel Siemens ABB
Transformers – Cast-Coil	Square D/Sorgel ABB
Transformers – Liquid-Filled	*Not Preferred Equipment*
Protection Relays & Monitoring Relays for Voltage, Current, Phase Loss, Etc.	SEL (Schweitzer Engineering Laboratories) *Other acceptable manufacturers may include the following (subject to prior approval by AW Engr / Owner)* All to be provded with Fiber-Optic Communications over Ethernet / Modbus TCP/IP

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

Equipment Description	Manufacturers
Power Quality Metering, Motor Monitoring & Feeder Protection Relays	SEL 735, SEL 710, SEL 751A, SEL-489 Other SEL devices as applicable for the design of the power distribution system. *Communications to utlilize fiber-optic interface; dual-port for loop configuration where available. Copper communications to be utilized only where specifically indicated. All to be provded with Fiber-Optic Communications capability Ethernet / Modbus TCP/IP and DNP3*
Low Voltage Motor Control Centers	Cutler-Hammer Siemens General Electric
Full Voltage Motor Starters	Cutler-Hammer Siemens General Electric
Reduced Voltage (Solid-State, Soft Start) Motor Starters	Cutler-Hammer Siemens General Electric Danfoss Benshaw
Low Voltage Variable Frequency Drives – Stand Alone Applications (Free-Standing or Wall Mounted Units) *NOTE: All VFD equipment to be "Heavy Duty" / "Industrial Duty" and rated for 50 C. and shall be CT rated regardless of load type. Cooling fans shall be accessible without requiring total dismantling of the drive assembly; top outlet discharge preferred.* *"HVAC Rated" Drives are Not Permitted* *** NEMA4X Note: Drive assembly to be rated NEMA 4x by manufacturer; use of open chassis or NEMA 1 drives installed in NEMA 4x enclosure is not suitable in meeting this criteria.*	<u>Free-Standing – Wall or Floor Mounted</u> Toshiba ABB Siemens/Robicon Danfoss Benshaw Yaskawa <u>NEMA 4X Type (where required)**</u> Yaskawa T B Woods Harmonic Filters (where required) TCI Mirrus
Low Voltage Variable Frequency Drives – Part of MCC Lineup/Equipment *(Not an AW preferred method)*	Cutler-Hammer General Electric Square D Seimens
Low Voltage Automatic or Manual Transfer "Switches" – Contactor Type assembly	ASCO 4000 Series (unless otherwise suitable) Cutler-Hammer GE/Zenith Russelectric
Low Voltage (*Service Entrance Rated where applicable*) Automatic Transfer Equipment (Circuit Breaker Transfer Equipment – Manual or Automatic) *NOTE: Circuit Breaker – Main and Circuit Breaker – Standby REQUIRED unless specifically accepted otherwise*	Cutler-Hammer/Eaton Square D Russelectric Switchgear General Electric

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

Equipment Description	Manufacturers
Uninterrupted Power Supplies	APC Powerware General Electric Mesta Liebert MCG
Surge Protective Devices (UL-1449, Rev 3 Compliant and Listed/Labeled)	APT – Advanced Protection Technologies MCG APC
Lighting Fixtures – Fluorescent T-8 lamps, Program-Start Ballasts, Indoor Enclosed and Gasketed Fluorescent for Damp and Wet Locations (Process and Chemical Rooms)	EPCO GFF Series w/SS Latches, Simkar EN 2 or 3 w/SS Latches, Holophane ERS Series, Lithonia FSW or FHE Series, ILS Others as accepted by Owner *(Note – the use of fixtures similar to Lithonia DMR Series, Columbia LUN Series, Simkar OV450, etc. are generally prohibited due to on-going physical / performance issues associated with this type of design (limited latches retaining sealed integrity of the assembly). Fixture selection is to take into consideration lamp output, lumen maintenance, and environmental factors associated maintainability of the overall system.*
Lighting Fixtures – Fluorescent T-8 lamps, Program-Start Ballasts, Indoor dry applications	Benjamin, Philips, Keene Lithonia
Lighting Fixtures – Fluorescent T-8 lamps, Program-Start Ballasts, Indoor Hazardous Locations	Appleton Crouse-Hinds Killark
Lighting Fixtures – LED Indoor	Lithonia Philips Cree
All LED luminaires must be UL Listed (e.g. UL8753 / UL8750) and tested to IESNA LM-79 and LM-80 standards and that the results of those tests must be submitted to the Owner as part of the submittal review process. LED fixtures to be provided with a 5 year warranty covering the driver, the LED components and the luminaire.	
Lighting Fixtures – LED Outdoor	RAB Cree Philips Dialight Lithonia
Lighting Fixtures – HPS Outdoor	Holophane Infranor Devine Philips

INAW ACCEPTABLE EQUIPMENT MANUFACTURERS

Equipment Description	Manufacturers
Lighting Control - Occupancy Sensors	Sensor Switch (High Humidity / Low Temperature Type) – process & chem. Areas Leviton, Hubbell, P&S along with others mfgrs and products to be provided as determined suitable for the location and environment where installed. *NOTE: Technology (passive IR, ultrasonic, or dual) to be based on location where installed*.
Lighting Control – Daylight Harvesting and/or Special Function and Dimming	Lutron Wattstopper Day Light Controls
Control and Timing Relays (“Ice-cube” relay style)	Diversified Potter Brumfield Syrelec Allen Bradley Square D Cutler-Hammer Seimens Releco
Push Buttons, Selector Switches & Pilot Lights (30 mm minimum size devices, NEMA 4X style preferred and high-intensity LED pilot lamps)	Cutler-Hammer Square D Seimens Allen Bradley Kraus & Naimer
Definite Purpose Relays and Contactors	Cutler Hammer Square D Siemens Allen Bradley
Industrial Plugs & Receptacles	Meltric Corp. Hubbell Levitonr
PVC Coated Rigid Steel Conduit	Ocal Robroy
Fiberglass Conduit	Champion FRE
Power Generation Equipment – (Diesel engine driven units)	Cummins Caterpillar Kohler Baldor
Corrosion Resistant Wiring Devices	Woodhead

APPENDIX B

Indiana American Water Company
Winchester Water Treatment Facility

DESIGN MEMORANDUM REQUIREMENTS

The outline provided below identifies the minimum information that must be included in the Design Memorandum. The Design/Builder shall add additional information to the memorandum where appropriate to sufficiently define all critical design parameters so the Owner can understand the Design/Builder's design concept and visualize the final product.

The main section of the Design Memorandum must include project design data which was utilized in the development of drawings and specifications. This would include quantities, capacities, rates, and all other pertinent design criteria for each specific section specified in the Design Scope. A comparison of the required equipment (as calculated or as specified in the Design Scope) to the equipment selected by the Design/Builder is critical such that the Owner can understand the Design/Builder's logic in sizing facilities and selecting equipment. This information must be presented in an organized, easy to read tabular or outline format.

Provide a brief description of the water treatment approach to include

- Influent and effluent parameters
- Tankage capacities
- Equipment sizing, quantities, and capacities
- Specific process information and specific design criteria
- Operational approach to meeting effluent capacities
- Treatment residuals management

Provide a brief description of the following items for site development

- Layout of the facilities
- Site security
- Site roadways and parking
- Landscaping
- Storm water collection and drainage
- Site utilities

Provide a brief description of the following architectural items

- Structure and Arrangement
- Interior construction – to include room finishes
- Exterior construction

Provide a brief description of the following structural items

- Building structure basis for design
- Design stresses and loading criteria
- Specific geotechnical requirements

Provide a brief description of the following mechanical building systems

- Design criteria
- Plumbing system design
- Sanitary drainage, collection, and treatment systems
- Potable water systems
- Fire Protection
- Heating, ventilation and air conditioning systems

Provide a brief description of the following electrical systems

- General design criteria
- Power distribution functional requirements
- Standby Power
- Lighting requirements
- Telephone communication systems
- Fire Alarm systems
- Lightning protection

Provide a brief description of the following instrumentation and controls systems

- Control system architecture.
- Control philosophy

Along with the above information, the following shall also be included in the Design Memorandum as a minimum.

a. A hydraulic profile
b. A process schematic showing all unit processes, points of chemical application, and points of on-line analytical sampling as a minimum.
c. Chemical feed system schematics
d. Preliminary drawings showing site and building layouts, sections, and architectural treatment.
e. Any additional drawings that may further define the facility proposed by the Design/Builder.
f. An I/O list, functional descriptions, graphic displays, reports, alarm, and historical database definition.
g. A listing of major equipment required for the project including the manufacturer and model number which will be used as a basis of design. If possible, at least two other alternative manufacturers shall be identified for all major equipment for inclusion in the specifications.
h. A summary of all permits required for the project and a brief description of the requirements of each. Any permit requirements that need to be completed by the Owner should be identified.
i. A summary of any significant issues resulting from discussions with utility companies.
j. A detailed project schedule.

AMERICAN WATER

AMERICAN WATER
ENGINEERING STANDARD T-2

LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT

Prepared by:
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Version Date: April 2017

AMERICAN WATER
ENGINEERING STANDARD T-2
LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT

BACKGROUND

Most drinking water and wastewater treatment facilities require chemical addition to help meet water quality or discharge requirements or objectives. These chemicals are typically stored and fed in a concentrated form, with many being strong acids, bases, or oxidizers. Careful attention to detail in selecting materials of construction, providing prudent safety features, and following proper operating procedures is critical to preventing injurious consequences to the water consumer, company personnel, the environment, and company facilities.

The purpose of this standard is to identify the recommended features for safe and reliable liquid chemical systems. The standard provides a basic uniform approach to preventing accidental chemical releases, and should be used by consultants and water company staff involved in designing, modifying, installing, and maintaining such systems.

Some of the most explicit design requirements for liquid chemical systems for water treatment facilities can be found in the "Recommended Standards for Water Works", which is often referred to as the "Ten States Standards". Some states have their own unique requirements, while others rely on the professional engineer to design a safe system. New Jersey and Pennsylvania are examples of states that have explicit secondary containment and spill prevention requirements for chemical storage. Some examples of references for design and operating requirements for chemical storage facilities are listed below.

- Recommended Standards for Water Works (2012) and Recommended Standards for Wastewater Facilities (2014); also known as Ten States Standards.

- A Guide to the Preparation of Discharge Prevention, Containment and Countermeasure (DPCC) and Discharge, Cleanup, and Removal (DCR) Plans and Plan Renewals; New Jersey Department of Environmental Protection – Bureau of Release Prevention (2015)

- Pennsylvania Department of Environmental Protection Regulations: CHAPTER 245. ADMINISTRATION OF THE STORAGE TANK AND SPILL PREVENTION PROGRAM

The contents of American Water's standard may go beyond the minimum requirements of some state regulatory agencies in order to provide consistent protection to consumers, company personnel, water company facilities, and the environment. American Water's standard does not take precedence over applicable State requirements.

SCOPE

This standard covers the design of liquid chemical storage, feed, and containment facilities for chemicals used in treating water and wastewater. The standard is meant to be used by engineers and other experienced personnel for the basic design and modification of liquid chemical systems. Selecting proper and cost-effective materials of construction, sizing components to address the range of chemical storage and feed requirements, and providing appropriate design features to prevent siphoning are examples where technical expertise is required. Guidelines for prioritizing improvements to existing chemical storage and feed systems are also presented in this document, along with a checklist for evaluating the completeness of proposed designs.

This document is primarily targeted toward the engineering design of facilities, although operational guidance is provided on a number of topics. The safety objectives in this standard are to be addressed in the design and installation of liquid chemical systems. Alternative designs must be carefully evaluated against the standard before implementation, and must not increase the risk of accidental chemical release nor the likelihood of human or environmental exposure to the chemical.

Finally, designers must evaluate site-specific conditions when developing design criteria for a project. Large treatment plants (e.g., greater than 50 million gallons per day (mgd)) and small treatment plants (less than 1 mgd) may have unique chemical storage and feed requirements. The design of the system must fit the application. Consideration should also be given to using safer forms or types of chemicals when possible, after evaluating the potential safety benefits in light of other operational and cost impacts.

HISTORY

This standard replaces the older version of American Water's Liquid Chemical Storage, Feed and Containment (T2) Standard, which was originally published in 1993 and updated in 1996. Numerous American Water personnel contributed to this document, including from both the Operations and Engineering functions, and their contributions are very much appreciated.

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Appendix A – Liquid Chemical Feed System Design Standard Conformance Checklist
Appendix B – Standard Schematic Diagrams for Liquid Chemical Systems
Appendix C – Material Selection Guide for Chemical Systems
Appendix D – Color Coding Standard for Water and Wastewater Treatment Chemicals
Appendix E – Guidelines for Prioritizing Improvements to Existing Chemical Systems
Appendix F – Requirements for Emergency Eyewash and Shower Equipment.
Appendix G – Guidelines for Venting Polyethylene Storage Tanks
Appendix H – Example of Chemical System Design Layouts and Details
Appendix I – Miscellaneous Information

AMERICAN WATER
ENGINEERING STANDARD T-2
LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT

PART 1 - SAFETY REQUIREMENTS AND FACILITY LAYOUT

1.1 SAFETY INFORMATION

A. In accordance with OSHA's Hazard Communication Standard, effective June 2015, Safety Data Sheets (SDS) with a standardized 16-section format are to be provided for each chemical. The safety data sheets are to be available to all personnel at each facility.

B. It is recommended that appropriate safety, regulatory, and emergency response information be prominently displayed near each chemical system.

1.2 LABELING

A. Tanks, piping, valves, chemical unloading connections, and other equipment are to be labeled to make operators, maintenance personnel, and other workers aware of the chemicals being handled, and to allow for unambiguous communication for operation and maintenance procedures.

1. Pumps are to be labeled.

2. Piping should be color coded according to Ten States Standards and identified with labels indicating the chemical with arrows pointing in the normal direction of flow. Ten State Standards color coding for water treatment plants is included in Appendix D.

3. Chemical system valves must be provided with a plastic or metal identification tag. In addition to the valve number, the valve tag should include the valve size, material of construction (PVC, CPVC, 304SS, etc.), and chemical service. Valves in sodium hypochlorite service should indicate if the ball is vented. The pressure settings for relief valves and backpressure valves are to be identified.

B. Bulk and day tanks must be clearly labeled with the following:

1. Unique Tank Identification Number

2. Chemical name

3. Chemical Abstract Service (CAS) number

4. Tank capacity (in gallons)

5. Manufacturer name

6. Tank material

7. Date of manufacture

8. Fiberglass tank manufacturer's design information including resins used and applicable operating environment. If the tank is specifically designed for a particular chemical that also needs to be on the name plate

C. As of July 9, 2015, OSHA has begun enforcing the change to Globally Harmonized System (GHS) of Classification and Labeling of Chemicals as the Hazard Communication Standard (HCS). The major changes to the HCS include specific criteria for classification of health and physical hazards, labels with signal word, pictogram, and hazard statement for each hazard class and category. This information must be posted within the chemical storage area.

D. Entry doors should be labeled with room contents and should be equipped with NFPA diamond labels identifying the type of hazard and degree (numeric value).

1.3 <u>PRECAUTIONS FOR CHEMICAL UNLOADING</u>

A. The mixing of incompatible chemicals can result in an exothermic reaction with production of gases such as chlorine or hydrogen. Access to the fill connection for bulk tanks must be restricted to prevent unintentional filling or mixing of chemicals with catastrophic consequences. For example, fill connections can be placed in locked enclosures.

B. Each bulk tank must be equipped with an individual fill line.

C. If tank fill connections are not located within individual locked enclosures, then each fill line must have an individual lockable quick connect cap, with independently keyed and color coded lock to minimize the possibility of connecting to an incorrect fill port.

D. A proven housekeeping approach is to permanently or temporarily locate drip pans below fill connections to capture small volumes of chemical during unloading operations. Permanent drip pans can be provided with latching lids to avoid filling with rainwater.

E. Fill connections are to be labeled clearly. The use of the CAS number is recommended in addition to the official CAS chemical name. Common alias names, such as "caustic" or "bleach", may also be used as long as the official CAS chemical name is also prominently displayed.

1.4 EYEWASHES AND EMERGENCY SHOWERS

A. The provision of appropriate eyewashes and emergency showers to provide first aid to workers in light of the hazards of chemicals is a federal requirement found in 29 CFR, Subpart K, Standard 1910.151 Medical and First Aid. Eyewashes and/or emergency showers must be provided for all liquid chemicals where workers will routinely be exposed to the chemical. The decision whether to use eyewash or eyewash and shower depends on the hazard of the chemical and the location. It is common to provide both devices as a combination unit.

B. Eyewashes and/or emergency showers are to be located adjacent to the chemical equipment and unloading areas. Showers and eyewash stations must be clearly identified, well lit, free from obstruction, in line of sight and no further than 10 seconds travel time of the potential hazard. Emergency showers are not required at chemical injection locations. Eyewash stations should be provided near chemical injection points that require routine maintenance.

C. Operation of eyewashes and emergency showers should trigger an audible alarm with a strobe light located in a visible area. Flow switch alarm from emergency showers and eyewashes should be provided and tied to SCADA. Operations staff at some locations may want to consider sending the alarm to the security monitoring control room also.

D. Eyewashes and/or emergency showers must meet American National Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-2014 or latest version). Appendix F includes specific requirements and recommendations for emergency eyewash and shower equipment.

E. Tempered water is to be provided for emergency eyewashes and showers per ANZI Z358.1 – 2014 and OSHA guidance with a temperature between 60 ^{o}F and 100 ^{o}F. Note that 85 ^{o}F water is considered optimum for flushing of eyes.

F. It is recommended that flushing of the water supply piping to plumbed emergency showers and eyewashes be performed weekly in accordance with ANSI Z358.1-2014. Otherwise, the chlorine residual that provides disinfection will dissipate over time, and the water can become unsanitary and unsuitable for flushing of eyes and skin. Automated flushing of piping systems, with solenoid valves discharging to waste, is one way to perform flushing of supply piping on a regular basis. Individual eyewashes and showers must be flushed manually.

1.5 LAYOUT OF CHEMICAL STORAGE AND FEED ROOMS

A. It is preferred to install bulk chemical storage tanks and related equipment indoors. Indoor locations protect tanks, piping and valves, instrumentation, and pumps from weather extremes. Indoor tank locations also eliminate the challenges associated with collection of stormwater within secondary containment. Each chemical should be located within its own secondary containment area, and should be walled off from other chemicals, especially those that are highly corrosive (e.g., bleach, fluoride) or reactive/incompatible (e.g., acids, caustics, etc.).

B. Liquid chemical feeders must be located inside of secondary containment.

C. Chemical feeders should be mounted at least 30 inches above floor level so they will not be immediately inundated should a chemical or water leak occur and to promote ease of maintenance. Day tanks may need to be elevated accordingly, to provide positive head on the metering pump suction.

D. All rooms must be laid out such that tripping hazards are avoided. Any piping within the containment area that could be a tripping hazard must be provided with guards and/or step over platforms.

E. A common strategy should be employed for rooms such that safety devices (eyewashes) are located in a similar location (such as near the door) in each room.

F. Storage tanks have a finite life expectancy. Provisions should be included in the design of the building to allow for removal/replacement of bulk chemical storage tanks. Provisions may include removable skylights, roof or wall panels, or coiling doors. Knockout masonry walls are the least desirable method of replacing tanks.

G. Worker entry into tanks should be addressed through the confined space program. Entry to a tank from a top hatch is problematic and should be avoided when possible. Where entry into the tank is necessary, all safety requirements and provisions such as confined space retrieval devices should be employed. Proper clearances are required to employ retrieval equipment.

H. It is helpful to have double doors or coiling/roll-up doors for loading drums, pallets, or bags into and out of the rooms.

I. For non-bulk storage rooms, hand truck access ramp systems are discouraged. A shallow recessed area in the floor, supplied with grating to achieve a flush surface, allows for unimpeded access by drums on dollies while providing full containment for the largest container, and avoids the need to go over curbs (See Detail H2, Appendix H). Door sweeps should be used in lieu of thresholds that could interfere with hand truck/dolly operation. If access ramps are used, they should be designed with a maximum 1:12 slope.

J. For drum handling, consider an overhead beam lifting mechanism to move drums into the building.

K. Access into chemical containment areas should be by stairs with handrails up and over the wall or down into a recessed containment area. The use of ladders presents an increased safety hazard compared to stairs. Where ladders are provided, they are to comply with OSHA regulations found in 29 CFR Part 1910, Subpart D, 1910.27 Fixed Ladders.

L. Where tanks are installed outdoors, it is recommended that roofs be provided to shield the tanks from direct sunlight, and to reduce the amount of stormwater entering the secondary containment area.

PART 2 - MATERIALS OF CONSTRUCTION

2.1 GENERAL REQUIREMENTS

A. Materials used in chemical systems for tanks, piping, fittings, gaskets, hoses, protective coatings, in-situ instrumentation, etc. must be appropriately selected for highest practical level of compatibility with each specific chemical. Life cycle cost should be considered when selecting materials of construction. For example, titanium is highly resistant to sodium hypochlorite, but is not an economical material of construction for bulk storage. Recommended materials of construction for common treatment chemicals are included in Appendix C of this document and AWWA “Water Treatment Design”, 5^{th} Edition. Materials of construction should also be based on American Water engineering and operation staff experience and feedback. Chemical resistance information can sometimes be ascertained from material selection charts provided by various vendors, although the validity of the data is sometimes uncertain.

B. Special precautions must be taken when selecting materials of construction for hydrogen peroxide and sulfuric acid (90 percent concentrated and greater) as incompatible materials can result in immediate violent reactions.

C. Other materials of construction may be acceptable based on operational experience.

D. Authority to regulate products for use in, or in contact with, drinking water rests with individual states. Local agencies may choose to impose requirements more stringent than those required by the State. A standard developed under the direction of NSF, NSF/ANSI61 Drinking Water System Components-Health Effects is referenced by some states or local agencies for liquid chemical system components. The designer should check with the regulator on their policies for using NSF 61 listed components in chemical service.

PART 3 – BULK STORAGE TANKS

3.1 GENERAL REQUIREMENTS

A. Bulk storage tanks are typically used where the chemical consumption and economics justifies bulk storage over drum storage, or where the chemical being handled is particularly corrosive and handling of drums may be a safety hazard.

B. See Section 10 regarding secondary containment. Double wall tanks do not meet the intent of this standard, although they may meet the minimum regulatory requirement.

C. Storage tanks must be equipped with the following fittings:

1. Fill
2. Vent
3. Overflow

4. Discharge/outlet (also serves as drain)
5. Continuous level measuring instrument mount
6. High level switch mount
7. Gasketed hatch (top) for tank inspection
8. Fiberglass reinforced plastic (FRP) and steel storage tanks with volumes greater than 2,000 gallons (or the state/local regulatory limit) should be provided with a side manway to allow for internal inspections

D. Sight glasses with connections to the bottom of tanks are discouraged because of the potential for leaks and breakage. FRP tanks can be formed with a translucent vertical strip so the liquid level can be seen, but the liquid level can be difficult to see without artificial lighting. To make translucent strips effective, it is recommended that two (2) strips be provided, located 180 degrees apart. In addition, a nozzle located above the translucent strip can allow for artificial illumination. The liquid level can sometimes be seen through the sidewall in rotomolded tanks, but it may not be a reliable method especially for larger tanks with thicker sidewalls.

E. Connections to rotomolded high density cross-linked polyethylene (HDXLPE) storage tanks in the bottom third of the tank must be made through flexible connections to increase tank longevity and safety and comply with manufacturer warranty requirements. The flexible connections are to compensate for misalignment, absorb expansion and contraction, and isolate vibration and shock that could damage a tank. Higher level piping connections should also provide for flexibility by avoiding rigid pipe clamps/restraints/supports in close proximity to the tank. Inadequate connections can shorten the life of the tank due to stress concentration at the nozzle.

F. FRP tanks may also require care with connections to prevent adding stress to the nozzles.

G. Bulk tank's outlet should allow full drainage, or near full drainage. Some FRP tank manufacturers recommend against incorporating a false floor (encapsulated balsa wood) to pitch toward the drain. A siphon connection to the outlet allows for draining below the outlet fitting.

H. Bulk tank outlets should be sized according to the maximum transfer pump flow. Excessive velocities in the tank outlet can result in vortexing that reduces the useful volume of the tank. Internal fittings (siphon outlet) that approach the floor of the tank also help maximize the useful volume of the tank, and allow for nearly full drainage.

I. When a day tank is installed, a remotely actuated valve (normally closed) should be installed near the bulk tank outlet to keep the tank isolated except during transfer (see schematic in Appendix B). A manual butterfly valve should be mounted directly on the tank outlet followed by a flexible connector as required in Paragraph 3.1D. The actuated valve must be located immediately downstream of the flexible connection and supported separately to avoid placing excessive stresses on the tank outlet nozzle.

J. A means of access, such as a fixed ladder, should be provided to the top hatch and adjacent instrumentation. Steel and FRP tanks can be designed for staff access to the entire top of the tank by providing a safety rail around the perimeter of the tank top.

3.2 SELECTING BULK TANK CAPACITY

A. Bulk tank capacity is typically reviewed when a facility is being designed, or to evaluate the adequacy of an existing facility. Federal, state, and local regulations governing chemical storage should be considered when determining bulk storage tank capacities. It is common to have a regulatory requirement for 30 days storage, but without specific conditions of dose and flow. There may be some water quality benefit to reducing on-site chemical storage.

B. Sodium hypochlorite degrades while in storage. It is recommended that 12.5% concentration sodium hypochlorite storage be designed for 15 days of average plant flow and maximum dose, or maximum plant flow and average dose, (whichever is considered most reasonable), if allowed by regulators. The amount of storage should be balanced with the reliability of procurement and delivery, and the variability of consumption, and other factors such as other sources of supply. In addition, storage tank capacities for onsite hypochlorite generator systems typically range between two and four days, and should be based on the level of redundancy and ability to obtain and use concentrated sodium hypochlorite in the event of an equipment outage.

C. For new facilities, review at least five (5) years of historical data when available and determine the maximum month consumption. The historical data should be compared to near term growth projections (5-10 years) to determine a future maximum month of storage.

D. If historical data is not available, the designer should identify the volume of storage required for 30 days of storage at a maximum dose and average treated water flow, and also the volume required for average dose and maximum treated water flow. The 30-day total of average dose and average flow should also be computed.

E. To receive a full bulk delivery, tanks must be sized to accommodate 150 % of a bulk shipment of chemical so a facility does not have to run their tank to empty before receiving a full truckload of chemical, or risk overfilling their storage tank.

F. Review tank re-fill strategy with operations staff, as there may be a way to split a bulk load among multiple (small) facilities. Large facilities with good transportation infrastructure may be able to operate with reduced bulk storage volumes.

G. When evaluating bulk storage volume, all data in this section should be taken into account, along with the reliability of supply (supply distance, weather, road conditions), and potential for unexpected high dosages (e.g. coagulant). Final tank size should be made in consultation with operations staff, taking into account site-specific needs and factors. The designer should document the final criteria used for tank volume selection.

3.3 INVENTORY AND TANK LEVEL MONITORING

A. See Part 15 for a summary of instrumentation and controls.

B. High quality level monitoring devices and level switches, suitable for the application, are desired because of their important role in preventing a chemical overflow/spill or feed interruption.

C. A reliable and accurate means of monitoring inventory is required for bulk tanks. Ultrasonic or radar level devices are recommended for liquid level monitoring. High and low level alarms are to be provided based on the continuous level monitor. If using an ultrasonic device, the fitting installed to mount the device must be located in such a way as to prevent extraneous reflections to cause erroneous readings.

D. To prevent chemical overflow resulting from the mis-calibration of the continuous level system, an independent high-level switch indicating imminent tank overflow is also required with local audible alarms that can be heard at the filling station. The level switch must be installed/placed to facilitate ease of periodic testing and maintenance.

E. Due to the high frequency of leaks observed with the bottom fittings on storage tanks, sight glasses are not recommended on bulk storage tanks. Connections below the liquid level should be limited to a single normal outlet. Tank drain should be integrated as a tee fitting on the outlet.

3.4 OVERFLOW AND VENT REQUIREMENTS

A. Tank overflow should be provided and directed to secondary containment. In cases where the chemical has suspected corrosive or injurious vapors or mists such as hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite, the end of the overflow pipe should be provided with a water seal (trap) (see Detail H3, Appendix H2). Rubber duckbill type valves have been shown to not be vapor tight.

B. All chemicals with the potential for corrosive or injurious vapors or mists are to be vented to the exterior. The vent line must not function as the overflow.

C. Special precautions must be taken with design of tank vents for onsite hypochlorite generation systems since blowers are used to positively ventilate the tank. Consult the system manufacturer for ventilation pressure requirements and inform the tank manufacturer of the anticipated pressure conditions.

D. The design of bulk storage tank venting is critical with pneumatic transfer of the chemical from the delivery truck. Without adequate venting, the storage tank can be overstressed with release of the air charge in the tank truck at the end of a delivery. This is a concern for both FRP and rotomolded polyethylene tanks. Specific guidelines for venting polyethylene storage tanks are included in Appendix G. It is recommended that the venting guidelines in Appendix G be used to size vents for all bulk storage tanks to avoid over-pressurization. Hinged top manway hatches can supplement properly designed venting to prevent over-pressurization during the unloading process, but should not be used on chemicals with harmful vapors, such as aqueous ammonia.

3.5 TANK HOLD-DOWNS

A. Tank restraints are needed to resist seismic forces in seismically active areas. The system should be designed by the tank vendor when site-specific seismic conditions are presented in an engineering specification. The actual anchor to the concrete slab is typically designed by the design engineer. To keep the tank from moving laterally, restraints may take the form of metal clips anchored to the tank pad, but not attached to the tank.

B. Hold-downs may be needed to prevent tanks from becoming buoyant in the case of secondary containment being filled with liquid.

C. Hold-downs are needed for tanks located outdoors due to wind loadings.

D. Design specifications for chemical tanks should call for tank restraints to be designed by a professional engineer.

3.6 SODIUM HYPOCHLORITE BULK TANKS

A. American Water has had inconsistent results using polyethylene storage tanks when storing dilute and concentrated sodium hypochlorite. Linear polyethylene and cross-linked polyethylene tanks equipped with a linear polyethylene liner are acceptable for storage of sodium hypochlorite where the volume does not exceed 1,000 gallons.

B. Storage tanks for sodium hypochlorite storage greater than 1,000 gallons in size should be constructed of fiberglass reinforced plastic (FRP). The tanks must be specifically designed and constructed for sodium hypochlorite due to the aggressive nature of the chemical.

C. For the longest tank life, and protection of the contents, bulk storage tanks should be located in a cool area away from direct sunlight.

D. Sodium hypochlorite storage tanks have a shorter service life than other chemical tanks and provisions for tank replacement are essential.

E. Cleaning and flushing of sodium hypochlorite tanks annually is recommended to protect the quality of the chemical, and to minimize tank degradation.

F. Some references suggest diluting sodium hypochlorite to slow the degradation process. Experience has shown that in-tank dilution is difficult to accomplish and is not recommended for medium to large tanks at American Water facilities. Where high temperatures may promote rapid degradation, it is recommended that air conditioning of storage rooms be provided.

3.7 TANK INSPECTION RECOMMENDATIONS

A. State regulations typically govern tank inspection requirements over the life of the tank. External tank inspections, looking for obvious signs of leakage or corrosion, may be required as often as weekly or monthly. More detailed formal inspections may be required on a schedule such as every five (5) years.

B. In states without inspection requirements, it is recommended that cursory external inspections be performed monthly for all tanks larger than 100 gallons, looking for leaks at fittings, or leaks at the bottom of tanks. For tanks 2000 gallons and larger, formal inspections should be performed at intervals no more than every 5 years. The formal inspection would include draining of the tank. The details of the formal inspections should mirror industry practice, and consider the type of chemical and the type of tank construction. Records of tank inspections should be maintained.

C. Some states require inspection of chemical storage tanks when either site volumes or individual tank volumes exceed a certain threshold volume. Regulatory compliance for steel tanks is often based on following an industry standard such as Steel Tank Institute STI-SP001 for inspection requirements. For FRP tanks greater than 2,000-gallon capacity, NJDEP requires acoustic emission testing in addition to internal and external inspections. Acoustic emission testing is a non-destructive test method that is addressed in ASTM 1067 “Standard Practice for Acoustic Emission Examination of Fiberglass Reinforced Plastic Resin (FRP) Tanks/Vessels”. Acoustic emission testing can be performed with the tank in-service. Inspection of rotomolded tanks, above a certain capacity, may be required by regulation, but there is no industry consensus standard for inspection. Entry to the rotomolded tanks for inspection is usually not required.

D. Most state regulations do not require tank entry for inspections. If the state requires internal inspection, a side entry port should must be provided. While the side entry port provides better access, it can also be difficult to seal and can be a source of leakage so is only recommended if internal inspections are required. Side entry access hatches are generally not available on rotomolded tanks.

E. Tank testing requirements should be clearly identified in a spill prevention plan, and also recorded in the asset management module of SAP so they can be incorporated into the facility’s preventive maintenance plan.

F. Entry to chemical storage tanks through the top hatch is discouraged. If access is required through the top hatch, all safety aspects must be addressed in advance of the inspection. For example, a top hatch must designed with anchor points for safety/retrieval devices to facilitate fall prevention and confined space retrieval/rescue.

PART 4 – TRANSFER PUMPS

4.1 GENERAL REQUIREMENTS

A. Transfer pumps are to be provided to deliver chemical from bulk tanks to day tanks or batch tanks. Gravity flow from bulk tank to day tank is not allowed because of the high risk for overflowing of the day tank due to not achieving 100% shutoff, or from extended transfer durations at low bulk tank levels.

B. Redundant transfer pumps must be provided for disinfectants and primary coagulants, and are recommended for other chemicals. Where there is a desire to minimize the number of installed transfer pumps, a single installed transfer pump is allowed for disinfection and primary coagulants if the production facility can be taken off line for repairs or replacement. Where only one transfer pump is installed, a second pump is recommended to be held in inventory as a spare.

C. A bypass around the transfer pump is not allowed.

D. Discharge piping from the transfer pumps must be configured to prevent gravity flow or siphonage from the bulk tank. The fill piping downstream of the siphon break should be sized for gravity flow. The exception is for viscous materials like polymers where siphoning is not a concern.

E. Direct piping from the bulk tank, through the transfer pumps, to the day tank, without an air break is permitted only for viscous chemicals such as polymers.

F. For most liquid chemicals, American Water has had good success using magnetic drive sealless centrifugal pumps. Often, the impeller must be trimmed according to the specific gravity and viscosity of the chemical.

4.2 OPERATION OF TRANSFER PUMP

A. Continuous local operator supervision of the transfer process is preferred. This is usually accomplished with a hold-to-run (momentary contact) push button switch. Transfer pumps should be sized to fill the day tank within two minutes to prevent operator fatigue.

1. Note that there have been instances where hold-to-run switches were purposely defeated and spills occurred. In most of these cases, the timeframe for filling the tank was longer than two minutes due to a design or operational problem with the pump. The pump problem should be corrected as soon as possible as this condition cannot be successfully addressed with an "undefeatable" switch.

B. For day tanks larger than 100 gallons, automatic shutoff of the transfer pumps may be employed if the following conditions are met:

1. Secondary containment is provided.

2. A high level switch, a continuous level measuring device, ***and*** a spill switch in a sump are ***all*** provided and interlocked with the transfer pump to provide at least three levels of overfill protection.

C. When automatic shutoff is used, transfer pumps should be sized to complete the transfer operation within 30 minutes. Automatic shutoff of the transfer pumps should be done through SCADA based on the continuous level (or weight) full tank set point. Shutoff with the high-level switch is an abnormal condition and should not be the basis for normal operation. The provision of a second switch for pump shutoff, in addition to high level, is acceptable.

D. **Transfer pump operation must *never* be initiated automatically without operator involvement.** Also, it is strongly recommended that transfer pump operation be only initiated locally and not remotely through SCADA. This approach assures that an operator visually inspects the chemical storage facility for leaks or other malfunctions prior to transferring chemicals. However, it is recognized that remote filling of day tanks may be desirable at some remote, un-manned locations. To minimize risks associated with remote refill, the following requirements must be met:

1. Three independent overfill protection devices must be provided. Devices must include 1) a sump level alarm and 2) an independent tank high-level probe directly interlocked with the transfer pumps. The third interlock would normally be a software alarm from the continuous level or weight monitoring device or SCADA system.

2. Monthly in-person observation of chemical transfer operation must be performed and documented.

3. Quarterly testing of all overfill protection devices must be performed and documented.

4. Remote refill must be limited to facilities not required to be attended on a daily basis.

5. Monthly and quarterly testing documentation shall be audited on a regular basis.

6. Video surveillance is a useful tool to assist in monitoring the transfer process and should be considered.

PART 5 – DAY TANKS

5.1 GENERAL REQUIREMENTS

A. Day tanks are used to allow accurate determinations of chemical use, and minimize the volume of chemicals which can be accidentally discharged into the treated water. Many regulatory agencies require day tanks where bulk liquid chemical storage is provided.

B. Day tanks are required when bulk storage is provided. An exception is in large treatment plants when chemical feed can be measured with a reliable flow meter and the chemical is used in pre-treatment. Direct feeding of chemicals from bulk tanks to finished water is not allowed.

C. Day tanks must be equipped with the following fittings:

1. Fill
2. Vent
3. Overflow
4. Discharge/outlet/drain
5. Continuous level measuring instrument mount (not required if weigh scale is provided)
6. High level switch mount

7. Gasketed hatch (top) or removable top for tank inspection

D. Day tanks may be elevated on a concrete pad to enable a positive suction head to the metering pumps at all levels in the day tank.

5.2 SIZING

A. A useful tool in sizing of day tanks is to calculate 125% of the daily volumetric requirements of the maximum dose for the average daily treated water volume, and the average dose for the maximum treated water volume. Where chemical doses have a wide range, resulting in large day tanks, day tanks may be downsized and refilled more than once per day when high chemical demands occur. An overly large day tank does not allow for accurate determination of feed rate and can compromise the safety goal of day tanks. The useful storage volume of the tank should be identified, not just the nominal tank volume.

B. For remote facilities that are not visited on a daily basis, it is acceptable to size a day tank for up to 3 days of projected maximum daily usage.

C. For new facilities, the basis of design for sizing the day tank should be documented in the Engineer's Report.

5.3 INVENTORY AND TANK LEVEL MONITORING

A. Continuous level or weight monitoring is recommended, with alarms for high and low level in the day tank. Ultrasonic or radar type non-contact devices work well for measuring level, although there is a certain dead zone near the device that must be considered.

B. An independent high level switch indicating imminent tank overflow with local audible alarm must be used. The high level switch must be interlocked with the transfer pump as described in Section 4.

C. The continuous level or weight monitoring provides a basis for inventory control. It is possible to use loss in weight, or loss in level calculations to calculate chemical consumption as a control strategy.

D. Sight glasses with connections to the bottom of tanks are discouraged because of the potential for leaks and breakage. FRP tanks can be formed with a translucent vertical strip so the liquid level can be seen, but the liquid level can be difficult to see without artificial lighting. To make translucent strips effective, it is recommended that two (2) strips be provided, located 180 degrees apart. Also a nozzle located above the translucent strip can allow for artificial illumination. The liquid level can sometimes be seen through the sidewall in rotomolded tanks, but it may not be a reliable method especially for larger tanks with thicker sidewalls.

5.4 OVERFLOW AND VENT REQUIREMENTS

A. The day tank fill line must be piped and vented to prevent the possibility of gravity flow or siphonage from the bulk tank to the day tank. Direct piping is allowed only for viscous chemicals such as polymer.

B. When sizing and installing the day tank overflow, the liquid level must not be allowed to rise such that the hydrostatic head exceeds the tank's design rating. This can typically be accomplished by making the overflow pipe at least two (2) inches larger than the fill line, i.e., 4" overflow for a 2" fill. Most tanks are atmospheric; meaning no amount of surcharge is acceptable.

C. Tank overflow must be provided and directed to secondary containment. In cases where the chemical has suspected corrosive or injurious vapors or mists, such as hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite, the end of the overflow pipe should be provided with a water seal (trap) (see Detail H3, Appendix H). Rubber duckbill type valves have been shown to not be vapor tight.

D. All chemicals with the potential for corrosive or injurious vapors or mists must be vented to the exterior.

PART 6 – METERING PUMPS

6.1 GENERAL REQUIREMENTS

A. Where facilities cannot be taken off line, redundant installed metering pumps are required for disinfectants and primary coagulants, and recommended for all other chemicals. Where only one pump is installed, a second pump is recommended to be held in inventory as a spare.

B. Metering pumps should be located near the day tanks. Diaphragm metering pumps have the ability to operate with a suction lift, but are more reliable with a flooded suction. While pumps could be installed at or near floor level, metering pumps should be elevated at least 30-inches off the floor to facilitate operation and maintenance, as well as reduce the chance of submergence if a leak occurs. Pumps are to be installed so that adequate suction conditions are maintained. It may be necessary to elevate day tanks to maintain adequate pump suction conditions.

C. Diaphragm metering pumps can have a wide flow range, with both stroking frequency (speed) and stroke length being adjustable. Pumps that only have variable speed, such as peristaltic pumps, have limited flow range (turndown).

D. A calibration cylinder must be provided on the suction side of the metering pumps to permit rapid and accurate determination of the pump's delivery rate. The top of the calibration cylinder must be piped back to the day tank to prevent a chemical spill should overfilling occur.

E. Note that diaphragm metering pump output is typically accurate and linear with respect to stroke length and stroking speed. However, the output typically goes to zero at 1-2% speed, so this must be accounted for when operating at low pump outputs.

F. Some regulators require splashguards adjacent to metering pumps. If not required by the regulator, this feature should be discussed as part of the facility design process.

G. Peristaltic type metering pumps are gaining acceptance for low pressure (< 30 psi) chemical feed applications, typically in the treatment plants. They inherently prevent siphoning because the tubing is always compressed. They also can pump the gas bubbles that are present in sodium hypochlorite systems without losing prime.

H. Some American Water facilities have had good success with gear pumps for sodium hypochlorite, or as transfer pumps for polymer. Gear pumps can operate at elevated pressures, but cannot tolerate grit or suspended solids.

6.2 SIZING

A. Metering pumps must be fully capable of operating over a feed range corresponding to max day/max dosage down to min day/min dosage. If necessary, a second set of pumps must be provided to feed chemicals accurately at low flow ranges.

6.3 PUMP CONTROL

A. Metering pump control includes start/stop and feed rate adjustment. Start/stop control must have safeguards to prevent feeding of chemicals without water flow (such as at a well station). Due to the frequency of overfeed, some regulatory agencies require two or three levels of protection.

B. The use of a single parameter to indicate flow to start/stop metering pumps is not allowed at partially attended or remotely operated facilities. Auxiliary relay contact outputs from a motor starter can be one of the multiple safety interlocks, when coupled with another positive means of flow detection. Treated water flowmeters can be used as one method to stop and start chemical systems. When there is no flow indicated by the flow meter, metering pumps must stop and remain in the off mode position. “Paddle-type” flow switches can report flow, but may be unreliable in some applications. A position switch on a check valve with external lever is a reliable indicator of flow. Continuous analyzers used for water quality monitoring downstream of chemical addition points, or detecting excessive loss of weight/level in the day tank can also be used as secondary “stops” for metering pumps for some chemicals. When excessive chemical feed is detected, an alarm is to be sent to the operator. If the alarm is not addressed within a prescribed time limit, the system may require a shut-down. Each system should be capable of stopping the pump even if there is a total failure of the other system.

C. Provisions should be included to allow manual operation/control of the metering pumps for equipment maintenance and troubleshooting. However, special care must be taken to ensure that only automatic mode with properly functioning safety interlocks is used during unattended operation.

D. Diaphragm metering pumps typically have capacity adjustment by varying speed, and stroke length (volume per stroke). For chemicals that are fed at a relatively consistent dose, remote control of speed alone is typically sufficient. Some installations may require remote control of both speed and stroke length.

PART 7 – PIPING AND TUBING

7.1 GENERAL REQUIREMENTS

A. Piping and tubing are needed to convey treatment chemicals from the point of delivery to the bulk storage tanks, to the feed equipment, and to the point of application.

B. The chemical piping system must provide adequate carrying capacity, and comply with the desired pressure and temperature ratings of the system.

C. It is good design practice to minimize the length of chemical feed piping, but it is not always possible. Underground chemical piping is costly and typically has higher maintenance requirements due to leaks and blockages. Providing spare feed lines to primary application points is good design practice.

D. In most cases, chemical piping and tubing will require replacement numerous times in the life of a facility, and should be installed in such a manner as to allow for replacement.

E. Bulk tank fill piping must be properly braced and supported because it is subject to shaking near the end of each bulk tank delivery (pneumatic transfer method). Typically the piping is at a high elevation, above the top of the bulk tanks. The piping should be pressure tested at time of installation. It is recommended that personnel stay away from overhead the fill piping during unloading as a pipe break could expose them to large quantities of chemical.

F. See Part 10 for secondary containment requirements.

7.2 PVC AND CPVC PIPING

A. Schedule 80 PVC piping is acceptable in many, but not all, rigid liquid chemical piping systems. Ammonium hydroxide (aqua ammonia), hydrogen peroxide, and sulfuric acid (above 94%) are not compatible with PVC and CPVC. Refer to Appendix C for recommended materials of construction.

B. CPVC should be considered for applications where temperatures exceed 90°F.

C. PVC and CPVC pipe should be joined by solvent welding. Large PVC/CPVC unions are difficult to seal so flanged connections should be used instead of union connections for pipe diameters of three inches (3 in) and greater.

D. Threaded joints are not as strong as solvent welded joints and there is a tendency for some chemicals to weep through the joints. The tendency for weeping is increased with higher operating pressures. Threaded joints are to be minimized, especially for caustic soda, sodium chloride brine, sodium hypochlorite, and sodium permanganate.

7.3 TUBING AND HOSES

A. Flexible plastic tubing can be used where continuous runs are required. The plastic tubing should be accessible and be easily replaced (see Detail H4, Appendix H).

B. Chemical hoses can be used when transitioning from rigid piping to equipment and diffusers. They can also serve as primary piping inside a rigid casing pipe.

C. When changing piping direction, gradual radius sweeps or concrete vaults are needed to allow for installation and removal of tubing and hoses. Sharp bends have proven to cause failure of tubing and hoses during installation.

D. Hoses may need support for strain relief at injection points.

PART 8 – VALVES

8.1 GENERAL REQUIREMENTS

A. Diaphragm metering pumps require at least 15 psi backpressure to function properly. If sufficient backpressure is not continuously available, then backpressure valves should be used to maintain a minimum of 15 psi backpressure to ensure accurate delivery. The valves also prevent siphonage or gravity flow of chemicals from the day tank through the metering pumps. Backpressure valves contain a diaphragm and spring, and are reliable; however, preventive maintenance and periodic testing are needed.

B. In situations where siphoning, or gravity flow, is possible, such as pumping chemical to a below grade clearwell, two backpressure valves should be placed in series to provide increased level of anti-siphon protection. The backpressure valve closest to the pump should be set at a higher pressure than the second backpressure valve. A vacuum breaker that opens to atmosphere is often used in plumbing systems (water) to prevent siphoning, but is not recommended in chemical systems due to the potential for leaks.

C. Pressure relief valves must be used where positive displacement metering pumps are capable of producing sufficient pressure to cause damage. The pressure relief valve must be installed upstream of the first valve on the metering pump discharge. Isolation valves are not allowed between the metering pump and the pressure relief valve. The discharge of the pressure relief valve should be directed to the day tank or drum, or to the pump suction line upstream of individual isolation valves if only a single day tank is present. The practice of directing the pressure relief valve discharge to the containment sump allows the discharge to be visually identified, but results in a release that must be addressed, and is not recommended.

D. A “Four-Way Valve” which provides anti-siphon, backpressure, priming, and pressure relief action is commercially available for low capacity applications and can be used to replace separate pressure relief and backpressure valves.

E. Large PVC/CPVC ball valves can be difficult to operate. It is suggested that butterfly valves be used in sizes 3 inch and larger.

F. Valves must be accessible for operation and testing. It is recommended that the piping design and installation not allow valves to be located more than five (5) feet above finished floor.

8.2 BACKPRESSURE VALVE TESTING

A. Backpressure valves contain a spring and diaphragm. If the backpressure valve becomes clogged, it may not perform properly, or the flow through the valve may be blocked. The functioning of the valve cannot be determined by visual inspection since there are no external moving parts. Valve testing procedures used to determine the integrity of a particular valve diaphragm and seat are discussed below:

1. The functioning of backpressure valves can be determined by observation of an upstream and downstream pressure gauge. The upstream pressure gauge should read higher than the downstream gauge.

2. When backpressure valves serve to prevent gravity flow (e.g. siphon), then it is possible to test the valve in-situ, or on a test bench, by creating a downstream vacuum condition using a hand vacuum pump (see Figure I-1 in Appendix I). Any leakage through the valve should be trapped in the receiver, as the liquids would damage the vacuum pump. Testing of anti-siphon valves is recommended at least once per year.

8.3 BALL VALVES FOR SODIUM HYPOCHLORITE

A. Ball valves in sodium hypochlorite service are to have vented balls with a 1/8 inch diameter hole located in the ball on the downstream side to relieve internal pressurization caused by degradation of the sodium hypochlorite.

PART 9 – FEEDING FROM DRUMS

9.1 GENERAL REQUIREMENTS

A. Chemicals may be fed directly from non-refillable drums in low capacity systems.

B. Where drums are used, it is recommended that proper drum handling equipment be provided to minimize the risks associated with moving drums. Such equipment includes hoists, pallet trucks, and dollies. Training should be provided on the proper operation of the equipment.

C. As with day tanks, it is prudent to limit the volume of chemical directly connected to the water supply in case of accidental release. A day tank is to be used if the drum represents more than a seven-day average flow-average dose supply.

D. It may be convenient to have a permanent "day" tank, and use an electric drum pump to transfer from drums to the day tank. This approach minimizes the need to move drums around, including on and off the scale.

E. Drum mixing devices must be provided when applicable.

9.2 INVENTORY AND TANK LEVEL MONITORING

A. A weighing scale or reliable level monitoring device should be used to monitor the quantity of material remaining in the drum. The system should also be equipped with a low weight alarm. An independent high level switch is not required.

9.3 VENTILATION REQUIREMENTS

A. Adequate ventilation should be provided for drum feed areas. Separate rooms may be necessary for fuming chemicals such as hydrofluosilicic acid.

PART 10 – SECONDARY CONTAINMENT

10.1 GENERAL REQUIREMENTS

A. Secondary containment must be provided for all bulk tanks, day tanks, batch tanks, metering pumps, transfer pumps, and chemical unloading areas. To the extent possible, bulk tanks and day tanks should be in the same containment.

1. Most chemical leaks occur between the bulk tank and the metering pumps. In some areas, the minimum regulatory requirements may allow double wall tanks in lieu of providing secondary containment for all of the facilities listed above, but double wall tanks, by themselves, do not meet American Water's requirement for secondary containment.

B. Minimum secondary containment volume is to be determined based on 110 percent of the largest storage tank capacity within the containment area plus allowances for fire sprinkler water, stormwater contribution, or reasonable freeboard as appropriate. State or local regulations may dictate the amount of capacity necessary for secondary containment.

C. All metering pump suction piping should be located in the containment area.

D. The secondary containment structure should be protected with a coating or liner if the chemical is corrosive to the containment structure based on the expected duration of contact. A prime example of a corrosive chemical that would require a coating or liner is hydrofluosilicic acid within a concrete containment area. Appendix C includes a recommendation for when concrete containment areas should be equipped with a chemical resistant coating/liner.

E. Penetrations of conduit and piping through containment walls or floors is not permitted, and notes on the engineering drawings should address this prohibition. Chemical resistant coating systems should be touched up after installation of drilled anchors used for tank restraint systems, pipe supports, etc.

F. Secondary containment must also be provided for all drums/carboys. The containment volume should hold the larger of 1) 110 percent of the contents of the largest drum, or 2) 10 percent of all drums in storage. Portable containment skids are acceptable if they are capable of containing the full contents of the drum, although bladder style skids should be avoided if possible due to long term integrity concerns.

G. Secondary containment should be provided for buried chemical solution lines to minimize the potential for accidental releases to the environment. Secondary containment for reinforced flexible tubing should be provided with schedule 80 solvent welded PVC, CPVC or continuous HDPE piping. Refer to Detail H4, Appendix H for recommended standard.

H. Where chemical feed lines are buried, it is common to have concrete vaults at intermediate locations to allow for changes in direction, or have access for replacement of chemical tubing. Likewise, concrete vaults may be used where the chemical is injected into the water pipeline. While watertight underground vaults are the goal of designers, vaults are rarely water tight in practice. These are important assets and should be inspected on a regular frequency, at least monthly. It is recommended that liquid level switches be provided in chemical piping vaults, with high level indication to SCADA. A local red/green alarm light can provide rapid indication of a vault with high liquid level. Sumps should be provided in the base of the vault to allow for draining of water, or chemical, when required. Refer to Part 14-Provisions for Maintenance for additional guidance on sumps.

I. Secondary containment for exposed chemical feed lines within buildings is not required because the building should provide an adequate level of containment, leaks are readily evident, and chemical feed flow rates are generally low. However, additional protection (e.g., double-walled pipe, flexible tubing inside a larger diameter PVC pipe, or drip tray system) should be provided for chemical lines where the lines are located near doorways. Secondary containment is not required for lime slurry or powdered activated carbon slurry.

J. Floor drains are not allowed in secondary containment areas. As mentioned elsewhere in this document, a sump within the containment area is a useful feature that provides a common point to monitor for leaks, and for maintenance. Refer to Part 14 – Provisions for Maintenance for additional guidance on sumps.

10.2 CHEMICAL UNLOADING AREA CONTAINMENT

A. Minimum secondary containment volume for bulk chemical unloading areas is to be determined based on the volume of the largest chemical delivery tank truck plus freeboard. The designer shall evaluate local and state regulations, and use professional judgement in determining freeboard. USEPA suggests, but does not require, sufficient freeboard to contain 24 hours of precipitation from the 25-year design storm. The designer is to explicitly identify the criteria used in the Design Memorandum.

B. If chemical deliveries are infrequent, then secondary containment volume can be based on an estimated spill rate and duration. The designer shall identify the basis for stormwater contribution.

C. Portable containment systems may be used on an interim basis until permanent containment systems can be completed.

PART 11 – DILUTION WATER

11.1 GENERAL REQUIREMENTS

A. Continuous dilution water, after the metering pump, is sometimes recommended to improve dispersion at the feed point, to dilute the concentrated chemical to a more practical concentration, or where the chemical output is very low. An indicator device such as a residential type positive displacement meter should be provided immediately upstream of the chemical injection point to provide positive flow indication.

B. Any water supply connected to a chemical system must have proper backflow protection. A reduced pressure zone (RPZ) type device is required for the building water supply to chemical systems. Parallel RPZ devices are required where the flow of water cannot be interrupted. RPZ discharge to chemical containment is prohibited because of the potential high rate of discharge of water.

C. At each chemical system connection to water, some form of backflow prevention is needed. For filling of batch tanks, an air gap or a vacuum breaker may be used. At each chemical system, the minimum level of protection should be a check valve.

D. At each chemical system connection to water within secondary containment, a solenoid valve should be provided to allow for remote shutoff in the event of a water leak within a containment area.

E. At each chemical system connection to water, a high pressure switch should be provided to indicate that the line may be clogged and there is potential for the chemical to be pumped backwards through the water line. Activation of the switch is to send an alarm to SCADA.

F. Low concentrations of iron or manganese in the water can cause rotameters or sight flow indicators to become opaque. The use of residential type flow meters can be a cost effective and reliable flow indicator with low maintenance requirements.

11.2 SOFTENED WATER

A. Softened water is highly recommended when diluting high pH chemicals such as ammonium hydroxide, sodium hydroxide, and sodium hypochlorite to minimize scaling (rapid scaling) of chemical feed lines. Total hardness less than 10 mg/l (as $CaCO_3$) is desirable and achievable by ion exchange softening.

PART 12 – LEAK DETECTION

12.1 GENERAL REQUIREMENTS

A. Chemical feed systems should have a sump within the secondary containment area equipped with a level switch to signal the occurrence of a leak. It is important that personnel be alerted of a leak as soon as possible.

B. Further, it is recommended that the sump mounted leak sensor be electrically interlocked with the isolation valve on the bulk storage tank, and the transfer pumps. Upon detection of a leak the valve should close and transfer pumps should stop, until the leak condition is locally acknowledged. Metering pumps can continue to operate.

PART 13 – CONTINUOUS ANALYZERS

13.1 GENERAL REQUIREMENTS

A. Water quality should be monitored downstream of the chemical addition point to protect the consumer from accidental chemical over- or under-feeds. For strong acids and bases, continuous pH monitoring must be employed to provide warning of excessive chemical feed. Chlorine residual must be monitored to ensure that the correct disinfectant concentration is present. Other online analyzers such as phosphate, fluoride, and ammonia may also be desirable.

13.2 WARNING SYSTEMS

A. In a manned station, alarms from these analytical devices should warn the operator through SCADA so appropriate countermeasures can be taken.

B. In an unmanned facility, alarms should be provided to alert the operator via SCADA or autodialer of a potential problem, and consideration should be given to taking facilities offline in response to an overfeed or underfeed alarm.

PART 14 – PROVISIONS FOR MAINTENANCE

14.1 GENERAL REQUIREMENTS

A. Provide means for draining chemical piping to allow for maintenance. Connections should also be available to flush suction and discharge chemical piping. Discharge piping flush connections should be downstream of all special valves. Draining and flushing procedures should be documented in Standard Operating Procedures. Flush water and flushing connections should be provided when the chemical is compatible with water.

B. Facilities must have the capability to drain chemical storage tanks. Temporary hose and pumping equipment may be necessary to transfer the chemical out of the secondary containment area to an intermediate tank.

C. Provisions for disposal of cleaning/wash down and safety shower test water within secondary containment areas should be considered in the design phase of improvements. While an automatic sump pump would defeat the purpose of secondary containment, a manually operated sump pump powered from a SCADA-controlled 120-volt outlet with a short duration timer (e.g., 10 minutes), triggered by a local pushbutton switch, may be provided and connected to the sanitary sewer for this purpose. The pump must only be used when water/liquid in the sump is acceptable for discharge. Testing of the liquid, such as pH, should be performed prior to discharge. A similar procedure can be used for pumping out vaults for buried piping.

D. Where tubing is used, it must be easily accessible and removable for replacement.

E. Valves must not be placed at an elevation of more than 5 feet above finished floor. It is recommended that this note be included on all piping design drawings as an instruction to the contractor.

F. It is common for chemicals to be injected into a water main under pressure. The details of the injection assembly are critical because of the need for proper dispersion of the chemical, avoiding corrosion at the site of injection (internal and external), and allow for safe removal of the injection stab tube for cleaning. It is typical to provide a brass corporation that is threaded to the water pipe, or to a saddle attached to the water pipe. The use of a saddle has many advantages. The corporation acts as a shutoff valve when the stab tube is removed. It is important to restrain the stab tube, using an appropriately sized chain or double chain, as the tube is removed. It is common for PVC and CPVC to be used as the stab tube, and the tube to penetrate one-third of the diameter of the pipe. Metal stab tubes, are preferable to plastic stab tubes when the length exceeds about 8 inches because long plastic tubes can break due to fatigue. Non-removable stab tubes are a simpler device and may be appropriate where the chemical does not tend to form blockages. A leading supplier of injection assemblies is Saf-T-Flo.

G. All instrumentation and valves must be accessible for maintenance and repair. If temporary ladders are to be used to access equipment, then there must be sufficient space for correctly positioning the ladder and accessing the equipment in a safe manner in accordance with OSHA requirements.

PART 15 – INSTRUMENTATION AND CONTROL

15.1 GENERAL REQUIREMENTS

A. Instrumentation and controls are addressed at multiple locations in this document and are summarized in this part.

B. Typical chemical storage and feed process flow diagrams are provided in Appendix B. Designers typically use the process flow diagram as the basis for preparation of Piping and Instrumentation Diagram (P&ID) type drawings. The P&ID drawings should be carefully reviewed early in the design.

C. It is typical to periodically have minor chemical discharges near the metering pumps during routine operation and maintenance. It is recommended that control and electrical panels and devices be purposely kept away from metering pumps, minimum of 36 inches, to avoid exposure to routine chemical leaks.

15.2 LEVEL CONTROLS

A. Continuous level instrumentation is required to monitor bulk tank level. Non-contact ultrasonic or radar devices, mounted on top of the tank, away from the fill connection, have proved to be reliable and accurate. Close attention must be paid to positioning these devices to prevent "ghost" signals from creating nuisance alarms. High level alarm shall sound at the fill station.

B. For day tanks, level is to be monitored directly or indirectly using non-contact ultrasonic or radar devices, electronic weigh scales. In some cases, pressure transmitters may be used.

C. A level switch, independent of the continuous level instrumentation, is to be located in bulk storage tanks and day tanks to identify when the liquid level is near the overflow level. The high-level switch should be interlocked to visual and audible alarms, connected to SCADA. Bulk tank high-level switch shall alarm at the fill station. The high-level switch in day tanks is to be interlocked with transfer pumps.

D. For day tank installations where continuous level instruments may not be reliable during filling (such as small tanks), a dedicated level switch can be used to terminate a fill cycle.

E. Level switches are to be provided to sense a high liquid level in secondary containment sumps and provide alarm indication through SCADA.

F. Level switches should be provided in buried piping vaults that are providing secondary containment. Local alarm lights (red/green) can provide rapid indication of a high level.

15.3 CHEMICAL FLOW METERING

A. Metering the flow of liquid chemicals is difficult and rarely performed because the flows are typically low, the chemicals are corrosive, and flows may occur in a pulse type manner.

B. No specific recommendations for flow meters are made in this document. The day tank often serves as an adequate "flow meter" when changes in level or weight are calculated over a discrete time period.

C. When a chemical flow meter is being considered, a number of checks should be made prior to implementation. For example, the range of the flow meter should be verified against the project requirements, the viscosity of the chemical should be checked against meter capabilities, and the pressure rating of the meter should be verified. The meter components should be resistant to the chemical. Provisions for verifying accuracy over the life of the unit should be included in the design.

15.4 PUMP AND VALVE CONTROLS

A. Metering pump controls are discussed in Section 6.3.

B. Transfer pump controls are discussed in Section 4.2. The high level switch in day tanks and the sump leak alarm must be hard-wired to the starter for the transfer pump to provide certainty of pump shut-off on high level. Stopping the pump on “full” level using the continuous level signal through SCADA is acceptable.

C. Actuated valves on the outlet of bulk storage tanks may use electric motors or pneumatic actuators. Full open and full closed limit switches are to report position back to SCADA and local control panel. Actuated outlet valves on bulk tanks should close automatically if a high level leak alarm is detected.

15.5 CONTROL PANELS

A. A local control panel is to be provided at the bulk fill area (typically outdoors) to provide important information that can minimize the potential for tank overflows during chemical unloading. The control panel is to indicate the percent full status of each bulk storage tank. The control panel should show the position of the spill containment valve, if valve is equipped with a limit switch. The fill control panel is to be equipped with an alarm beacon and audible alarm horn to signal when a bulk tank high level alarm is triggered. A silence pushbutton is to be provided, but an alarm indicator beacon is to continue to show if a high tank level alarm is active. A typical panel is shown in Detail H5, Appendix H.

B. A local control panel is to be provided for each bulk chemical/day tank/transfer system. The control panel is to present tank level or weight, status of transfer pumps and actuated valves, pump selector switch, and pump start/stop pushbuttons. The control panel will also have visual and audible alarms. Typical panels are shown in Details H6 thru H8, Appendix H.

15.5 SCADA CONTROL

A. It is expected that SCADA will continuously monitor chemical inventories. SCADA can also use algorithms to calculate usage by the loss in weight or level in day tanks.

B. SCADA will present status of pumps and valves.

C. SCADA is not to be used to automatically refill day tanks. However, remote operator-initiated refill of day tanks is permitted when all safety alarm interlocks are in place and properly maintained/tested as previously described.

D. All alarms are to be sent to SCADA and logged.

END

Appendix A

Liquid Chemical Feed System Design Standard Conformance Checklist

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		SUB SECTION	YES	NO	N/A	COMMENT
1.	**SAFETY REQUIREMENTS AND BUILDING LAYOUT**					
1.01	Are Safety Data Sheets (SDS) available to all personnel?	1.1				
1.02	Is wall space reserved for display of safety information?	1.1				
1.03	Are pumps labeled?	1.2				
1.04	Is piping color coded according to Ten State Standards ?	1.2				
1.05	Is piping identified with labels indicating the chemical, and arrows pointing in the normal direction of flow? Labels are required.	1.2				
1.06	Are chemical system valves provided with an ID tag?	1.2				
1.07	Are pressure relief and backpressure valves labeled with pressure settings?	1.2				
1.08	Are storage tanks labeled with signage identifying usable capacity of the tank, contents of the tank, and chemical hazards? See Standard.	1.2				
1.09	Are facility entry doors labeled with NFPA diamond labels?	1.2				
1.1	Are separate bulk tank fill pipelines and connections provided?	1.3				
1.11	Are fill connections for bulk tanks provided with independently keyed locked enclosures? Or locked fill caps?	1.3				
1.12	Are fill connections for bulk tanks labeled including CAS number?	1.3				
1.13	Are drip pans provided at fill connections for housekeeping?	1.3				
1.14	Are eyewashes and emergency showers provided for all liquid chemicals?	1.4				
1.15	Are eyewashes and emergency showers located adjacent unloading areas?	1.4				
1.16	Do eyewashes and emergency showers meet American National Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-2014 or latest version)?	1.4				

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		SUB SECTION	YES	NO	N/A	COMMENT
1.17	Is an alarm beacon and connection to SCADA provided?	1.4				
1.18	Is tempered water (60 deg to 100 deg F) provided for emergency eyewashes and showers?	1.4				
1.19	Is there a means to flush stagnant piping on a weekly basis?	1.4				
1.20	Are chemicals isolated within separate secondary containment areas?	1.5				
1.21	Are walls provided between chemical areas?	1.5				
1.22	Are chemical feeders within secondary containment?	1.5				
1.23	Are there tripping hazards (such as conduits, piping, etc)?	1.5				
1.24	Is there a means to replace tanks? How?	1.5				
1.25	Will workers be required to enter the top hatch of a tank? If so, are all required confined space equipment provided in compliance with confined space rquirements?	1.5				
1.25	Are properly sized doors provided where drums, pallets, IBC/totes are handled?	1.5				
1.26	Has a recessed containment area been considered where drums or IBC/totes are handled so grating is flush to concrete floor?	1.5				
1.27	Where ramps are provided, are they a maximum slope of 1:12?	1.5				
1.28	Has an overhead beam been considered for drum handling?	1.5				
1.29	Is ingaress and egress for secondary containment areas safe with stairs and handrails? Stairs preferable to ladders.	1.5				
1.3	For outdoor tanks, has a sunshade been considered to prolong tank life, minimize heating of tank contents, control stormwater accumulation?	1.5				
2.	**MATERIALS OF CONSTRUCTION**	**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
2.01	Do the materials of construction for tanks, piping, pumps, and valves agree with Appendix C?	2.1				
2.02	Does the chemical have unique properties that must be considered (such as hydrogen peroxide or concentrated sulfuric acid)?	2.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
2.03	Is there local operational experience on materials of construction?	2.1				
2.04	Does the Regulator have NSF 61 requirements for selection of chemical equipment? If so, have selections been made accordingly?	2.1				
3. BULK STORAGE TANKS		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
3.01	Has bulk storage been considered to minimize handling of drums and IBC containers?	3.1				
3.02	Are double wall tanks proposed in lieu of secondary containment? If so, why? Reconsider the benefits of locating tanks within secondary containment per this Standard.	3.1				
3.03	Is a side manway provided for FRP tanks that require entry for internal inspection?	3.1				
3.04	Are sightglasses provided? Are they protected from damage? Sightglasses are not recommended for bulk tanks.	3.1				
3.05	Are flexible connections provided for pipe connections at the lower 1/3 of the tank wall for polyethylene tanks ?	3.1				
3.06	Does the tank allow for full drainage, or near full drainage with a siphon outlet?	3.1				
3.07	Is the tank outlet sized to minimize vortexing at the maximum transfer pumping rate?	3.1				
3.08	Is a normally closed remotely actuated discharge valve installed on or near the tank outlet?	3.1				
3.09	Is the remotely actuated discharge valve supported independently of the tank?	3.1				
3.10	Is a manual valve provided (butterfly preferred) upstream of the remotely actuated valve?	3.1				
3.11	Is a ladder provided to access the top of the tank?	3.1				
3.12	Has the desired storage capacity been evaluated from different perspectives? (e.g. max dose, avg day demand, etc)	3.2				
3.13	Are bulk tanks sized to accommodate at least 150 % of a bulk shipment of chemical?	3.2				
3.14	Has local Operations been consulted with respect to splitting partial bulk loads with other sites?	3.2				

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		SUB SECTION	YES	NO	N/A	COMMENT
3.15	Are there unique supply factors that may alter storage volumes (limited road access, nearby suppliers, etc)?	3.2				
3.16	Is continuous level monitoring provided?	3.3				
3.17	Is an independent high level switch provided?	3.3				
3.18	Are high level alarms provided at the unloading station and near the tank?	3.3				
3.19	Is tank overflow directed to secondary containment?	3.4				
3.20	Is a rubber duckbill valve, or a water trap, used to seal the overflow?	3.4				
3.21	Are tanks vented to the outdoors (corrosive, fuming, mists/aerosols during filling)?	3.4				
3.22	Is the venting system consistent with the discharge of air at the end of a chemical delivery? Are the vent lines sized in accordance with Appendix G?	3.4				
3.23	Are restraints provided for seismic conditions? Designed by a P.E.?	3.5				
3.24	Are restraints provided for outdoor tanks?	3.5				
3.25	Are sodium hypochlorite tanks constructed of FRP at sizes greater than 1,000 gallons?	3.6				
3.26	Is sodium hypochlorite storage protected from direct sunlight?	3.6				
3.27	Has air conditioning of the storage room for sodium hypochlorite been considered in hot climates?	3.6				
3.28	Are the state and Company requirements for tank inspection documented?	3.7				
3.29	Does the tank have access for inspection?	3.7				
4. TRANSFER PUMPS		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
4.01	Where bulk tanks are used, are transfer pumps provided to deliver the chemical from the bulk tanks to day tanks?	4.1				
4.02	For disinfectants and primary coagulants, are redundant transfer pumps provided?	4.1				
4.03	Is the discharge piping from the transfer pumps configured to prevent gravity flow or siphonage from the bulk tank?	4.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
4.04	Is the fill piping downstream of the siphon break sized for gravity flow?	4.1				
4.05	Are magnetic drive, non-metallic, constant speed pumps proposed?	4.1				
4.06	Does the pump impeller require trimming to avoid overload due to viscosity and/or specific gravity?	4.1				
4.07	To prevent operator fatigue, are transfer pumps sized to fill small day tanks within two minutes?	4.2				
4.08	For day tanks larger than 100 gallons, are means provided to automatically shut off the transfer pumps through SCADA and hard wired controls?	4.2				
4.09	For transfer pumps that are configured to shutoff automatically, are the pumps sized to complete the transfer operation within 30 minutes?	4.2				
4.10	For transfer pumps that are configured to shutoff automatically, are the following safe guards provided : secondary containment, high level switch, continuous level measuring device, and a spill switch in a sump, all interlocked with the transfer pump?	4.2				
4.11	Is remote operation of transfer pumps proposed or practiced?	4.2				
4.12	With remote operation of transfer pumps, verify the following features and management processes are present:	4.2				
4.13	a) Sump level sensor and alarm; Independent high level switch interlocked with pumps; software alarm from continuous level or weight.	4.2				
4.14	b) Monthly in-person observation of transfer operation; documented.	4.2				
4.15	c) Quarterly testing of all overfill devices; documented	4.2				
4.16	d) Remote fill limited to facilities not attended on daily basis	4.2				
4.17	e) Process for reviewing monthly and quarterly testing program	4.2				
4.18	f) Has video surveillance during transfer been considered?	4.2				
5. DAY TANKS		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
5.01	Are day tanks provided with bulk tanks? If not, why not?	5.1				
5.02	Does the level of the day tank provide positive suction to the metering pumps?	5.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
5.03	How was the day tank volume determined? Was the useful volume of the tank considered?	5.2				
5.04	For a remote site, is the tank sized for more than 3 days of maximum use? Three days is the maximum allowed.	5.2				
5.05	Is continuous level or weight monitoring provided?	5.3				
5.06	Is an independent high level switch provided?	5.3				
5.07	Is programming provided to calculate rate of loss in level or weight ?	5.3				
5.08	Are sightglasses provided? Are they protected from damage? Sightglasses are not recommended.	5.3				
5.09	Is the fill line piped to avoid siphoning or gravity flow from the bulk tank?	5.4				
5.10	How was the overflow pipe sized? Is it larger than the fill line? Was the maximum rate of the transfer pump considered?	5.4				
5.11	Is daytank overflow directed to secondary containment?	5.4				
5.12	How is the overflow sealed to prevent discharge of vapor to the room?	5.4				
5.13	Is the day tank vented to the outdoors?	5.4				
6.	**METERING PUMPS**	**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
6.01	Are redundant metering pumps provided for disinfectants and primary coagulants?	6.1				
6.02	Are metering pumps located near the day tank?	6.1				
6.03	Are metering pumps installed at least 12-inches off the floor, (30 inches preferred) to facilitate operation and maintenance?	6.1				
6.04	Are metering pumps installed so that adequate suction conditions are maintained?	6.1				
6.05	Is a calibration cylinder provided on the suction side of the metering pumps to permit rapid and accurate determination of the pump's delivery rate?	6.1				
6.06	Are metering pumps capable of operating over a feed range corresponding to max day/max dosage down to min day/min dosage?	6.2				
6.06	For unattended faciliites, are there at least two (2) reliable safety interlocks to assure that metering pumps are not operating without process water flow?	6.3				

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		SUB SECTION	YES	NO	N/A	COMMENT
6.07	At unattended facilities, is there a facility shutdown, or alarms, when the safety interlocks are not met?	6.3				
6.08	Typically metering pump speed is controlled, and stroke length is manually adjusted. Must stroke length be remotely adjusted?	6.3				
7.	**PIPING AND TUBING**	**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
7.01	Is chemical metering pump (diaphragm type) suction piping sized to accommodate pulsing supply/discharge?	7.1				
7.02	Are spare feed lines provided to primary application points?	7.1				
7.03	Are piping and tubing installed in a manner to allow for replacement? Can a single tube be pulled and replaced?	7.1				
7.04	Is bulk tank fill piping supported and braced for transferring chemical, including the erratic flow at the end of a bulk truck delivery?	7.1				
7.05	Are you sure of the compatiblity of the piping with the chemical? See Appendix C.	7.2				
7.06	Will the chemical be delivered hot? Was CPVC considered for elevated temperatures?	7.2				
7.07	Are flanged connections used at pipe sizes of 3 inch and larger instead of unions?	7.2				
7.08	Have threaded connections been minimized?	7.2				
7.09	For underground tubing or hose installations, are vaults or long radius sweep carrier piping used to allow for installation and replacement of tubing/hose?	7.3				
7.10	Do tubing/hose lengths allow for elimination of joints except in pull boxes?	7.3				
7.11	Is strain relief provided where hoses/tubing connect to rigid pipe connections?	7.3				
8.	**VALVES**	**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
8.01	Is gravity flow or siphoning possible through a metering pump? Have two backpressure valves, placed in series, been provided?	8.1				
8.02	Is a pressure relief valve located prior to the first isolation valve after a metering pump?	8.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
8.03	Is a multifunction valve provided for low capacity diaphragm metering pump?	8.1				
8.04	Have butterfly valves been considered instead of large (3 inch and larger) ball valves?	8.1				
8.05	Are valves located within reach, no more than five (5) feet above finished floor?	8.1				
8.06	Are backpressure valves cleaned and tested on a regular basis?	8.2				
8.07	Are ball valves in sodium hypochlorite service provided with a vented ball (e.g. 1/8 inch diameter hole)?	8.3				
9. DRUM FEED SYSTEMS		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
9.01	Where drums are used, is drum handling equipment (hoists, pallet trucks, and dollies) provided to minimize the hazards associated with the moving of drums?	9.1				
9.02	How many days supply is provided by a drum/carboy? Should a day tank be provided?	9.1				
9.03	Is a weigh scale or a reliable level monitoring device provided to monitor the quantity of material remaining in the drum?	9.2				
9.04	If a weigh scale is provided, must a full drum be lifted onto the scale? Is proper lifting equipment provided?	9.2				
9.05	Is adequate ventilation provided for drum feed areas?	9.3				
10. SECONDARY CONTAINMENT		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
10.01	Is secondary containment provided for all bulk tanks, day tanks, batch tanks, metering pumps, transfer pumps, and chemical unloading areas?	10.1				
10.02	Are bulk tanks and day tanks located within the same containment?	10.1				
10.03	Is secondary containment volume determined based on 110 percent of the largest storage tank capacity within the containment area plus allowances for fire sprinkler water etc?	10.1				
10.04	Is metering pump suction piping located in the containment area?	10.1				
10.05	For corrosive chemicals, are secondary containment structures protected with a coating or liner?	10.1				
10.06	Are there piping or conduits penetrating the floor or sidewalls of the containment area?	10.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
10.07	Is secondary containment provided for all drums and carboys?	10.1				
10.08	Is secondary containment provided for buried chemical solution lines to minimize the potential for accidental releases to the environment?	10.1				
10.09	Are there high level switches and alarms in chemical feed pits and piping pull boxes (recommended).	10.1				
10.10	If level alarms are not provided for chemical feed pits and pull boxes, is there an operational monitoring program for chemical feed and chemical piping pull boxes?	10.1				
10.11	Is secondary containment provided for bulk truck unloading area?	10.2				
10.12	For bulk chemical unloading areas, is the minimum secondary containment volume determined based on the volume of the largest chemical delivery tank truck plus freeboard? Is the criteria for spill volume documented?	10.2				
11. DILUTION WATER		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
11.01	Is continuous dilution (or chase) water provided?	11.1				
11.02	If continuous dilution water is provided, is there a mans to provide positive indication of flow?	11.1				
11.03	Is backflow protection provided for all water supply connected to a chemical system?	11.1				
11.04	Are RPZ devices provided? Do RPZ devices discharge out of secondary containment?	11.1				
11.05	Is a solenoid valve provided at each chemical area to allow for remote isolation of water supply?	11.1				
11.06	Where continuous dilution water is provided, is there a high pressure switch that would indicate the feed line is clogged?	11.1				
11.07	Will rotameters or sight flow indicators be obscured by manganese?	11.1				
11.08	Is ion exchange softened water provided for diluting high pH chemicals such as ammonium hydroxide, sodium hydroxide, and sodium hypochlorite to minimize scaling of chemical feed lines?	11.2				

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		SUB SECTION	YES	NO	N/A	COMMENT
11.09	Are drains provided for the softener backwash and regeneration? Is there a good location for salt storage? Are sample taps provided to monitor hardness?	11.2				
12. LEAK DETECTION		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
12.01	Is a sump provided within secondary containment?	12.1				
12.02	Is the sump equipped with a high level switch and alarm to SCADA?	12.1				
12.03	Is the sump high level switch and alarm interlocked with the isolation valve on the bulk tank and the transfer pumps?	12.1				
13. CONTINUOUS ANALYZERS		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
13.01	For strong acids and bases, is continuous pH monitoring employed to provide warning of excessive chemical feed?	13.1				
13.02	Is chlorine residual monitored to ensure that the correct disinfectant concentration is present?	13.1				
13.03	In attended facilities, do alarms from analytical devices warn operators of chemical over-or under feeds?	13.2				
13.04	In the absence of full time staffing, do alarms go to on-call personnel?	13.2				
13.05	In the absence of full time staffing, has consideration been given to taking facilities off-line in response to an overfeed or underfeed alarm?	13.2				
14. PROVISIONS FOR MAINTENANCE		**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
14.01	Are means for draining chemical piping provided?	14.1				
14.02	Is there a means to drain chemical storage tanks?	14.1				
14.03	Are there provisions for disposal of wash down water, and safety shower water from secondary containment?	14.1				
14.04	Is there a means to access and replace tubing?	14.1				
14.05	Are valves accessible; not more than 5 feet above finished floor?	14.1				
14.06	Is the chemical injection assembly properly detailed?	14.1				
14.07	Is a metal stab tube used for insertion lengths > 8 inches?	14.1				

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		SUB SECTION	YES	NO	N/A	COMMENT
14.08	If a ladder is required, is there space to safely position the ladder?	14.1				
15.	**INSTRUMENTATION AND CONTROL**	**SUB SECTION**	**YES**	**NO**	**N/A**	**COMMENT**
15.01	Are P&ID drawings available for the chemical system?	15.1				
15.02	Are electrical panels and controls located at least 36 inches away from metering pumps to avoid contact from chemical leaks?	15.1				
15.03	Is continuous level monitoring provided for bulk tanks?	15.2				
15.04	Have ultrasonic level monitors been located away from the fill line? Has the deadzone near the transmitters been accounted for?	15.2				
15.05	Do bulk tank high level alarms sound at the fill station?	15.2				
15.06	Is level, or weight, (or pressure/level) monitoring provided for day tanks?	15.2				
15.07	Is an independent high level switch provided for day tanks?	15.2				
15.08	Is a FULL level switch provided where continuous level may not be accurate during filling cycle?	15.2				
15.09	Is a high level switch provided within secondary containment to signal a chemical or water leak?	15.2				
15.10	Are high level switches provided in buried chemical piping vaults?	15.2				
15.11	Is there local indication of high liquid level at chemical piping vaults?	15.2				
15.08	Have options for chemical flow from metering pumps been reviewed?	15.3				
15.09	For transfer pumps: is the high level switch hard-wired to the transfer pump starter to stop the pump on high level?	15.4				
15.10	For bulk tank outlet valves: is status (OPEN/CLOSED) provided to SCADA?	15.4				
15.11	Does the bulk tank outlet valve close on detection of a high level alarm condition in the sump?	15.4				
15.12	Is bulk tank level and high level switch status shown at a bulk tank fill panel, located near the fill connection? Is there an alarm beacon and audible alarm on high level?	15.3				
15.13	Is a local control panel provided for the transfer of chemicals from bulk tank to day tank ?	15.4				

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Liquid Chemical Storage, Feed & Containment Systems
T2 Design Standard Conformance Checklist

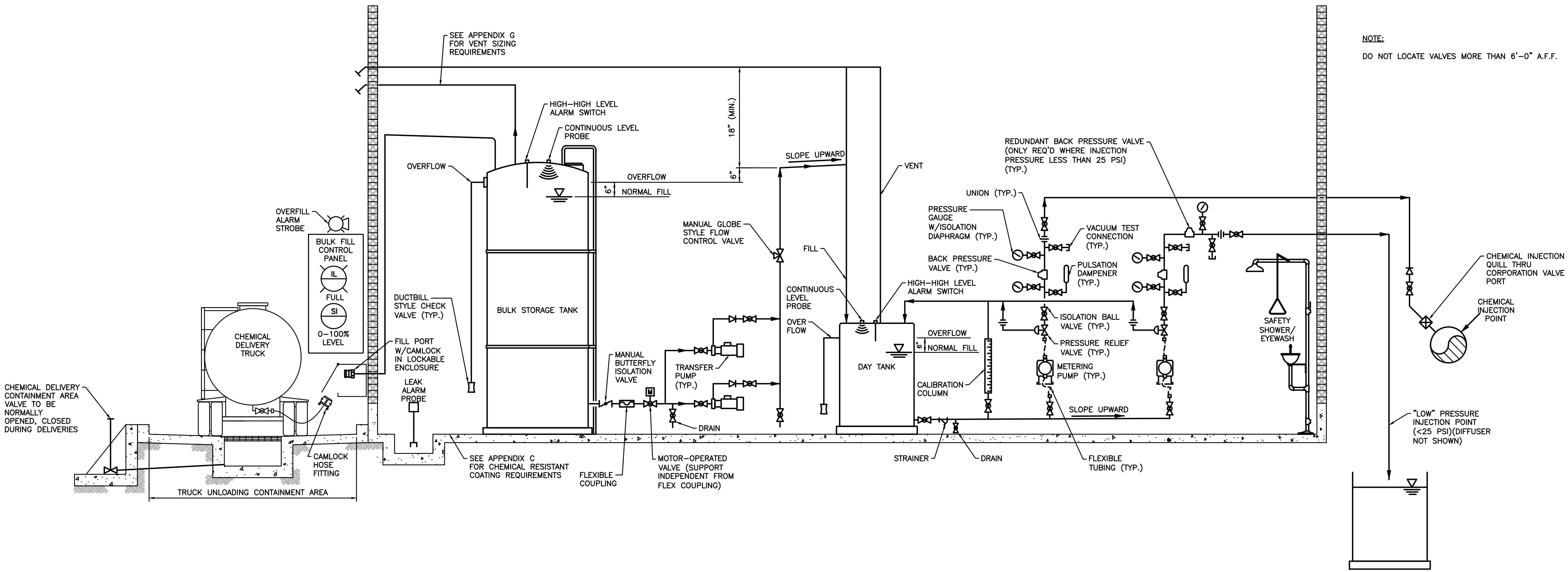
		SUB SECTION	YES	NO	N/A	COMMENT
15.14	Is there an algorithm in SCADA to calculate feed rate from loss in day tank level? (suggested)	15.4				
15.15	Is status of pumps and automated valves shown in SCADA?	15.4				
15.16	Is automatic day tank refill practiced (without Operator initiation)?	15.4				
15.17	Are alarms logged to SCADA ?	15.4				

Comments:

Appendix B

Standard Schematic Diagrams for Liquid Chemical Systems

- **Figure B1 - Bulk Liquid Chemical System**
- **Figure B2 - Drum/Day Tank Feed System**
- **Figure B3 – Direct Drum Feed System**



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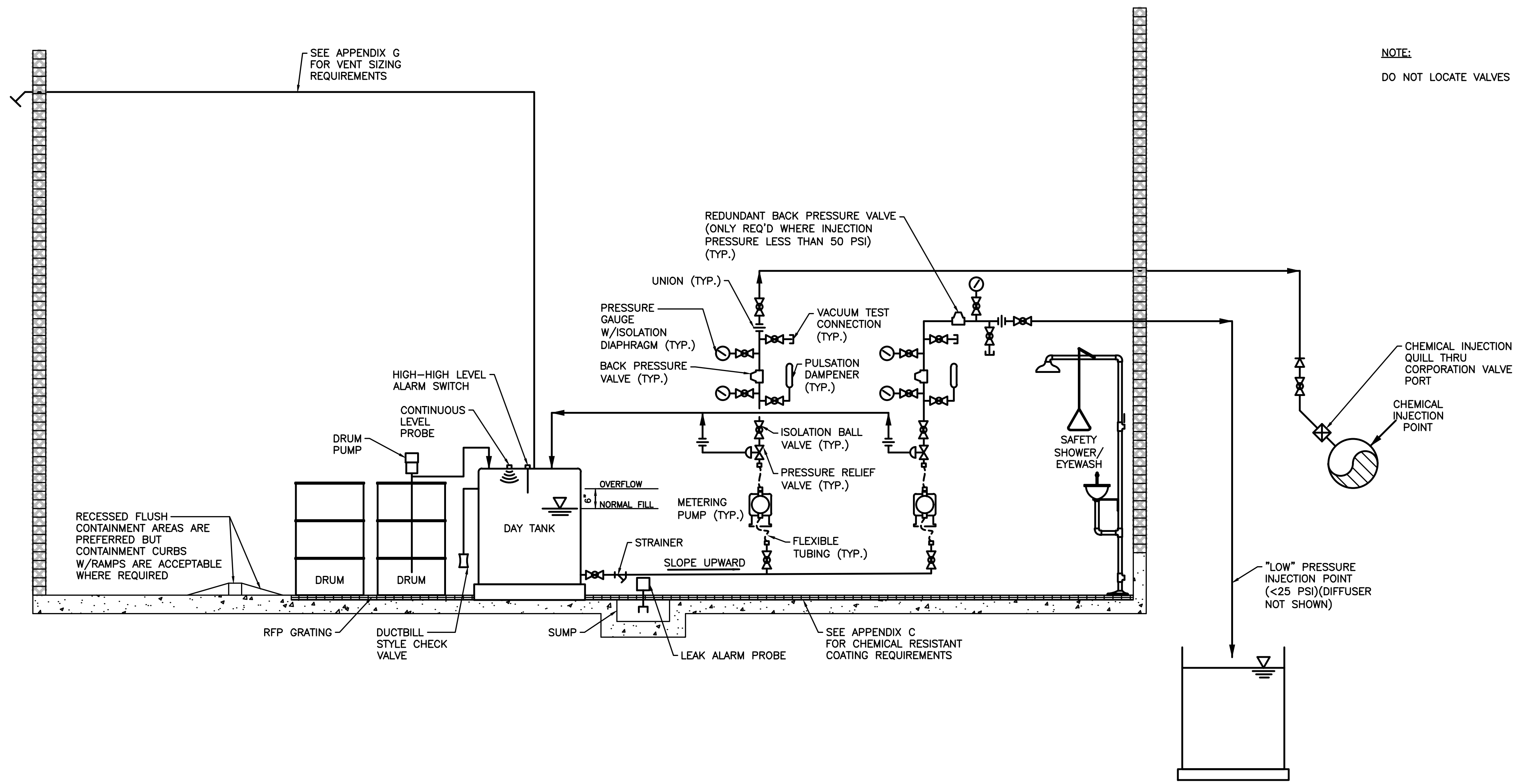
3906 CHURCH RD.
MT. LAUREL, NJ 08054
AMERICAN WATER

LICENSED PROFESSIONAL ENGINEER NO.

DRAWN BY R. BEATTY
PROJECT ENG'R
DATE 10–28–16
PROJECT

BULK LIQUID CHEMICAL SYSTEM PROCESS SYSTEM SCHEMATIC

AMERICAN WATER	ENGINEERING OPERATIONS CENTER	USE DIMENSIONS ONLY SCALE N.T.S.
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES	STANDARD	APPENDIX B–1



NOTE:

DO NOT LOCATE VALVES MORE THAN 6'–0" A.F.F.

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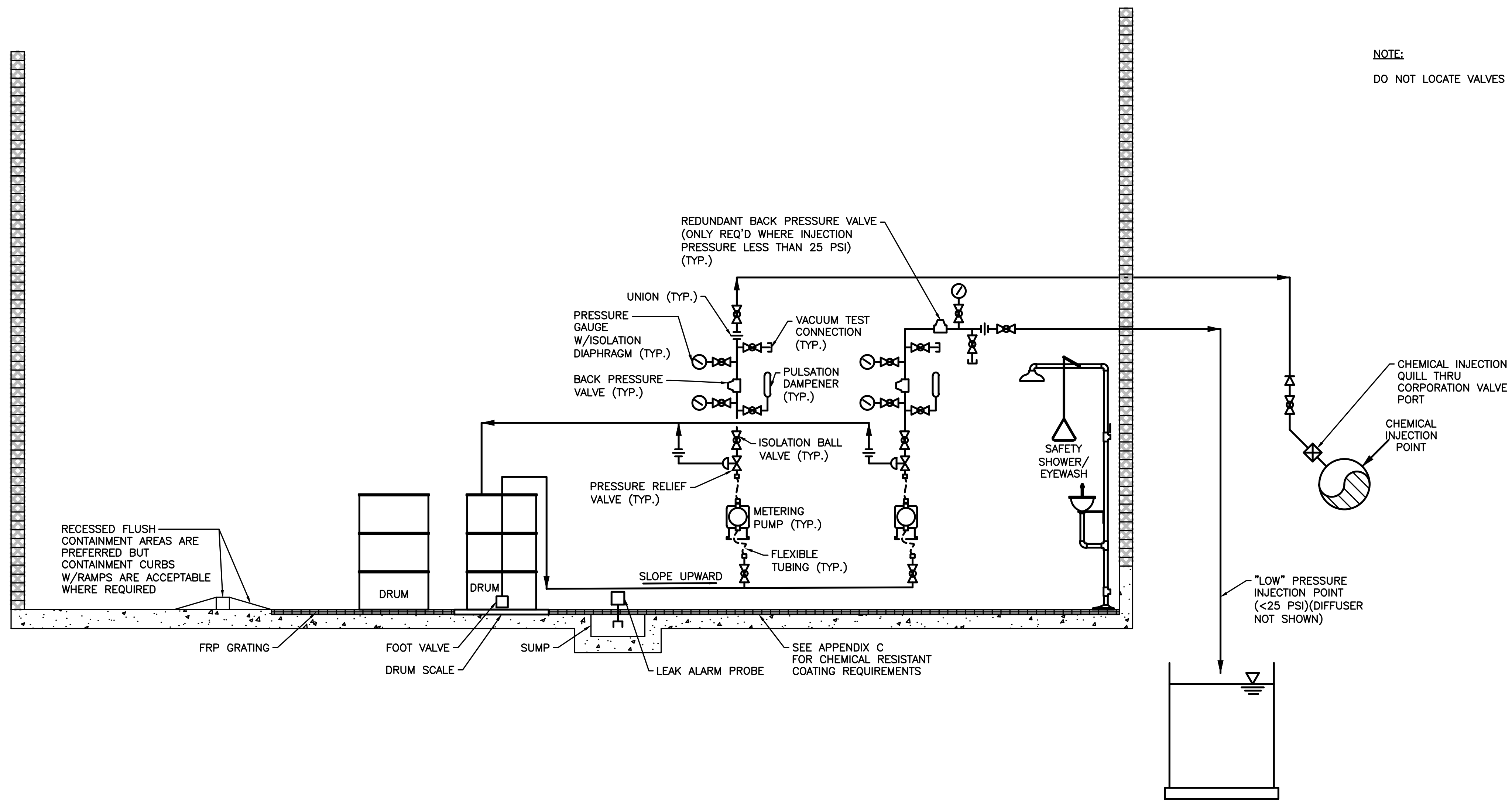
NOTE:

DO NOT LOCATE VALVES MORE THAN 6'-0" A.F.F.



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DRAWN BY R. BEATTY
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BULK LIQUID CHEMICAL SYSTEM
PROCESS
SYSTEM SCHEMATIC

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Appendix C

Material Selection Guide for Liquid Chemical Systems

AMERICAN WATER

ENGINEERING STANDARD T-2 APPENDIX C

American Water Engineering

Recommended Materials of Construction for Common Water & Wastewater Treatment Chemicals[1,2]

Chemical	Tanks	Piping[3,4]	Valves[3,4]	Flexible[3] Hose and Tubing	Pump Head Elastomers	Secondary Containment Liner
Aluminum Sulfate - Liquid (48%)	XLHDPE	PVC	PVC	HDPE / BrPVC	EPDM	NR
Ammonium Hydroxide (19% - 29%)	CS (no internal coating)	CS	CS	HDPE / BrPVC	EPDM	NR
Ammonium Sulfate (Liquid)	XLHDPE	PVC	PVC	BrPVC	EPDM	NR
Calcium Hydroxide (Lime) Slurry (5%)	CS (no internal coating)	CS	CS / SS	BrPVC	Hypalon / Neoprene	NR
Ferric Chloride	XLHDPE	PVC	PVC	BrPVC	EPDM	NR
Hydrofluosilicic Acid (23%)	LHDPE up to 1000 gal; XLHDPE w/LHDPE liner >1,000 gal	PVC	PVC	BrPVC	FKM	S2P
Phosphoric Acid - Orthophosphate	XLHDPE	PVC	PVC	BrPVC	FKM	S2P
Polyaluminum Chloride	XLHDPE	PVC	PVC	BrPVC	EPDM	NR
Potassium Permanganate (<2%)	XLHDPE	PVC	PVC	BrPVC	EPDM	S2P
Powdered Activated Carbon Slurry	SS / Concrete should be considered for large capacity tanks	PVC	PVC	BrPVC	Hypalon	NR
Sodium Chlorite (18%-31%)	XLHDPE	CPVC	CPVC	BrPVC	EPDM	NR
Sodium Hydroxide (25% - 50%)	CS (no internal coating)	CS/SS[5]	CS/SS[5]	BrPVC	EPDM	S2P[6]
Sodium Hypochlorite (>5%)	LHDPE up to 1000 gal; FRP >1,000 gal	PVC	PVC	HDPE	FKM	NR
Sodium Hypochlorite (0.8%)	LHDPE up to 1000 gal; FRP >1,000 gal	PVC	PVC	HDPE	FKM	NR
Sodium Permanganate (20% - 40%)	XLHDPE	HDPE[7]	PVC	BrPVC	FKM	S2P
Zinc Orthophosphate	XLHDPE	PVC	PVC	BrPVC	FKM / EPDM	NR

Notes:

1) Where two materials are listed, both have been found to be reliable and cost-effective.
2) Contact Corporate Engineering or consult trusted published chemical compatability data for chemicals not listed.
3) Designer should verify selected material has adequate pressure rating for required service.
4) Rigid PVC/CPVC piping shall be a minimum of Schedule 80.
5) Schedule 80 PVC is also compatible but has a life expectancy of less than 15 years in caustic service.
6) Concrete attack due to this chemical is slow, so investing in special epoxy coating should be cost-justified.
7) Oxidant resistant HDPE system (Asahi Chem Proline) with heat welded joints

Legend:

BrPVC	Braided polyvinyl chloride (tubing)
CPVC	Chlorinated polyvinyl chloride
CS	Carbon steel
EPDM	Ethylene propylene diene monomer
FKM	Fluoropolymer (Viton brand name)
FRP	Fiber(glass) reinforced plastic
HDPE	High density polyethylene (tubing)
Hypalon	Chlorosulfonated PE trademarked by Dupont
LHDPE	Linear, high density polyethylene
Neoprene	Chlorprene synthetic rubber
NR	Not required
PVC	Polyvinyl chloride
SS	Stainless Steel (304 or 316L)
S2P	Specialty two-part epoxies, such as: 1) Chemline 784/32 2) Tnemec Series 282 Tneme-Glaze
XLHDPE	Cross-linked, high density polyethylene

Appendix D

Color Codes for Water Treatment Chemicals

APPENDIX D

Water Treatment Plant Color Coding

TYPE OF PIPE	USE OF PIPE	COLOR OF PIPE
Water Lines:	Raw water	Olive Green
	Settled or clarified water	Aqua
	Finished or potable water	Dark Blue
Chemical Lines:	Alum or primary coagulant	Orange
	Ammonia	White
	Carbon slurry	Black
	Caustic	Yellow w/ green band
	Chlorine gas or solution	Yellow
	Fluoride	Light blue w/ red band
	Lime slurry	Light green
	Ozone	Yellow w/ orange band
	Phosphate compounds	Light green w/ red band
	Polymers or coagulant aids	Orange w/ green band
	Potassium permanganate	Violet
	Soda ash	Light green w/ orange band
	Sulfuric Acid	Yellow w/ red band
	Sulfur Dioxide	Light green w/ yellow band
Waste Lines:	Backwash waste	Light Brown
	Sludge	Dark Brown
	Sewer (sanitary or other)	Dark Gray
Other Lines:	Compressed Air	Dark Green
	Natural Gas	Red or Yellow
	Backwash recycle	Beige

Appendix E

Guidelines for Prioritizing Improvements to Existing Chemical Systems

APPENDIX E

American Water
Liquid Chemical Storage, Feed & Containment Systems
Prioritization of Improvements at Existing Facilities

This appendix provides guidance in the evaluation of existing facilities for compliance with the Standard. A checklist is provided with High, Medium, and Low prioritization of the various components of the Standard to assist the evaluator in developing a scope of improvements where deficiencies are found.

PRIORITY	RATIONALE
HIGH	May impact safety of customers or on-site personnel. Failure that could result in a service interruption. Regulatory requirement.
MEDIUM	Spill prevention within secondary containment that could be costly to address.
LOW	Desirable, but not essential features.

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
1.	**SAFETY REQUIREMENTS AND BUILDING LAYOUT**					
1.01	Are Safety Data Sheets (SDS) available to all personnel?	1.1			X	*Regulatory requirement*
1.02	Is wall space reserved for display of safety information?	1.1		X		
1.03	Are pumps labeled?	1.2		X		
1.04	Is piping color coded according to Ten State Standards ?	1.2		X		
1.05	Is piping identified with labels indicating the chemical, and arrows pointing in the normal direction of flow? Labels are required.	1.2			X	*Labeling of piping is required*
1.06	Are chemical system valves provided with an ID tag?	1.2		X		
1.07	Are pressure relief and backpressure valves labeled with pressure settings?	1.2		X		
1.08	Are storage tanks labeled with signage identifying usable capacity of the tank, contents of the tank, and chemical hazards? See Standard.	1.2			X	*Labeling of tanks is required*
1.09	Are facility entry doors labeled with NFPA diamond labels?	1.2		X		
1.1	Are separate bulk tank fill pipelines and connections provided?	1.3			X	
1.11	Are fill connections for bulk tanks provided with independently keyed locked enclosures? Or locked fill caps?	1.3			X	
1.12	Are fill connections for bulk tanks labeled including CAS number?	1.3			X	
1.13	Are drip pans provided at fill connections for housekeeping?	1.3		X		
1.14	Are eyewashes and emergency showers provided for all liquid chemicals?	1.4			X	*A shower may not be required if hazard is low*
1.15	Are eyewashes and emergency showers located adjacent to bulk unloading areas?	1.4			X	

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Liquid Chemical Storage, Feed & Containment Systems
Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	MED	HIGH	COMMENT
1.16	Do eyewashes and emergency showers meet American National Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-2014 or latest version)?	1.4			X	*See Appendix F*
1.17	Is an alarm beacon and connection to SCADA provided?	1.4		X		
1.18	Is tempered water (60 deg to 100 deg F) provided for emergency eyewashes and showers?	1.4			X	
1.19	Is there a means to flush stagnant piping on a weekly basis?	1.4			X	*Routine flushing prevents microbiological contamination*
1.20	Are chemicals isolated within separate secondary containment areas?	1.5		X		*Incompatible chemicals must not be within the same containment area.*
1.21	Are walls provided between chemical areas?	1.5		X		
1.22	Are chemical feeders within secondary containment?	1.5			X	
1.23	Are there tripping hazards (such as conduits, piping, etc)?	1.5			X	
1.24	Is there a means to replace tanks? How?	1.5		X		
1.25	Will workers be required to enter the top hatch of a tank? If so, are all required confined space equipment provided in compliance with confined space rquirements?	1.5			X	
1.25	Are properly sized doors provided where drums, pallets, IBC/totes are handled?	1.5			X	
1.26	Has a recessed containment area been considered where drums or IBC/totes are handled so grating is flush to concrete floor?	1.5		X		
1.27	Where ramps are provided, are they a maximum slope of 1:12?	1.5			X	
1.28	Has an overhead beam been considered for drum handling?	1.5		X		
1.29	Is ingress and egress for secondary containment areas safe with stairs and handrails? Stairs preferable to ladders.	1.5		X		*If ladder is existing, evaluate installation of stairs*

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Liquid Chemical Storage, Feed & Containment Systems

Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
1.3	For outdoor tanks, has a sunshade been considered to prolong tank life, minimize heating of tank contents, control stormwater accumulation?	1.5		X		
2. MATERIALS OF CONSTRUCTION		SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
2.01	Do the materials of construction for tanks, piping, pumps, and valves agree with Appendix C?	2.1			X	
2.02	Does the chemical have unique properties that must be considered (such as hydrogen peroxide or concentrated sulfuric acid)?	2.1			X	
2.03	Is there local operational experience on materials of construction?	2.1		X		
2.04	Does the Regulator have NSF 61 requirements for selection of chemical equipment? If so, have selections been made accordingly?	2.1			X	
3. BULK STORAGE TANKS		SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
3.01	Has bulk storage been considered to minimize handling of drums and IBC containers?	3.1		X		
3.02	Are double wall tanks proposed in lieu of secondary containment? If so, why? Reconsider the benefits of locating tanks within secondary containment per this Standard.	3.1			X	
3.03	Is a side manway provided for FRP tanks that require entry for internal inspection?	3.1			X	
3.04	Are sightglasses provided? Are they protected from damage? Sightglasses are not recommended for bulk tanks.	3.1		X		
3.05	Are flexible connections provided for pipe connections at the lower 1/3 of the tank wall for polyethylene tanks ?	3.1			X	
3.06	Does the tank allow for full drainage, or near full drainage with a siphon outlet?	3.1		X		
3.07	Is the tank outlet sized to minimize vortexing at the maximum transfer pumping rate?	3.1		X		
3.08	Is a normally closed remotely actuated discharge valve installed on or near the tank outlet?	3.1		X		
3.09	Is the remotely actuated discharge valve supported independently of the tank?	3.1			X	

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
3.10	Is a manual valve provided (butterfly preferred) upstream of the remotely actuated valve?	3.1		X		
3.11	Is a ladder provided to access the top of the tank?	3.1			X	
3.12	Has the desired storage capacity been evaluated from different perspectives? (e.g. max dose, avg day demand, etc)	3.2			X	
3.13	Are bulk tanks sized to accommodate at least 150 % of a bulk shipment of chemical?	3.2			X	
3.14	Has local Operations been consulted with respect to splitting bulk loads with other sites?	3.2			X	
3.15	Are there unique supply factors that may alter storage volumes (limited road access, nearby suppliers, etc)?	3.2			X	
3.16	Is continuous level monitoring provided?	3.3			X	
3.17	Is an independent high level switch provided?	3.3			X	
3.18	Are high level alarms provided at the unloading station and near the tank?	3.3			X	
3.19	Is tank overflow directed to secondary containment?	3.4			X	
3.20	Is a rubber duckbill valve, or a water trap, used to seal the overflow?	3.4		X		
3.21	Are tanks vented to the outdoors (corrosive, fuming, mists/aerosols during filling)?	3.4			X	
3.22	Is the venting system consistent with the discharge of air at the end of a chemical delivery? Are the vent lines sized in accordance with Appendix G?	3.4			X	*Inadequate venting can shorten the service life of the tank*
3.23	Are restraints provided for seismic conditions? Designed by a P.E.?	3.5		X		
3.24	Are restraints provided for outdoor tanks?	3.5			X	
3.25	Are sodium hypochlorite tanks constructed of FRP at sizes greater than 1,000 gallons?	3.6		X		
3.26	Is sodium hypochlorite storage protected from direct sunlight?	3.6		X		*Direct sunlight will shorten the life of the tank and degrade the chemical*
3.27	Has air conditioning of the storage room for sodium hypochlorite been considered in hot climates?	3.6		X		

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	MED	HIGH	COMMENT
3.28	Are the state and Company requirements for tank inspection documented?	3.7			X	
3.29	Does the tank have access for inspection?	3.7			X	
4.	**TRANSFER PUMPS**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
4.01	Where bulk tanks are used, are transfer pumps provided to deliver the chemical from the bulk tanks to day tanks?	4.1			X	
4.02	For disinfectants and primary coagulants, are redundant transfer pumps provided?	4.1			X	
4.03	Is the discharge piping from the transfer pumps configured to prevent gravity flow or siphonage from the bulk tank?	4.1			X	
4.04	Is the fill piping downstream of the siphon break sized for gravity flow?	4.1			X	
4.05	Are magnetic drive, non-metallic, constant speed pumps proposed?	4.1			X	
4.06	Does the pump impeller require trimming to avoid overload due to viscosity and/or specific gravity?	4.1			X	
4.07	To prevent operator fatigue, are transfer pumps sized to fill small day tanks within two minutes?	4.2			X	
4.08	For day tanks larger than 100 gallons, are means provided to automatically stop the transfer pumps through SCADA and hard wired controls?	4.2			X	
4.09	For transfer pumps that are configured to shutoff automatically, are the pumps sized to complete the transfer operation within 30 minutes?	4.2			X	
4.10	For transfer pumps that are configured to shutoff automatically, are the following safe guards provided : secondary containment, high level switch, continuous level measuring device, and a spill switch in a sump, all interlocked with the transfer pump?	4.2			X	
4.11	Is remote operation of transfer pumps proposed or practiced?	4.2			X	
4.12	With remote operation of transfer pumps, verify the following features and management processes are present:	4.2				
4.13	a) Sump level sensor and alarm; Independent high level switch interlocked with pumps; software alarm from continuous level or weight.	4.2			X	

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
4.14	b) Monthly in-person observation of transfer operation; documented.	4.2			X	
4.15	c) Quarterly testing of all overfill devices; documented	4.2			X	
4.16	d) Remote fill limited to facilities not attended on daily basis	4.2			X	
4.17	e) Process for reviewing monthly and quarterly testing program	4.2			X	
4.18	f) Has video surveillance during transfer been considered?	4.2		X		
5.	**DAY TANKS**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
5.01	Are day tanks provided with bulk tanks? If not, why not?	5.1			X	
5.02	Does the level of the day tank provide positive suction to the metering pumps?	5.1			X	
5.03	How was the day tank volume determined? Was the useful volume of the tank considered?	5.2			X	
5.04	For a remote site, is the tank sized for more than 3 days of maximum use? Three days is the maximum allowed.	5.2		X		
5.05	Is continuous level or weight monitoring provided?	5.3			X	
5.06	Is an independent high level switch provided?	5.3			X	
5.07	Is programming provided to calculate rate of loss in level or weight ?	5.3	X			
5.08	Are sightglasses provided? Are they protected from damage? Sightglasses are not recommended.	5.3		X		
5.09	Is the fill line piped to avoid siphoning or gravity flow from the bulk tank?	5.4			X	
5.10	How was the overflow pipe sized? Is it larger than the fill line? Was the maximum rate of the transfer pump considered?	5.4			X	
5.11	Is daytank overflow directed to secondary containment?	5.4			X	
5.12	How is the overflow sealed to prevent discharge of vapor to the room?	5.4			X	

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Liquid Chemical Storage, Feed & Containment Systems

Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
5.13	Is the day tank vented to the outdoors?	5.4			X	
6.	**METERING PUMPS**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
6.01	Are redundant metering pumps provided for disinfectants and primary coagulants?	6.1			X	
6.02	Are metering pumps located near the day tank?	6.1		X		
6.03	Are metering pumps installed at least 12-inches off the floor, (30 inches preferred) to facilitate operation and maintenance?	6.1		X		
6.04	Are metering pumps installed so that adequate suction conditions are maintained?	6.1		X		
6.05	Is a calibration cylinder provided on the suction side of the metering pumps to permit rapid and accurate determination of the pump's delivery rate?	6.1		X		
6.06	Are metering pumps capable of operating over a feed range corresponding to max day/max dosage down to min day/min dosage?	6.2			X	
6.06	For unattended faciliites, are there at least two (2) reliable safety interlocks to assure that metering pumps are not operating without process water flow?	6.3			X	
6.07	At unattended facilities, is there a facility shutdown, or alarms, when the safety interlocks are not met?	6.3			X	
6.08	Typically metering pump speed is controlled, and stroke length is manually adjusted. Must stroke length be remotely adjusted?	6.3			X	
7.	**PIPING AND TUBING**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
7.01	Is chemical metering pump (diaphragm type) suction piping sized to accommodate pulsing supply/discharge?	7.1			X	
7.02	Are spare feed lines provided to primary application points?	7.1		X		
7.03	Are piping and tubing installed in a manner to allow for replacement? Can a single tube be pulled and replaced?	7.1		X		
7.04	Is bulk tank fill piping supported and braced for transferring chemical, including the erratic flow at the end of a bulk truck delivery?	7.1			X	

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Liquid Chemical Storage, Feed & Containment Systems

Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
7.05	Are you sure of the compatiblity of the piping with the chemical? See Appendix C.	7.2			X	
7.06	Will the chemical be delivered hot? Was CPVC considered for elevated temperatures?	7.2			X	
7.07	Are flanged connections used at pipe sizes of 3 inch and larger instead of unions?	7.2		X		
7.08	Have threaded connections been minimized?	7.2		X		
7.09	For underground tubing or hose installations, are vaults or long radius sweep carrier piping used to allow for installation and replacement of tubing/hose?	7.3			X	
7.10	Do tubing/hose lengths allow for elimination of joints except in pull boxes?	7.3			X	
7.11	Is strain relief provided where hoses/tubing connect to rigid pipe connections?	7.3			X	
8.	**VALVES**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
8.01	Is gravity flow or siphoning possible through a metering pump? Have two backpressure valves, placed in series, been provided?	8.1			X	*Two valves are needed where siphoning or gravity flow can occur.*
8.02	Is a pressure relief valve located prior to the first isolation valve after a metering pump?	8.1			X	
8.03	Is a multifunction valve provided for low capacity diaphragm metering pump?	8.1			X	
8.04	Have butterfly valves been considered instead of large (3 inch and larger) ball valves?	8.1		X		
8.05	Are valves located within reach, no more than five (5) feet above finished floor?	8.1			X	
8.06	Are backpressure valves cleaned and tested on a regular basis?	8.2		X		*High priority for systems susceptible to siphon or flow by gravity.*
8.07	Are ball valves in sodium hypochlorite service provided with a vented ball (e.g. 1/8 inch diameter hole)?	8.3			X	
9.	**DRUM FEED SYSTEMS**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
9.01	Where drums are used, is drum handling equipment (hoists, pallet trucks, and dollies) provided to minimize the hazards associated with the moving of drums?	9.1			X	

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	MED	HIGH	COMMENT
9.02	How many days supply is provided by a drum/carboy? Should a day tank be provided?	9.1		X		
9.03	Is a weigh scale or a reliable level monitoring device provided to monitor the quantity of material remaining in the drum?	9.2		X		
9.04	If a weigh scale is provided, must a full drum be lifted onto the scale? Is proper lifting equipment provided?	9.2			X	
9.05	Is adequate ventilation provided for drum feed areas?	9.3		X		
10.	**SECONDARY CONTAINMENT**	SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
10.01	Is secondary containment provided for all bulk tanks, day tanks, batch tanks, metering pumps, transfer pumps, and chemical unloading areas?	10.1			X	
10.02	Are bulk tanks and day tanks located within the same containment?	10.1			X	
10.03	Is secondary containment volume determined based on 110 percent of the largest storage tank capacity within the containment area plus allowances for fire sprinkler water etc?	10.1			X	
10.04	Is metering pump suction piping located in the containment area?	10.1			X	
10.05	For corrosive chemicals, are secondary containment structures protected with a coating or liner?	10.1			X	
10.06	Are there piping or conduits penetrating the floor or sidewalls of the containment area?	10.1		X		
10.07	Is secondary containment provided for all drums and carboys?	10.1			X	
10.08	Is secondary containment provided for buried chemical solution lines to minimize the potential for accidental releases to the environment?	10.1			X	*Priority related to hazard of chemical and environmental setting.*
10.09	Are there high level switches and alarms in chemical feed pits and piping pull boxes (recommended).	10.1		X		
10.10	If level alarms are not provided for chemical feed pits and pull boxes, is there an operational monitoring program for chemical feed and chemical piping pull boxes?	10.1			X	
10.11	Is secondary containment provided for bulk truck unloading area?	10.2			X	

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Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
10.12	For bulk chemical unloading areas, is the minimum secondary containment volume determined based on the volume of the largest chemical delivery tank truck plus freeboard? Is the criteria for spill volume documented?	10.2			X	
11. DILUTION WATER		SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
11.01	Is continuous dilution (or chase) water provided?	11.1				*Provide dilution water only where beneficial*
11.02	If continuous dilution water is provided, is there a means to provide positive indication of flow?	11.1		X		
11.03	Is backflow protection provided for all water supply connected to a chemical system?	11.1			X	
11.04	Are RPZ devices provided? Do RPZ devices discharge out of secondary containment?	11.1			X	
11.05	Is a solenoid valve provided at each chemical area to allow for remote isolation of water supply?	11.1	X			
11.06	Where continuous dilution water is provided, is there a high pressure switch that would indicate the feed line is clogged?	11.1			X	*If feed line is clogged, chemical may be pushed into dilution water plumbing.*
11.07	Will rotameters or sight flow indicators be obscured by manganese?	11.1	X			
11.08	Is ion exchange softened water provided for diluting high pH chemicals such as ammonium hydroxide, sodium hydroxide, and sodium hypochlorite to minimize scaling of chemical feed lines?	11.2			X	
11.09	Are drains provided for the softener backwash and regeneration? Is there a good location for salt storage? Are sample taps provided to monitor hardness?	11.2			X	
12. LEAK DETECTION		SUB SECTION	**LOW**	**MED**	**HIGH**	**COMMENT**
12.01	Is a sump provided within secondary containment?	12.1		X		
12.02	Is the sump equipped with a high level switch and alarm to SCADA?	12.1			X	

PROJECT:

American Water

Liquid Chemical Storage, Feed & Containment Systems

Prioritization of Improvements at Existing Facilities

			PRIORITY			
		SUB SECTION	LOW	MED	HIGH	COMMENT
12.03	Is the sump high level switch and alarm interlocked with the isolation valve on the bulk tank and the transfer pumps?	12.1			X	
13. CONTINUOUS ANALYZERS		SUB SECTION	LOW	MED	HIGH	COMMENT
13.01	For strong acids and bases, is continuous pH monitoring employed to provide warning of excessive chemical feed?	13.1			X	
13.02	Is chlorine residual monitored to ensure that the correct disinfectant concentration is present?	13.1			X	
13.03	In attended facilities, do alarms from analytical devices warn operators of chemical over-or under feeds?	13.2			X	
13.04	In the absence of full time staffing, do alarms go to on-call personnel?	13.2			X	
13.05	In the absence of full time staffing, has consideration been given to taking facilities off-line in response to an overfeed or underfeed alarm?	13.2			X	
14. PROVISIONS FOR MAINTENANCE		SUB SECTION	LOW	MED	HIGH	COMMENT
14.01	Are means for draining chemical piping provided?	14.1		X		
14.02	Is there a means to drain chemical storage tanks?	14.1			X	
14.03	Are there provisions for disposal of wash down water, and safety shower water from secondary containment?	14.1			X	*See Standard for recommended approach*
14.04	Is there a means to access and replace tubing?	14.1			X	
14.05	Are valves accessible; not more than 5 feet above finished floor?	14.1			X	
14.06	Is the chemical injection assembly properly detailed?	14.1		X		*Details of assembly should be documented in O&M manual*
14.07	Is a metal stab tube used for insertion lengths > 8 inches?	14.1			X	
14.08	If a ladder is required, is there space to safely position the ladder?	14.1			X	*If temporary ladder is unsafe, consider alternatives.*
15. INSTRUMENTATION AND CONTROL		SUB SECTION	LOW	MED	HIGH	COMMENT
15.01	Are P&ID drawings available for the chemical system?	15.1		X		

PROJECT:

American Water

Liquid Chemical Storage, Feed & Containment Systems

Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	PRIORITY MED	PRIORITY HIGH	COMMENT
15.02	Are electrical panels and controls located at least 36 inches away from metering pumps to avoid contact from chemical leaks?	15.1		X		*Difficult to move panels once they are installed*
15.03	Is continuous level monitoring provided for bulk tanks?	15.2			X	
15.04	Have ultrasonic level monitors been located away from the fill line? Has the deadzone near the transmitters been accounted for?	15.2			X	
15.05	Do bulk tank high level alarms sound at the fill station?	15.2			X	
15.06	Is level, or weight, (or pressure/level) monitoring provided for day tanks?	15.2			X	
15.07	Is an independent high level switch provided for day tanks?	15.2			X	
15.08	Is a FULL level switch provided where continuous level may not be accurate during filling cycle?	15.2			X	
15.09	Is a high level switch provided within secondary containment to signal a chemical or water leak?	15.2			X	
15.10	Are high level switches provided in buried chemical piping vaults?	15.2		X		*Can reduce the need for routine inspections*
15.11	Is there local indication of high liquid level at chemical piping vaults?	15.2	X			*Can reduce the time required for routine inspectons*
15.08	Have options for chemical flow from metering pumps been reviewed?	15.3	X			
15.09	For transfer pumps: is the high level switch hard-wired to the transfer pump starter to stop the pump on high level?	15.4			X	
15.10	For bulk tank outlet valves: is status (OPEN/CLOSED) provided to SCADA?	15.4			X	
15.11	Does the bulk tank outlet valve close on detection of a high level alarm condition in the sump?	15.4			X	
15.12	Is bulk tank level and high level switch status shown at a bulk tank fill panel, located near the fill connection? Is there an alarm beacon and audible alarm on high level?	15.3			X	
15.13	Is a local control panel provided for the transfer of chemicals from bulk tank to day tank ?	15.4			X	
15.14	Is there an algorithm in SCADA to calculate feed rate from loss in day tank level? (suggested)	15.4	X			
15.15	Is status of pumps and automated valves shown in SCADA?	15.4			X	

PROJECT:

American Water
Liquid Chemical Storage, Feed & Containment Systems
Prioritization of Improvements at Existing Facilities

		SUB SECTION	PRIORITY LOW	MED	HIGH	COMMENT
15.16	Is automatic day tank refill practiced (without Operator initiation)?	15.4			X	*Requires careful implementation with operational checks and maintenance procedures*
15.17	Are alarms logged to SCADA ?	15.4			X	

Comments:

Appendix F

Requirements for Emergency Eyewash and Shower Equipment

Guardian ANSI/ISEA Z358.1 Compliance Checklist

Requirements for Emergency Eyewash and Shower Equipment

Background

American Water has numerous chemical storage and feed installations that are necessary for the treatment of water or wastewater. Many of the chemicals are handled in a concentrated form and are a cause for concern if introduced into eyes or exposed to the skin or body parts. Discussions of requirements for emergency eyewashes and emergency showers often arise during design or significant modification of these facilities. The purpose of this document is to identify the regulatory requirements and provide some suggestions for economical and effective methods to provide appropriate equipment/systems.

Regulation

OSHA regulations require first aid for workers under 29 CFR 1910.151. Part (c), shown below, addresses flushing of eyes and body.

§ 1910.151 Medical services and first aid.

(c) Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

OSHA Interpretation

OSHA's interpretation of the regulation is explained in a response (2004) from OSHA's Directorate of Enforcement Programs (DEP) (provided below, in part)

> "The OSHA requirements for emergency eyewashes and showers, found at 29 CFR 1910.151(c), specify that "where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. As the standard states, an eyewash and/or safety shower would be required where an employee's eyes or body could be exposed to injurious corrosive materials. If none of the materials used in this work area is an injurious corrosive [chemical] (as indicated by the Material Safety Data Sheet (MSDS) for each product), then an emergency eyewash or shower would not be required pursuant to 1910.151(c).
>
> While not having the force of a regulation under the OSHA Act, the current ANSI standard addressing emergency eyewash and shower equipment (ANSI [Z]358.1-2004) provides for eyewash and shower equipment in appropriate situations when employees are exposed to hazardous materials. ANSI's definition of "hazardous material" would include caustics, as well as additional substances and compounds that have the capability of producing adverse effects on the health and safety of humans. ANSI's

standard also provides detail with respect to the location, installation, nature, and maintenance of eyewash and shower equipment. You also may wish to consult additional recognized references such as W. Morton Grant's *Toxicology of the Eye* (Charles C Thomas Pub. Ltd., 4th edition, August 1993) when considering potential chemical exposures to the eye and the appropriateness of installing eyewash facilities to protect employees against hazards associated with particular chemicals and substances."

ANSI Standard for Emergency Eyewash and Shower Equipment

The latest ANSI standard on this topic is ANSI Z358.1-2009 (approved by ANSI in 2009). This Standard is widely accepted by OSHA and industry. OSHA uses the Standard in their site audits. The Standard *"establishes minimum performance and use requirements for eyewash and shower equipment for the emergency treatment of the eyes or body of a person who has been exposed to injurious materials*".

The Standard was updated in 1998, 2004, and again in 2009. Providing water of a tepid temperature has been part of the Standard since 1998. Tepid water temperatures, generally defined as 60 to 100 degrees F, are needed to prevent injury, or worsened injury, from cold water temperatures or very warm water temperatures. Untempered cold water is a deterrent to proper flushing, and can quickly lead to numbness, confusion, and disorientation which are the symptoms of hypothermia. Providing flushing fluid at temperatures conducive to use for the recommended irrigation period is considered an integral part of providing suitable facilities.

Equipment manufacturers provide equipment that meets the Standard. Designers and installers must provide sufficient water supply, water temperature, equipment locations, etc. for the system to perform as intended. The Standard requires weekly testing to demonstrate availability. Weekly testing flushes sediment from the lines and minimizes microbial contamination from stagnant water.

Table 1 shows the hydraulic performance required by the Standard. Note that the shower flow rate is much higher than the flow of a residential shower of 2 to 2.5 gpm (or less).

Table 1 - Required Hydraulic Performance

Device	Minimum Flow, gpm	Minimum Duration, minutes
Eyewash	0.4	15
Eye/Face Wash	3	15
Shower	20	15

The Standard states that the flushing device is to be located in an accessible location that requires no more than 10 seconds to reach. The device is to be on the same level as the hazard and the path of travel is to be free of obstructions. The Standard states the flushing device should be immediately adjacent to the hazard for strong acids or strong caustics. Many water treatment chemicals can be classified as strong acids or strong caustics. Strong oxidizers such as sodium hypochlorite and sodium permanganate, while not mentioned specifically in the Standard, should be addressed similarly.

Portable Flushing Systems
OSHA has stated its policy for providing portable flushing equipment in a response to a specific request for clarification of requirements for lead acid battery service in 1982. Portable systems typically cannot meet the duration of plumbed systems, especially for showers. A portion of OSHA's response is shown below. The reference to electrolyte in OSHA's response could be generalized to all corrosive injurious fluids.

Various forms of eye wash equipment are available today. Many are of the portable or self-contained wall mounted type which are limited in the quantity of water available for eye wash purposes, and usually do not provide for body drenching. This equipment may be used for compliance with 29 CFR 1910.151(c) only when it is not economically feasible to provide plumbed equipment and/or where the potential employee exposure to electrolyte(s) is determined to be slight.

Other Factors
OSHA has identified other factors that should be considered in determining the type of flushing equipment/systems needed in a lead battery maintenance operation. Table 2 identifies the relevance of the lead acid battery example to American Water's chemical systems.

Table 2 - Other Factors that Affect Need for Flushing

Factors Identified by OSHA in Lead Acid Battery Example	Relevance to American Water Chemical Systems
Employee Functions	Worker functions include: Routine operation including inspection, rate adjustment, feeder calibration; Chemical transfer; Chemical unloading; Maintenance and repair of equipment, piping, and valves;
Type of Electrolyte and Concentration	Type of chemical; concentration; specific hazards
Type and Size of Battery	Volume of chemical tanks; operating pressure of chemical piping; rate of chemical delivery from feeder/metering pump; rate of chemical transfer and unloading;
Facility Layout	Layout
Personal Protective Equipment (PPE)	PPE varies, but usually does not include full protection from hazard

Material Safety Data Sheets (MSDS)
MSDS sheets are required to be available to employees for the purpose of communicating the hazards of chemicals used in their workplace. The MSDS sheets contain descriptions of the hazards, and recommendations for first aid in the event of the chemical contacting eyes or skin.

MSDS recommendations are listed in Table 3 for a sampling of chemicals used at American Water.

Table 3 - Examples of MSDS Flushing Guidance

Chemical	Eye Contact Flushing	Skin Contact Flushing	Comments
Liquid Alum (50%)	15 minutes or more	Flush with plenty of water;	
Ferric Chloride (38%)	Rinse for at least 15 minutes	Flush for at least 15 minutes	Remove contaminated clothing and shoes
Sodium Hypochlorite (12.5%)	Rinse for at least 15 minutes	Immediately flush with plenty of water	Remove contaminated clothing and shoes
Fluosilicic Acid (23%)	Flush for at least 15 minutes	Immediately flush with plenty of water	Remove contaminated clothing
Caustic Soda (50%)	Flush 20 to 60 minutes	Flush 20 to 60 minutes	Flush with lukewarm water; repeat if necessary. Remove contaminated clothing and shoes

Summary

1. As part of first aid requirements in the work place, federal regulations require equipment/ systems to be provided to quickly flush/drench eyes and other body parts where anyone may come into contact with corrosive, injurious fluids.
2. Many water treatment chemicals are corrosive, injurious fluids and have the potential to harm eyes, skin, and body parts.
3. ANSI Standard Z358.1 (2009) American National Standard for Emergency Eyewash and Shower Equipment is widely accepted by OSHA and industry for defining the required performance of flushing equipment and systems.
4. The Standard sets minimum flow rates and durations of flow for various flushing equipment/systems.
5. Providing flushing fluid at a temperature conducive to use for the recommended irrigation period is an integral part of providing suitable facilities. The Standard requires the temperature of the water supply to be tepid. Tepid is understood to be approximately 60 to 100 degrees F.
6. The water supply is to be of potable quality.
7. The Standard calls for weekly testing of equipment to verify availability and address stagnant water quality concerns.

8. Portable flushing equipment, with inherent flow and duration limitations, can be used to supplement a system that is compliant with the Standard, or can be used where a compliant system is infeasible, or where the hazard is low. A site with no potable water would be a good candidate for portable flushing equipment.
9. MSDS sheets for water treatment chemicals provide recommendations for first aid in the event of the chemical contacting someone's eyes, or skin. The MSDS sheets frequently identify a minimum period of time for flushing of eyes and skin. Removal of clothing and shoes may be necessary.

Design Recommendations

American Water places a high priority on safety. Identification of alternatives and consideration of their feasibility should be performed and documented by a cross-functional team before proceeding with design and installation of a system that does not meet the latest requirements of ANSI Z358.1. A non-compliant system is usually preferable to not having any flushing system, and may be an interim step preceding installation of a compliant system.

The first aid recommendations contained in MSDS sheets should be reviewed for the chemicals planned to be present for a project. Flushing systems should be designed to provide the first aid measures identified in the MSDS sheets.

General design recommendations are provided below for the two extreme situations of 1) a medium to large treatment plant complex with multiple flushing stations, and 2) a small facility with a single flushing station.

When needed, a tempered water system should be requested in the Design Concept, and addressed in the Design Memorandum/Basis of Design document. A tempered water schematic should be produced as part of the design drawings.

For a large treatment plant, with numerous flushing stations, a central system with hot water or tempered water circulating pump(s) is recommended. Hot water is typically produced from electric or natural gas and stored in a storage tank(s). Hot water is then blended with cold water via a mixing valve to produce tempered water. The mixing valves are located in the vicinity of the flushing stations. Alternatively, tempered water can be circulated through a single mixing valve located near the hot water storage tank.

For a single flush station, hot water can be supplied from either a hot water heater/storage tank, or from an instantaneous heater. In order to meet the hydraulic and temperature requirements for an emergency shower, the hot water heater/storage tank volume may need to be larger than typical residential units. For example, with hot water being stored at 130 degrees F and cold water supplied at 55 degrees F, the hot water storage volume must be at least 53 gallons to meet a 65 degree tepid water target for 15 minutes at 20 gpm. With a 38 degree F supply water temperature, at least 119 gallons of hot water storage is necessary. Note that the recovery rate for tank type heaters is relatively low compared to the demand for water over a 15 minute period, and therefore not an important design parameter. American Water Engineering has developed a spreadsheet calculator tool that can be used to estimate storage tank volumes and heat input requirements for both tank type heaters and tankless heaters.

Electric tankless hot water heaters are usually impractical due to their high electrical demands. Natural gas tankless heaters can be a practical solution where natural gas is available. Multiple tankless heaters can be installed to operate in parallel, if needed, to provide the necessary heated water supply which is then blended with cold water to the desired temperature by a mixing valve. Propane fuel for tankless heaters may also be a practical alternative for remote locations. Circulation of hot water or tempered water is typically not required for a single flush station as long as the hot water heat source is in relatively close proximity to the eyewash/shower. An example of a natural gas tankless heater and eyewash/shower for a remote site is shown in Figure 1.

Protection from freezing should be included in the design and installation where appropriate.

Someone that has activated a flushing station may benefit from assistance provided by others. It is recommended that activation of a flushing station be alarmed through SCADA resulting in prompt notification of the event to American Water personnel. A flow switch is typically installed on the water supply with an input to SCADA. The activation can be a single input for several flushing stations, or one per each station. In some instances, local alarm indication with audible and visual indication may be desirable. These design preferences should be resolved with local operations staff prior to detailed design (Design Concept if possible).

An emergency eyewash and shower should be provided where liquid chemical deliveries are made that involve temporary hose connections.

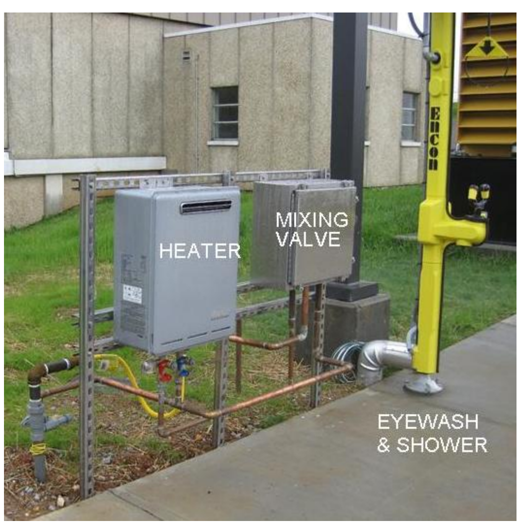


Figure 1 – Natural Gas Tankless Water

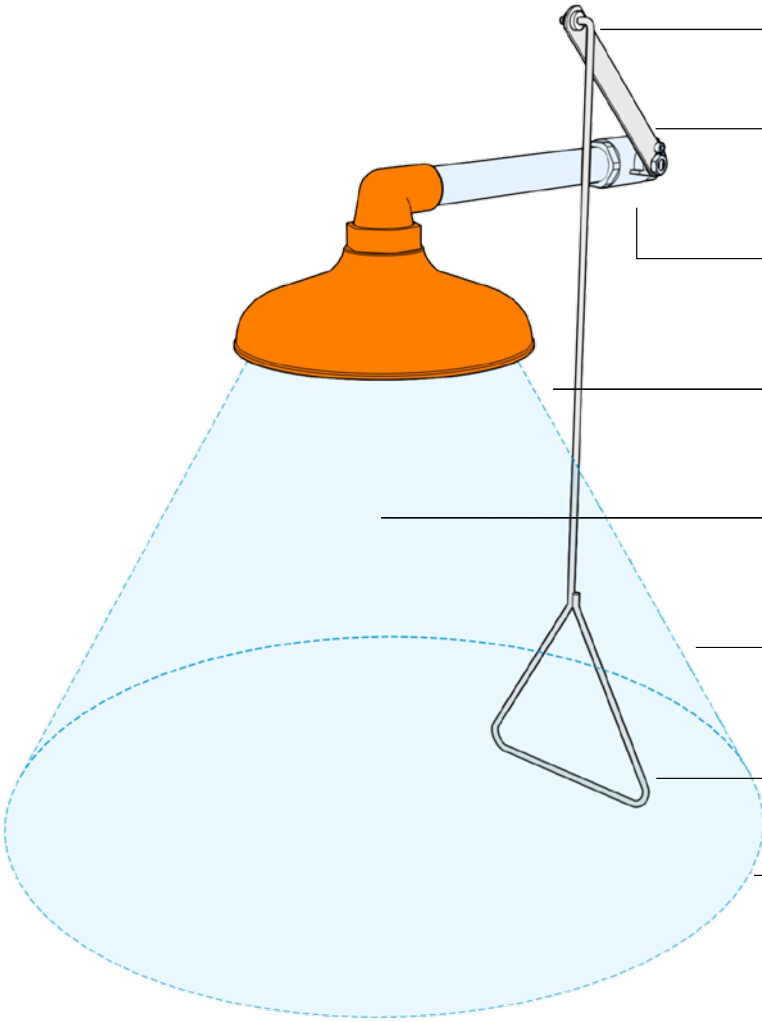
Guardian

ANSI / ISEA Z358.1 Compliance Checklist

Emergency Showers

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency showers. Please refer to the standard for a complete listing of these provisions.

All Guardian emergency showers are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ◯ **"Hands-free" stay-open valve activates in one second or less. (Section 4.2)**
- ◯ **Water supply shall be sufficient to supply at least 20 GPM in the required pattern for 15 minutes. (Sections 4.1.2, 4.5.5)**
- ◯ **Shower shall provide 20 gallons (75.7 liters) of water per minute for 15 minutes. (Section 4.1.2, 4.5.5)**
- ◯ **Height of water column shall be between 82" (208.3 cm) and 96" (243.8 cm) above floor. (Section 4.1.3, 4.5.4)**
- ◯ **Center of the water pattern shall be at least 16" (40.6 cm) from any obstructions. (Section 4.1.4, 4.5.4)**
- ◯ **At 60" (152.4 cm) above floor, the water pattern must be at least 20" (50.8 cm) in diameter. (Section 4.1.4)**
- ◯ **Easily located, accessible actuator no higher than 69" (173.3 cm) above floor. (Section 4.2)**
- ◯ **If provided, shower enclosure shall be a minimum diameter of 34" (86.4 cm). (Section 4.3)**

LOCATION	Install shower within 10 seconds (approximately 55 feet) of hazard, on the same level as hazard and with unobstructed travel path. (Section 4.5.2; B5)
IDENTIFICATION	Identify shower location with highly visible sign. Area around the shower shall be well-lit. (Section 4.5.3)
WATER TEMPERATURE	Water delivered by shower shall be tepid (60-100°F). (Section 4.5.6)
TRAINING	Instruct all employees in the location and proper use of emergency showers. (Section 4.6.4)
MAINTENANCE/INSPECTION	Activate shower at least weekly. (Section 4.6.2) Inspect annually for compliance with standard. (Section 4.6.5)

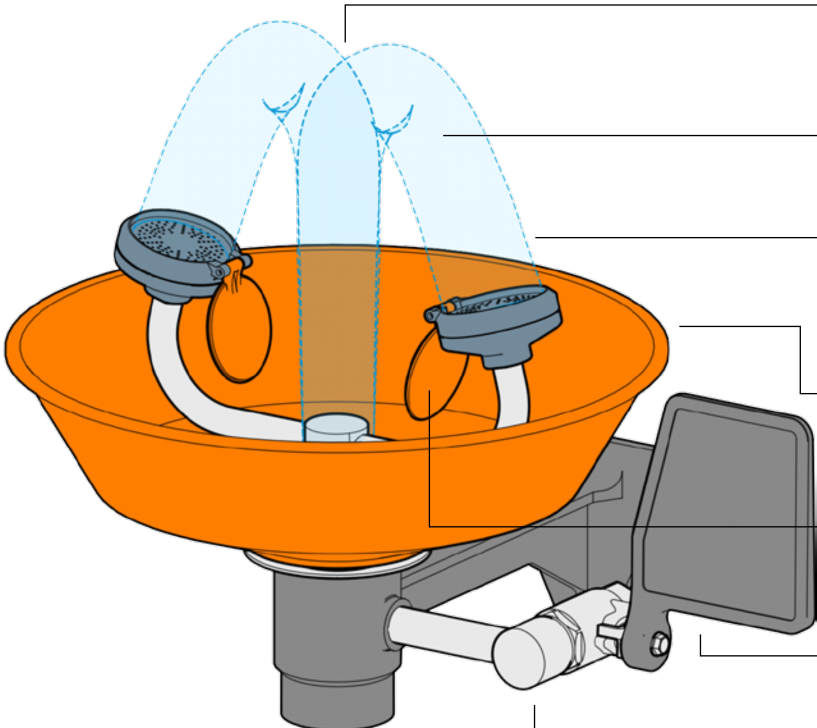
Guardian

ANSI / ISEA Z358.1 Compliance Checklist

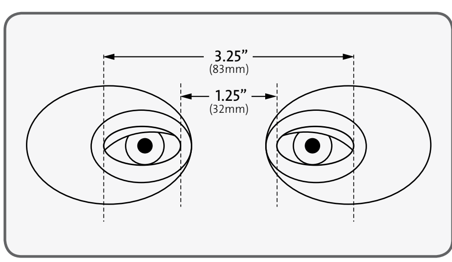
Eye/Face Washes

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency eye/face washes. Please refer to the standard for a complete listing of these provisions.

All Guardian eye/face wash units are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ○ Controlled, low velocity flow completely rinses eyes and face and is not injurious to user. (Section 6.1.1)
- ○ Water flow is sufficiently high to allow user to hold eyes open while operating. (Section 6.1.7)
- ○ Flushing fluid flow pattern shall be positioned between 33" (83.8 cm) and 53" (134.6 cm) from the floor and at least 6" (15.3 cm) from the wall or nearest obstruction. (Section 6.4.4)
- ○ Unit must deliver at least 3.0 gallons (11.4 liters) of water per minute for 15 minutes. (Section 6.1.6, 6.4.5)
- ○ Protect spray heads from airborne contaminants. Covers shall be removed by water flow. (Section 6.1.3)
- ○ Valve actuator shall be easy to locate and readily accessible to user. (Section 6.2)
- ○ "Hands-free" stay-open valve shall activate in one second or less. (Section 6.1.4, 6.2)
- ○ Unit washes both eyes simultaneously. Water flow covers area indicated on Guardian test gauge. (Section 6.1.8)



LOCATION	Install eye/face wash unit within 10 seconds (approximately 55 feet) of hazard, on the same level as hazard and with unobstructed travel path. Where strong acids or caustics are being handled, the eye/face wash shall be located immediately adjacent to the hazard. (Section 6.4.2; B5)
IDENTIFICATION	Identify eye/face wash with highly visible sign. Area around eye/face wash shall be well-lit. (Section 6.4.3)
WATER TEMPERATURE	Water delivered by eye/face wash shall be tepid (60-100°F). (Section 6.4.6)
TRAINING	Instruct all employees in the location and proper use of eye/face washes. (Section 6.5.4)
MAINTENANCE/INSPECTION	Activate eye/face wash at least weekly. (Section 6.5.2) Inspect annually for compliance with standard. (Section 6.5.5)

Guardian Equipment
1140 N North Branch St
Chicago, IL 60642

312 447 8100 TELEPHONE
312 447 8101 FACSIMILE
gesafety.com

Listed 8116. Units have been tested to and comply with ANSI Z358.1-2014 and the Uniform Plumbing Code.

ETL Listed 101496. Units have been tested to and comply with ANSI Z358.1-2014.

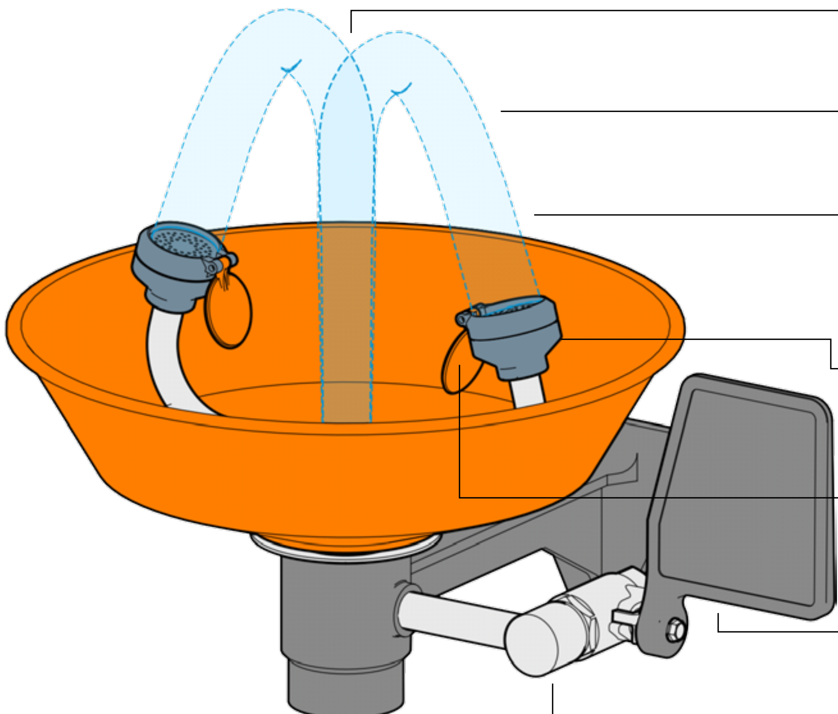
Guardian

ANSI / ISEA Z358.1 Compliance Checklist

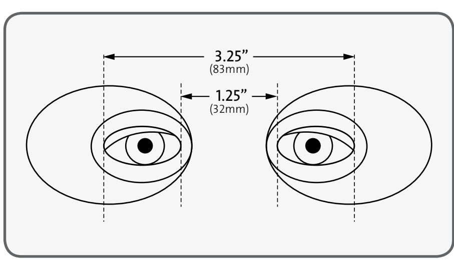
Eyewashes

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency eyewashes. Please refer to the standard for a complete listing of these provisions.

All Guardian eyewash units are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ○ Controlled, low velocity flow rinses both eyes and is not injurious to user. (Section 5.1.1)
- ○ Water flow is sufficiently high to allow user to hold eyes open while rinsing. (Section 5.1.7)
- ○ Flushing fluid flow pattern shall be positioned between 33" (83.8 cm) and 53" (134.6 cm) from the floor and at least 6" (15.3 cm) from the wall or nearest obstruction. (Section 5.4.4)
- ○ Unit must deliver at least 0.4 gallons (1.5 liters) of water per minute for 15 minutes. (Section 5.1.6)
- ○ Protect spray heads from airborne contaminants. Covers shall be removed by water flow. (Section 5.1.3)
- ○ Valve actuator shall be easy to locate and readily accessible to user. (Section 5.2)
- ○ "Hands-free" stay-open valve activates in one second or less. (Section 5.1.4, 5.2)
- ○ Unit washes both eyes simultaneously. Water flow covers area indicated on Guardian test gauge. (Section 5.1.8)



LOCATION	Install eyewash wash unit within 10 seconds (approximately 55 feet) of hazard, on the same level as hazard and with unobstructed travel path. Where strong acids or caustics are being handled, the eyewash shall be located immediately adjacent to the hazard. (Section 5.4.2; B5)
IDENTIFICATION	Identify eyewash with highly visible sign. Area around eyewash shall be well-lit. (Section 5.4.3)
WATER TEMPERATURE	Water delivered by eyewash shall be tepid (60-100°F). (Section 5.4.6)
TRAINING	Instruct all employees in the location and proper use of eyewashes. (Section 5.5.4)
MAINTENANCE/INSPECTION	Activate eyewash at least weekly. (Section 5.5.2) Inspect annually for compliance with standard. (Section 5.5.5)

Guardian Equipment
1140 N North Branch St
Chicago, IL 60642

312 447 8100 TELEPHONE
312 447 8101 FACSIMILE
gesafety.com

Listed 8116. Units have been tested to and comply with ANSI Z358.1-2014 and the Uniform Plumbing Code.

ETL Listed 101496. Units have been tested to and comply with ANSI Z358.1-2014.

Guardian

ANSI / ISEA Z358.1 Compliance Checklist

Eyewash/Drench Hose Units

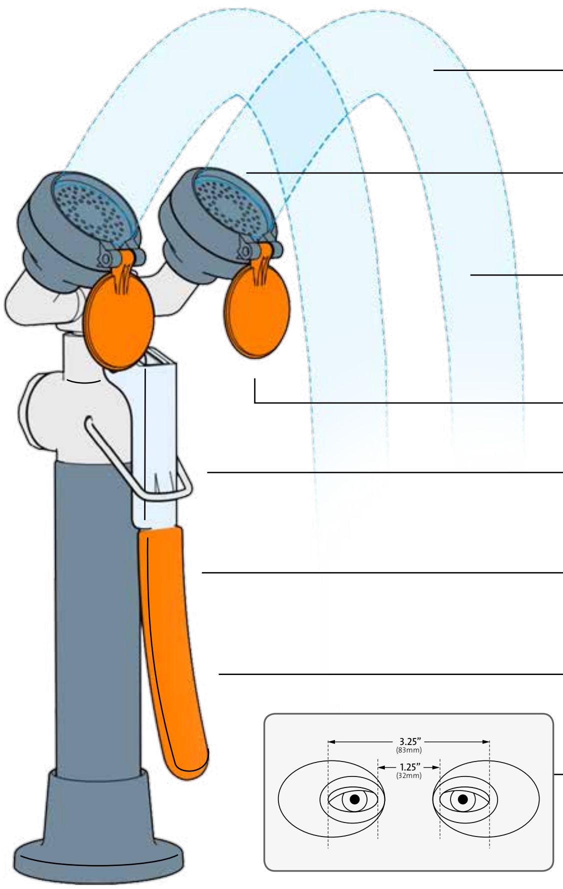
ANSI Standard Z358.1-2014 states that drench hose units may supplement, but may not be used in place of, dedicated eyewash units. Guardian offers a series of units that meet the provisions of the ANSI standard as both an eyewash and a drench hose. These dual purpose units can be used to combine an eyewash and a drench hose into a single versatile, economic unit.

To use the unit as a fixed eyewash, simply leave the unit in the holder. The dual spray heads will deliver water to both eyes simultaneously. To function as a drench hose, remove the unit from the holder and rinse any part of the eyes, face or body.

These units are particularly useful in areas (such as laboratories) where workers are handling relatively small quantities of injurious materials. However, should a spill occur, it might affect any part of the worker's eyes, face or body. Eyewash/drench hose units offer a degree of versatility not found with other types of emergency equipment.

This checklist summarizes the provisions of ANSI Z358.1-2014 for both eyewashes and drench hoses. Please refer to the standard for a complete listing of these provisions.

All Guardian eyewash/drench hose units are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ○ **Controlled, low velocity flow rinses both eyes and is not injurious to user. (Sections 5.1.1 and 8.2.1)**
- ○ **Water flow is sufficiently high to allow user to hold eyes open while rinsing. (Section 5.1.7)**
- ○ **Flushing fluid flow pattern shall be positioned between 33" (83.8 cm) and 53" (134.6 cm) from the floor and at least 6" (15.3 cm) from the wall or nearest obstruction. (Section 5.4.4)**
- ○ **Protect spray heads from airborne contaminants. (Section 5.1.3)**
- ○ **"Hands-free" stay-open valve shall activate in one second or less. (Sections 5.2 and 8.2.2)**
- ○ **Unit must deliver at least 0.4 gallons (1.5 liters) of water per minute for 15 minutes. (Section 5.1.6)**
- ○ **Valve actuator shall be easy to locate and readily accessible to the user. (Sections 5.2 and 8.2.2)**
- ○ **Unit washes both eyes simultaneously. Water flow covers area indicated on Guardian test gauge. (Section 5.1.8)**

LOCATION	Install eyewash/drench hose unit within 10 seconds (approximately 55 feet) of hazard, on same level as hazard and with unobstructed travel path. (Section 5.4.2; B5)
IDENTIFICATION	Identify eyewash/drench hose unit with highly visible sign. Area around unit shall be well-lit. (Sections 5.4.3 and 8.2.3.2)
WATER TEMPERATURE	Water delivered by eyewash/drench hose units shall be tepid (60-100°F). (Sections 5.4.6 and 8.2.3.4)
TRAINING	Instruct all employees in the location and proper use of eyewash/drench hose units. (Sections 5.5.4 and 8.2.4.4)
MAINTENANCE/INSPECTION	Activate eyewash/drench hose units at least weekly. (Sections 5.5.2 and 8.2.4.2) Inspect annually for compliance with standard. (Section 5.5.5 and 8.2.4.5)

Guardian Equipment
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Chicago, IL 60642

312 447 8100 TELEPHONE
312 447 8101 FACSIMILE
gesafety.com

Listed 8116. Units have been tested to and comply with ANSI Z358.1-2014 and the Uniform Plumbing Code.

ETL Listed 101496. Units have been tested to and comply with ANSI Z358.1-2014.

Guardian

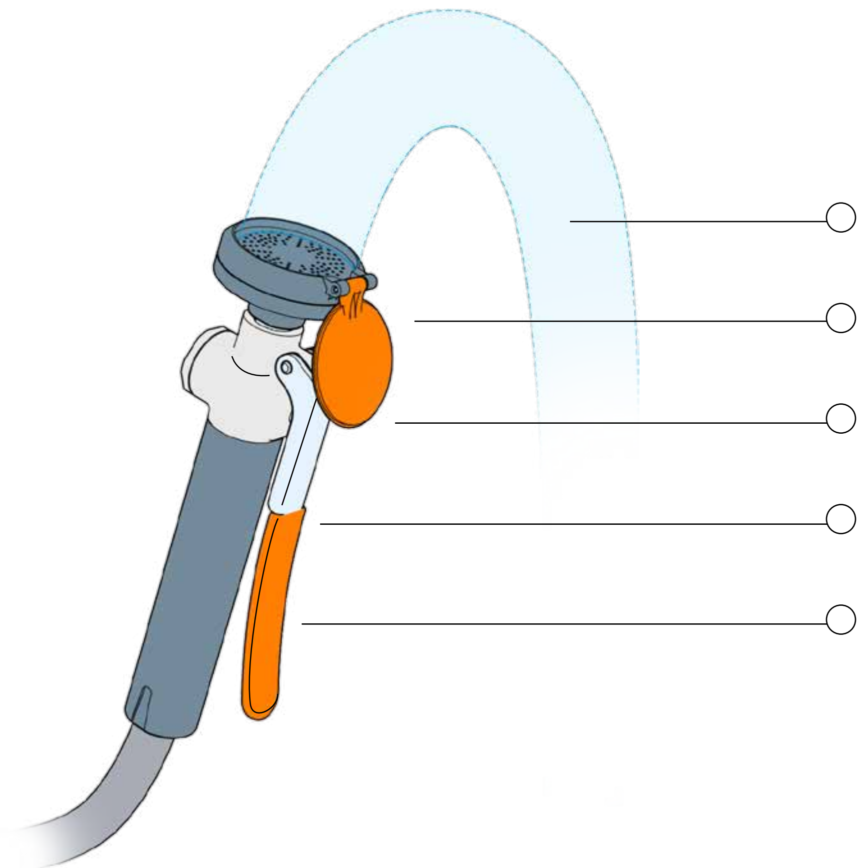
Drench Hose Units

Under ANSI Z358.1-2014, drench hose units support plumbed and self-contained emergency eyewash and shower stations, but cannot replace them. In other words, drench hoses are intended solely as supplemental units providing additional protection to personnel.

Drench hoses are useful in cases where the user is in a prone position or where it is necessary to reach areas of the face and body inaccessible to the fixed stream of a shower or eyewash unit. They are also advantageous in areas (such as laboratories) where they can be installed close to where accidents might occur.

This checklist summarizes the provisions of ANSI Z358.1-2014 relating to drench hoses. Please refer to the standard for a complete listing of these provisions.

All Guardian drench hose units are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ○ **Controlled, low velocity flow is not injurious to user. (Section 8.2.1)**
- ○ **Drench hose unit supplements shower and eyewash units installed in vicinity. (Section 8)**
- ○ **Valve shall go from "off" to "on" in one second or less. (Section 8.2.2)**
- ○ **Valve actuator shall be easy to locate and readily accessible to the user. (Section 8.2.2)**
- ○ **If providing shutoff valves, allowance shall be made to prevent unauthorized shutoff. (Section 8.2.3.3)**

LOCATION	**Install drench hose unit in area free of debris or obstructions. (Section 8.2.3.2)**
IDENTIFICATION	**Identify drench hose unit with highly visible sign. Area around drench hose shall be well-lit. (Section 8.2.3.2)**
WATER TEMPERATURE	**Water delivered by drench hose shall be tepid (60-100°F). (Section 8.2.3.4)**
TRAINING	**Instruct all employees in the location and proper use of drench hoses. (Section 8.2.4.4)**
MAINTENANCE/INSPECTION	**Activate drench hoses at least weekly. (Section 8.2.4.2) Inspect annually for compliance with standard. (Section 8.2.4.5)**

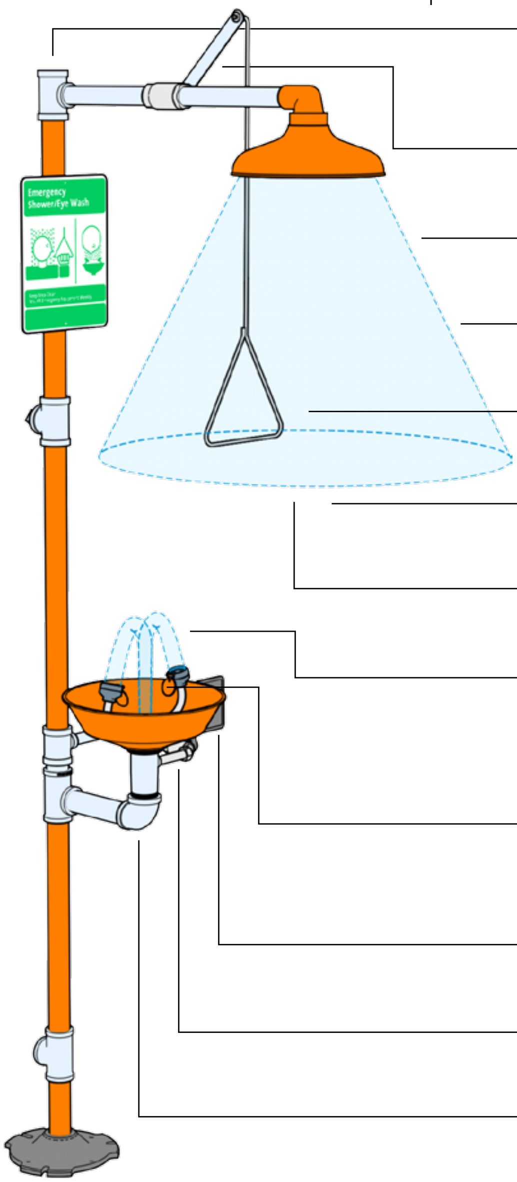
Guardian

ANSI / ISEA Z358.1 Compliance Checklist

Safety Stations

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to eye or eye/face wash and shower combination stations. Please refer to the standard for a complete listing of these provisions.

All Guardian safety stations are third-party certified to meet or exceed the provisions of ANSI Z358.1-2014.



- ◯ Connect unit to water supply capable of delivering required flow when all components are operated simultaneously. (Section 4.5.5, 7.4.4)
- ◯ "Hands-free" stay-open valve activates in one second or less. (Section 4.2)
- ◯ Height of water column shall be between 82" (208.3 cm) and 96" (243.8 cm) above floor. (Section 4.1.3, 4.5.4)
- ◯ Shower shall provide 20 gallons (75.7 liters) of water per minute for 15 minutes. (Section 4.1.2, 4.5.5)
- ◯ Easily located, accessible actuator no higher than 69" (173.3 cm) above floor. (Section 4.2)
- ◯ At 60" (152.4 cm) above floor, the water pattern must be at least 20" (50.8 cm) in diameter. (Section 4.1.4)
- ◯ Center of water pattern shall be at least 16" from any obstructions. (Section 4.1.4, 4.5.4)
- ◯ Flushing fluid flow pattern shall be positioned between 33" (83.8 cm) and 53" (134.6 cm) from the floor and at least 6" (15.3 cm) from the wall or nearest obstruction. (Section 5.4.4, 6.4.4)
- ◯ Protect outlet heads from airborne contaminants. Covers shall be removed by water flow. (Section 5.1.3, 6.1.3)
- ◯ Valve actuator shall be easy to locate and readily accessible to user. (Section 5.2, 6.2)
- ◯ "Hands-free" stay-open valve activates in one second or less. (Section 5.2, 6.1.4, 6.2)
- ◯ Unit must deliver at least 3.0 GPM (11.4 liters) (for eye/face wash) or 0.4 GPM (1.5 liters) (for eyewash) for 15 minutes. (Sections 5.1.6, 6.1.6, 6.4.5)

LOCATION	Install safety station within 10 seconds (approximately 55 feet) of hazard, on the same level as hazard and with unobstructed travel path. (Section 7.4.2; B5)
IDENTIFICATION	Identify safety station with highly visible sign. Area around safety station shall be well-lit. (Section 7.4.3)
WATER TEMPERATURE	Water delivered by safety station shall be tepid (60-100°F). (Section 7.4.5)
TRAINING	Instruct all employees in the location and proper use of safety station. (Section 7.5.4)
MAINTENANCE/INSPECTION	Activate safety station at least weekly. (Section 7.5.2) Inspect annually for compliance with standard. (Section 7.5.5)

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Chicago, IL 60642

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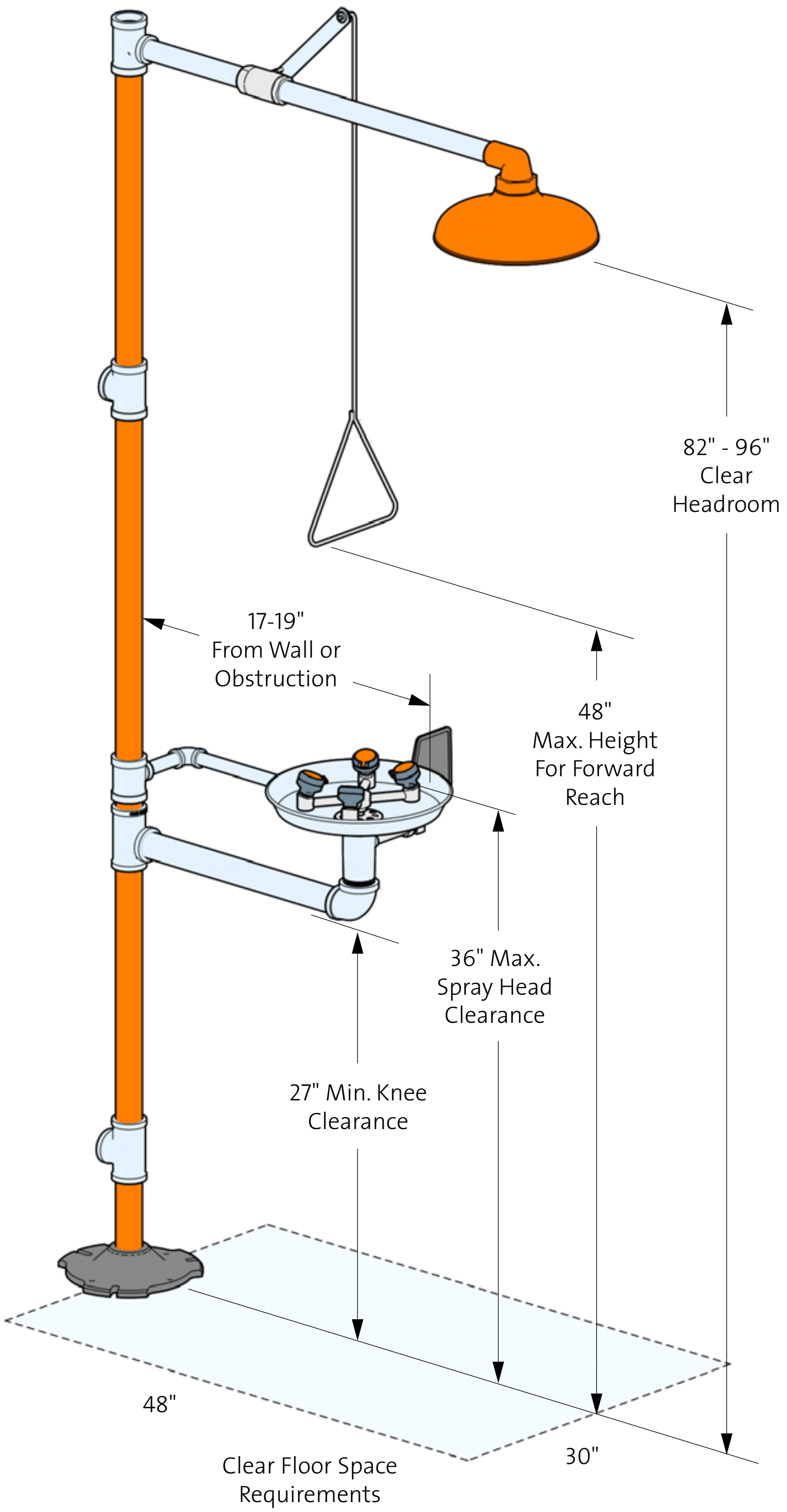
Listed 8116. Units have been tested to and comply with ANSI Z358.1-2014 and the Uniform Plumbing Code.

ETL Listed 101496. Units have been tested to and comply with ANSI Z358.1-2014.

Guardian

Barrier-Free Equipment



The Americans with Disabilities Act (ADA) requires that employers provide accessible workplaces for all employees. These workplaces may therefore require emergency eyewash and shower equipment that is specially constructed to provide access to handicapped persons.

Barrier-free emergency equipment must comply with the provisions of ANSI 117.1-1998 ("Accessible and Usable Buildings and Facilities"). These provisions include dimensions for minimum knee clearance, maximum height and reach, and minimum distance from obstructions.

Guardian offers an array of eyewash and shower units designed for barrier-free applications. These units meet the provisions of ANSI Z358.1-2014 for emergency equipment and the provisions of ANSI A117.1-1998 for accessibility. The provisions of ANSI Z358.1-2014 are summarized on pages 2-10. The additional provisions of ANSI A117.1-1998 for accessibility are shown here. Please refer to these standards for a complete description of these provisions.

Appendix G

Guidelines for Venting Polyethylene Storage Tanks

POLYPROCESSING SOLUTIONS, SIMPLIFIED.	**Technical Bulletin**	**Venting – Design for ACFM** (Air Cubic Feet per Minute)
	Date: January 2010 Rev. 1	

Poly Processing Company commissioned an engineering consulting firm to determine the proper venting requirements necessary for polyethylene storage tanks. Two methods of filling were considered, 1) mechanical pumping and 2) compressed air (pneumatic) from tanker trucks.

Filling by Mechanical Pump

Using mechanical pumps to fill your tank is a low impact process and typically does not cause excessive pressure to be placed upon the tank.

- ≤ 1000 gallons – vent size should equal the size of the largest fill or discharge fitting
- > 1000 gallons - vent size should exceed the largest fill or discharge fitting by one-inch.

Pneumatic Filling

The engineering study reviewed the pneumatic filling of a polyethylene storage tank for three common venting scenarios:

1. Short Vent (u-vent)
2. Long Vent (vented through the roof or into a common venting system)
3. Scrubber Vent (used where fume scrubbing is critical)

The following criteria were established for all three venting scenarios:

1. Maximum pressure used to unload tanker trailer was 30 psig.
2. Evaluate tanker hose impact; 1”, 2” & 3”.
3. Evaluate fill-line/fitting size impact; 1”, 2” & 3”.
4. Polyethylene tank internal pressure must not exceed 10” water column per ASTM D1998 section 1.1.3.

General Conclusions

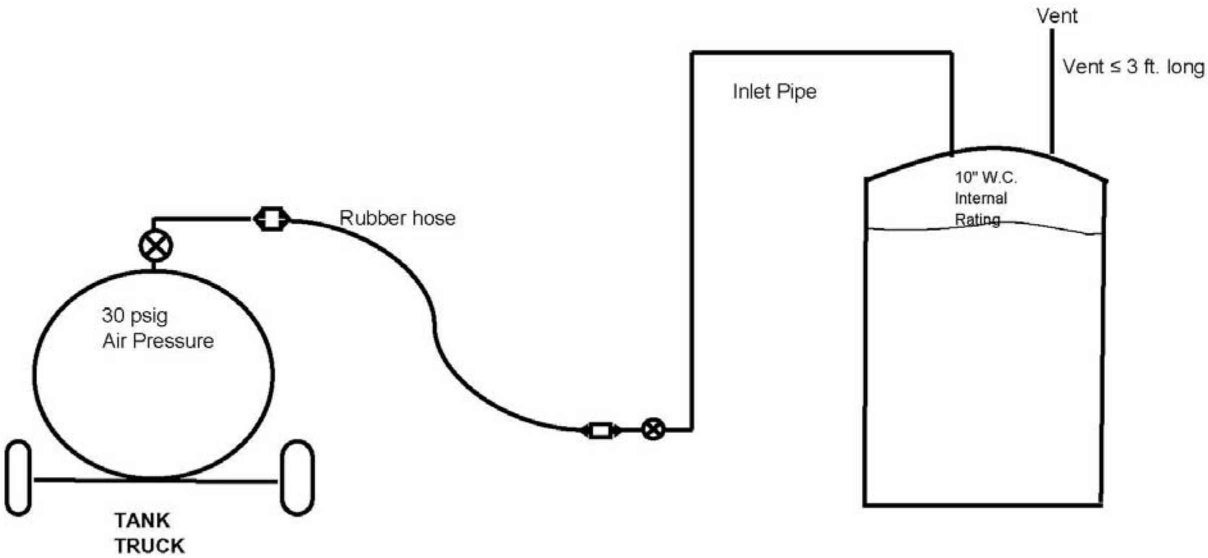
1. Tanker trailer, once emptied of liquid, becomes large reservoir of compressed air at 30 psig.
2. Size of delivery hose from trailer to tank, 1 to 3 inches in diameter, impacts the volume of air delivered to the tank during line purge.
3. Size of fill line / fitting of the tank, 1 to 3 inches in diameter, impacts the volume of air delivered to the tank during line purge.
4. Vent size 2 inches larger than the fill assembly is sufficient to handle the delivery of the liquid product, but may **not** handle the volume of air released from the tanker trailer based on conclusions #2 and #3.
5. **Venting capacity must equal or exceed Air Cubic Feet per Minute (ACFM) coming from tanker truck for adequate margin of safety and increased tank life!**

POLYPROCESSING SOLUTIONS, SIMPLIFIED.	Technical Bulletin Date: January 2010 Rev. 1	Venting – Design for ACFM (Air Cubic Feet per Minute)

Pneumatic Fill Scenario #1

Short Vent

- Vent length ≤ 3'
- Mesh size on bug screen ≥ ¼" or no screen



	Tank Vent Requirements				
	Hose	Inlet Pipe	Inlet Flow / ACFM	**Min. Vent Size**	Vent Flow / ACFM
A)	1"	1"	180	**3"**	600
B)	2"	1"	190	**3"**	600
C)	2"	2"	910	**4"**	1050
D)	3"	2"	1120	**6"**	2500
E)	3"	3"	2250	**6"**	2500

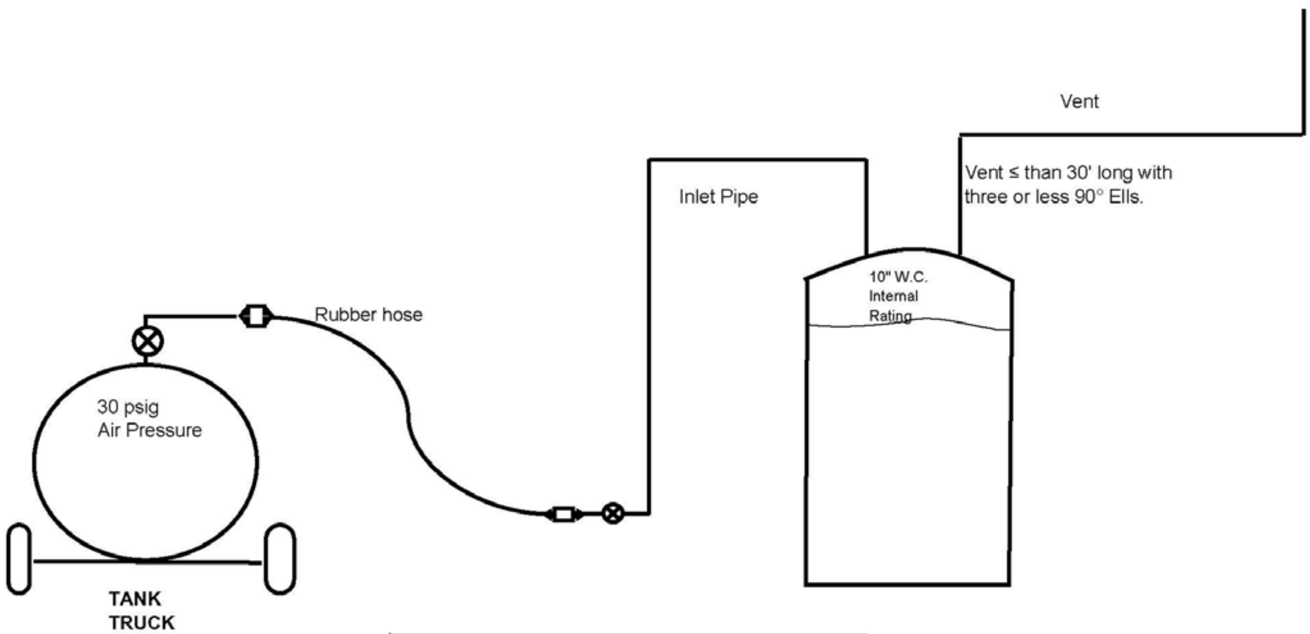
ACFM = air cubic feet per minute

POLYPROCESSING SOLUTIONS, SIMPLIFIED.	Technical Bulletin	Venting – Design for ACFM (Air Cubic Feet per Minute)
	Date: January 2010 Rev. 1	

Pneumatic Fill Scenario #2

Long Vent

- Vent length > 3' and ≤ 30'
- Three or less 90° elbows and no other restrictions, i.e. smaller diameter pipe



Tank Vent Requirements					
	Hose	Inlet Pipe	Inlet Flow / ACFM	**Min. Vent Size**	Vent Flow / ACFM
A)	1"	1"	180	**4"**	715
B)	2"	1"	190	**4"**	715
C)	2"	2"	910	**6"**	1870
D)	3"	2"	1120	**6"**	1870
E)	3"	3"	2250	**8"**	3450

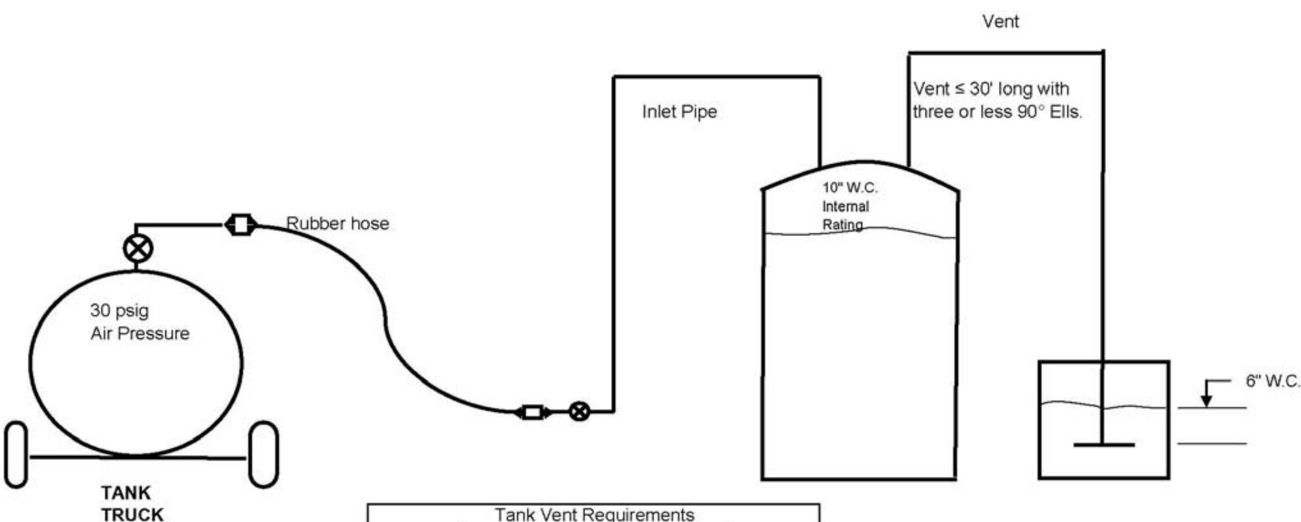
ACFM = air cubic feet per minute

POLYPROCESSING SOLUTIONS, SIMPLIFIED.	Technical Bulletin	Venting – Design for ACFM (Air Cubic Feet per Minute)
	Date: January 2010 Rev. 1	

Pneumatic Fill Scenario #3

Scrubber Vent

- Piping from vent to scrubber cannot be reduced
- Perforated dispersion pipe must be same diameter, or larger, as vent
- Centerline of dispersion pipe not to be submersed > 6 inches
- Sum of perforations ≥ cross sectional area of pipe



Tank Vent Requirements

	Hose	Inlet Pipe	Inlet Flow / ACFM	Min. Vent Size	Vent Flow / ACFM
A)	1"	1"	180	**4"**	380
B)	2"	1"	190	**4"**	380
C)	2"	2"	910	**6"**	970
D)	3"	2"	1120	**8"**	1780
E)	3"	3"	2250	**10"**	2935

ACFM = air cubic feet per minute

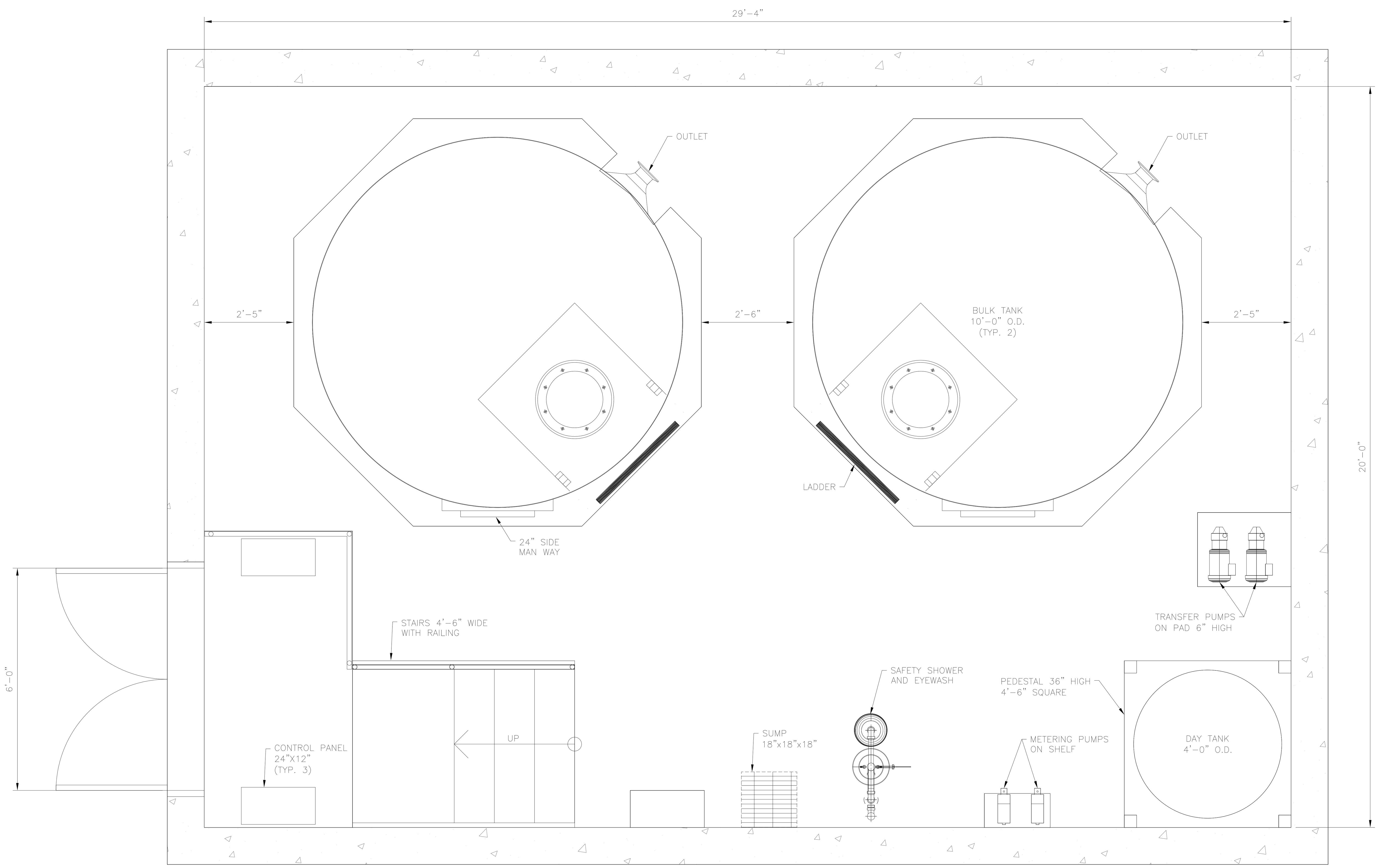
Appendix H

Bulk Chemical System Layout Example

- **H1 - Example of Bulk Chemical System Layout**

Selected Standard Detail Examples

- **H2 - Chemical Area Grating System**
- **H3 - Water Seal Trap**
- **H4 - Example of Flexible Plastic Tubing Application**
- **H5 - Control Panel for Fill Station**
- **H6 - Control Panel for Bulk Chemical Transfer System (Small Day Tank)**
- **H7 - Control Panel for Bulk Chemical Transfer System (Large Day Tank with one Bulk Tank)**
- **H8 - Control Panel for Bulk Chemical Transfer System (Large Day Tank with two Bulk Tanks)**



NOTES:

1. VALVES NOT SHOWN.
2. PIPING NOT SHOWN.

0 1' 2' 4'

SCALE: 1/2" = 1'-0"

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NO.

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PROJECT ENG'R S. CREEL

DATE 09-14-16

PROJECT

FIGURE H1

BULK STORAGE & FEED PLAN - EXAMPLE
FOR LIQUID CHEMICAL STANDARD

USE APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

FOR COMMENTS

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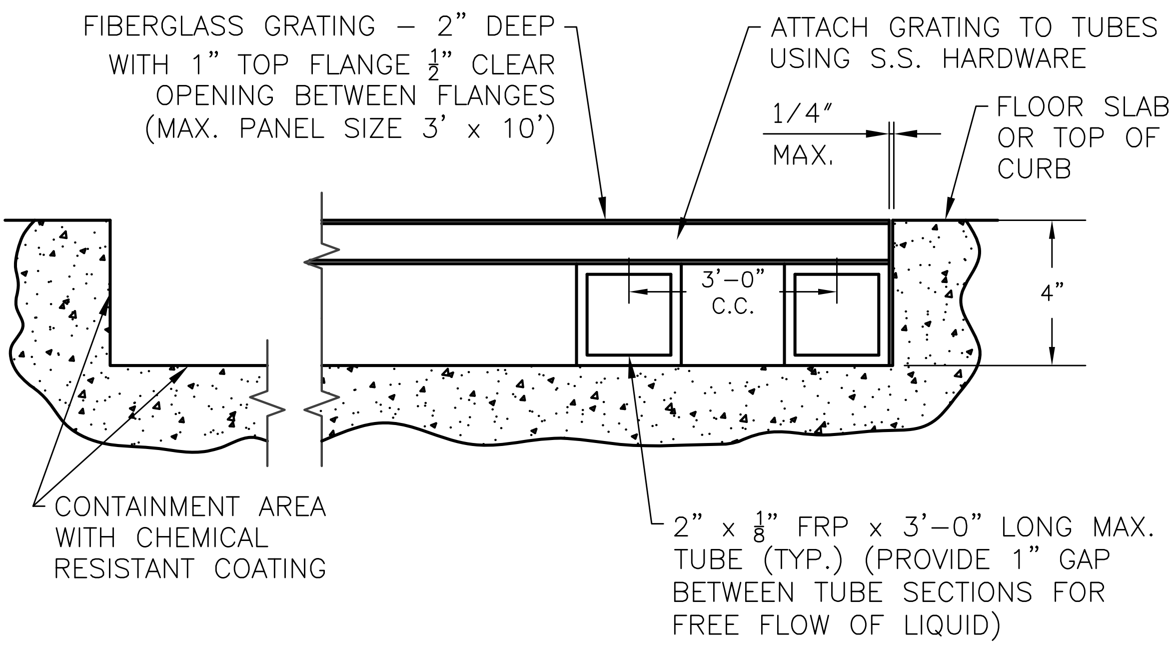
SCALE AS SHOWN

0201-0601-SD87

02010601SD87



DETAIL – H2
CHEMICAL AREA GRATING SYSTEM
N.T.S.

1 / X

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AMERICAN WATER STANDARD
CIVIL
CHEMICAL AREA GRATING SYSTEM
DETAIL H2

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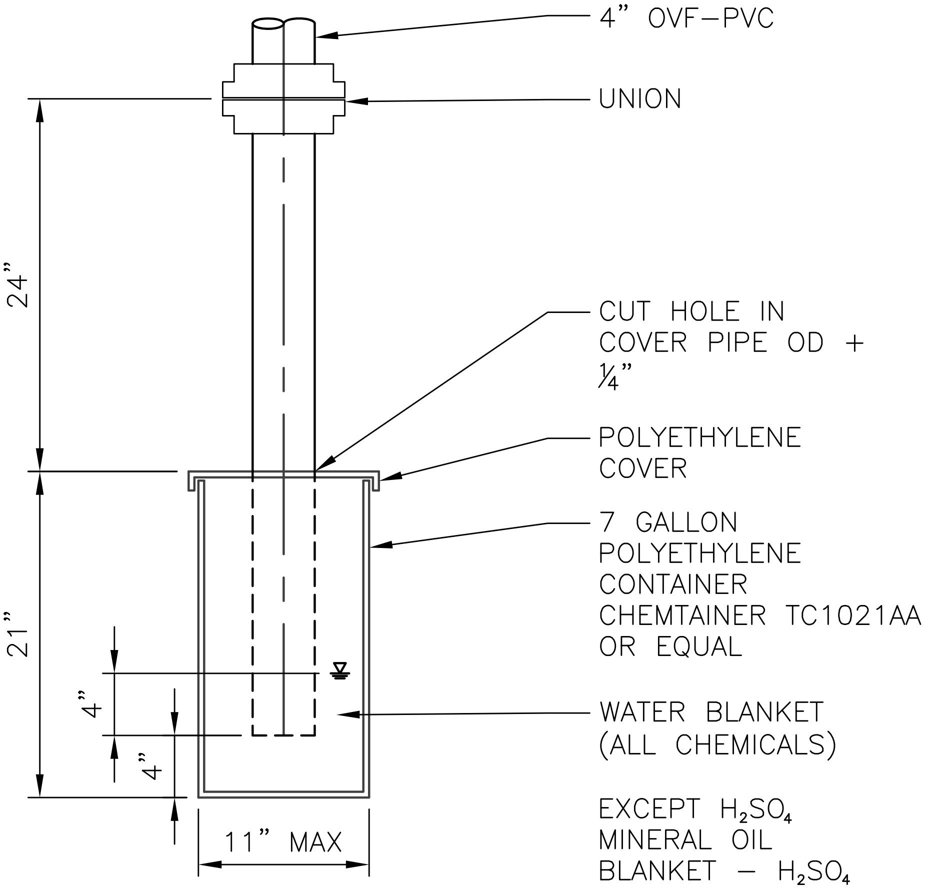

DETAIL – H3
CHEMICAL STORAGE TANK OVERFLOW
FUGITIVE EMISSION CONTAINMENT

N.T.S.

1
X

REVISIONS

AMERICAN WATER STANDARD
PROCESS
WATER SEAL TRAP
DETAIL H3

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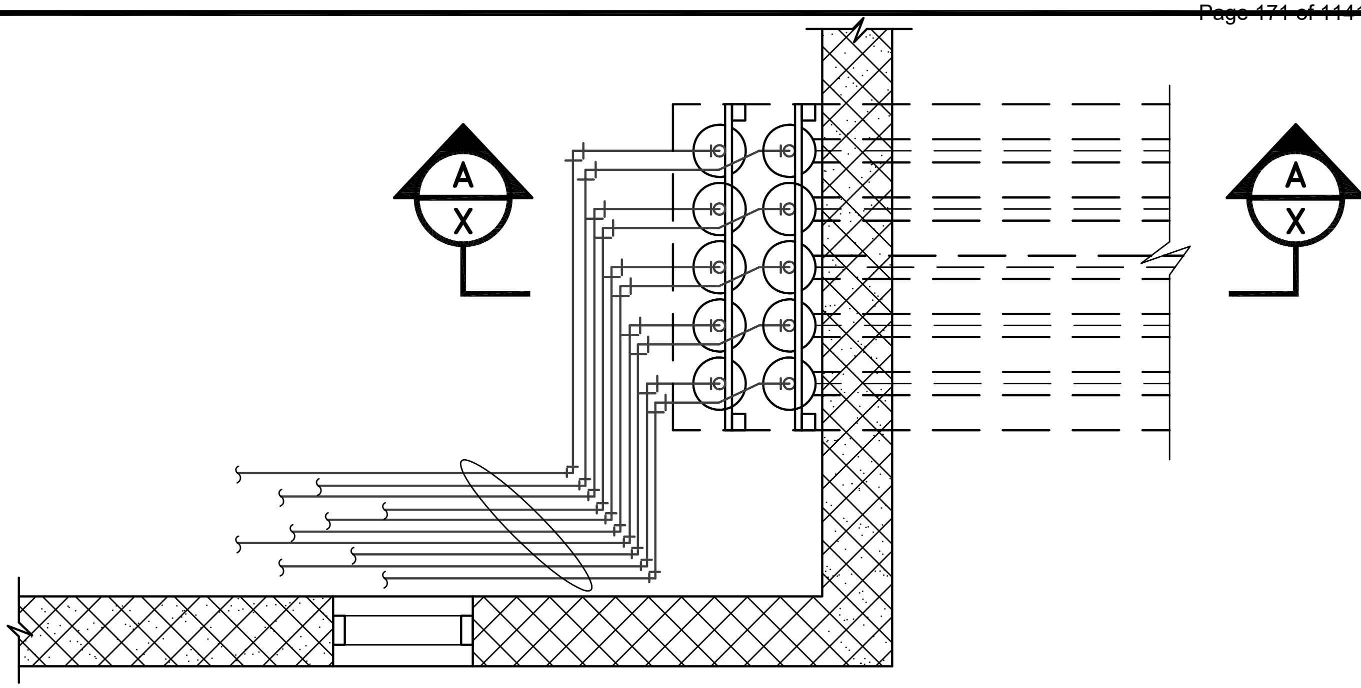
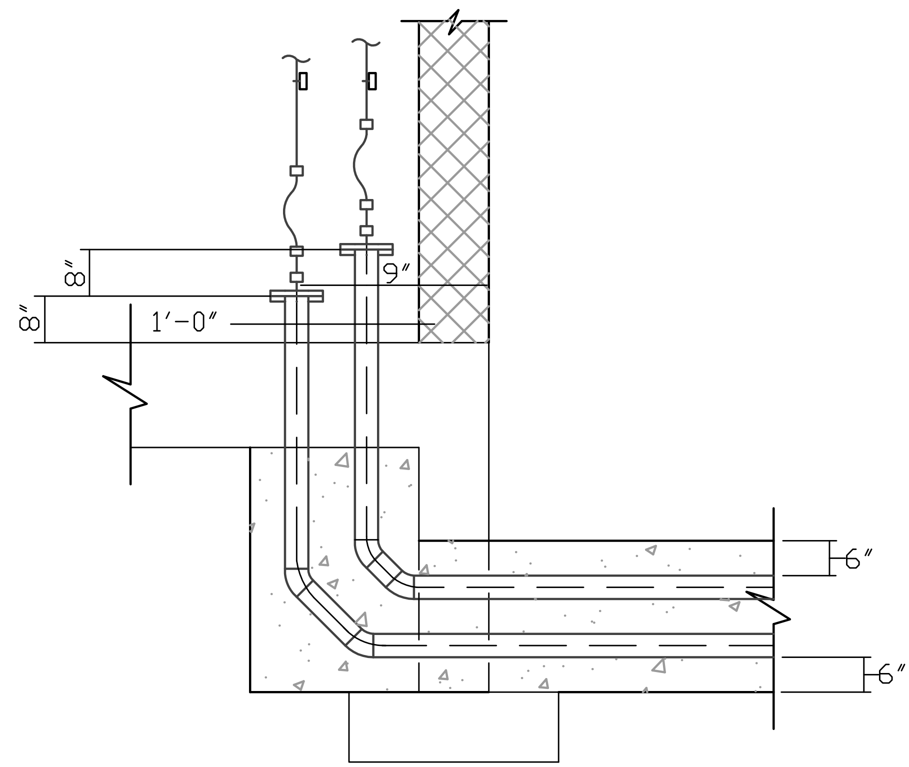
0201–0601–SD79

FOR COMMENTS

02010601SD79



PLAN VIEW



SECTION VIEW

REVISIONS

AMERICAN WATER STANDARD
CIVIL
FLEXIBLE PLASTIC TUBING APPLICATION
DETAIL H4

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MOUNT LAUREL, NJ 08054

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PROJECT IP

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SCALE N.T.S.

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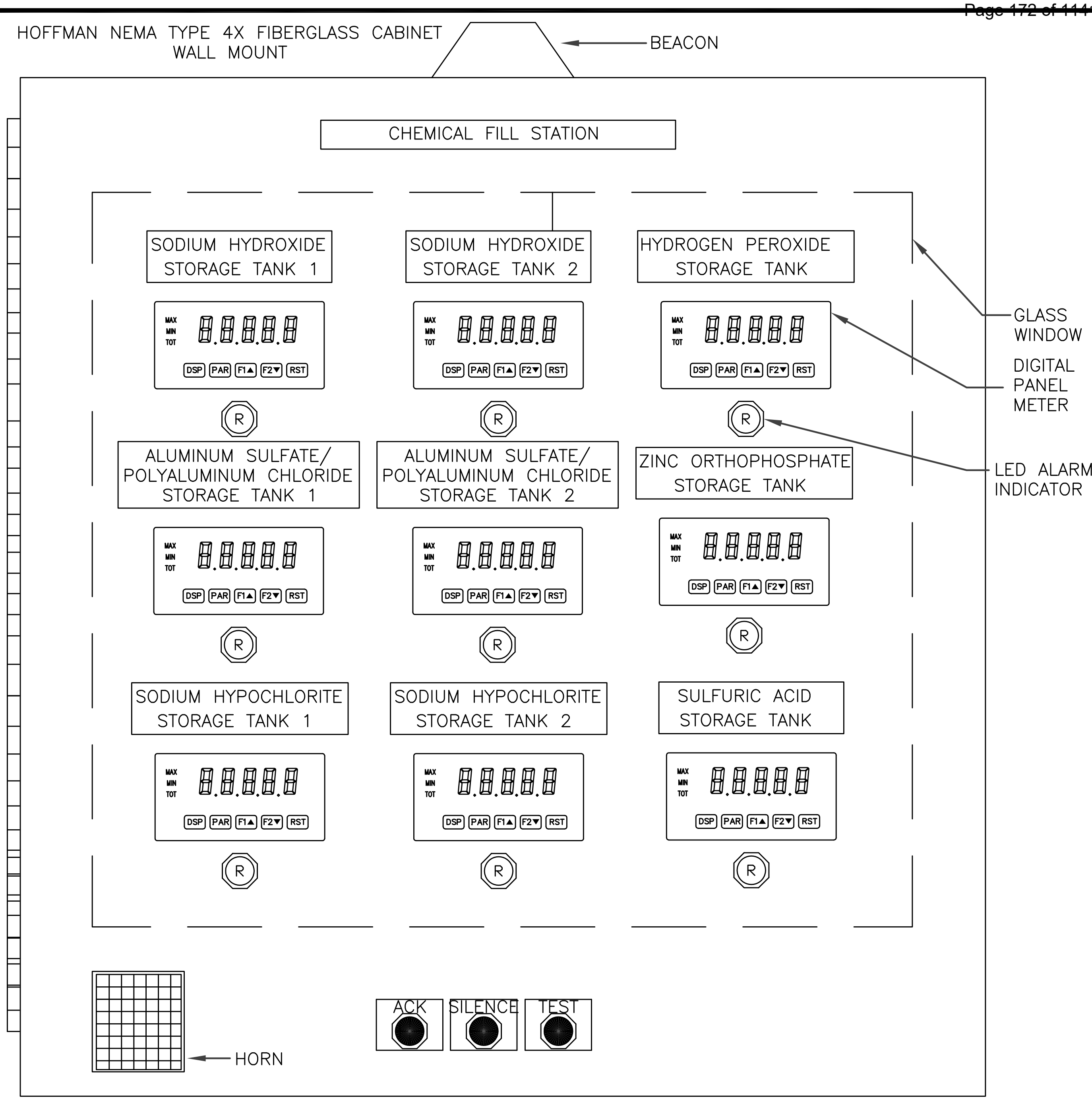
FOR CONSTRUCTION PURPOSES

0201-0601-SD80

FOR COMMENTS



FILL STATION ALARM PANEL (FSAP)
FRONT LAYOUT
(HOFFMAN NEMA TYPE 4X
FIBERGLASS CABINET WALL MOUNT)

REVISIONS

AMERICAN WATER STANDARD
PROCESS
FILL STATION ALARM PANEL (FSAP)
DETAIL H5

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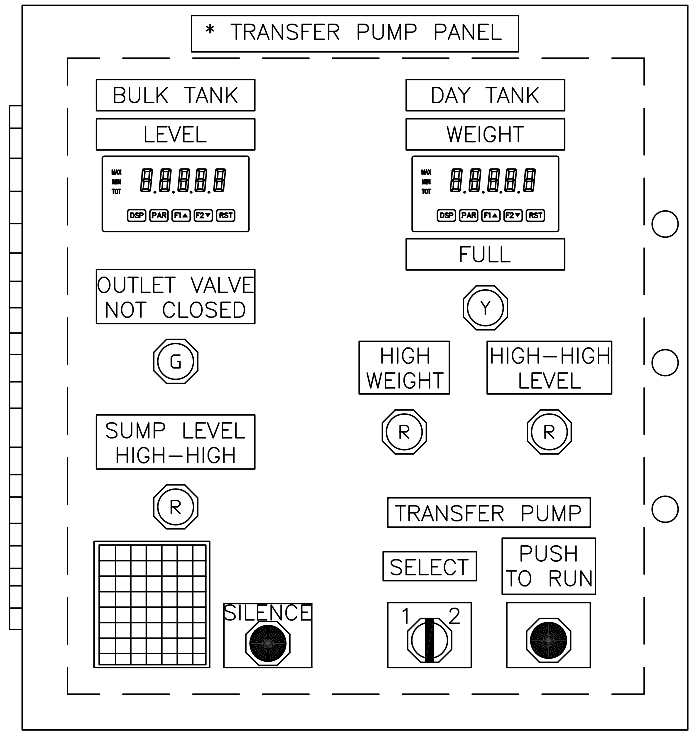
FOR COMMENTS

02010601SD83

HOFFMAN NEMA TYPE 4X FIBERGLASS CABINET
SIZE: 24"X24"X12" (MINIMUM)

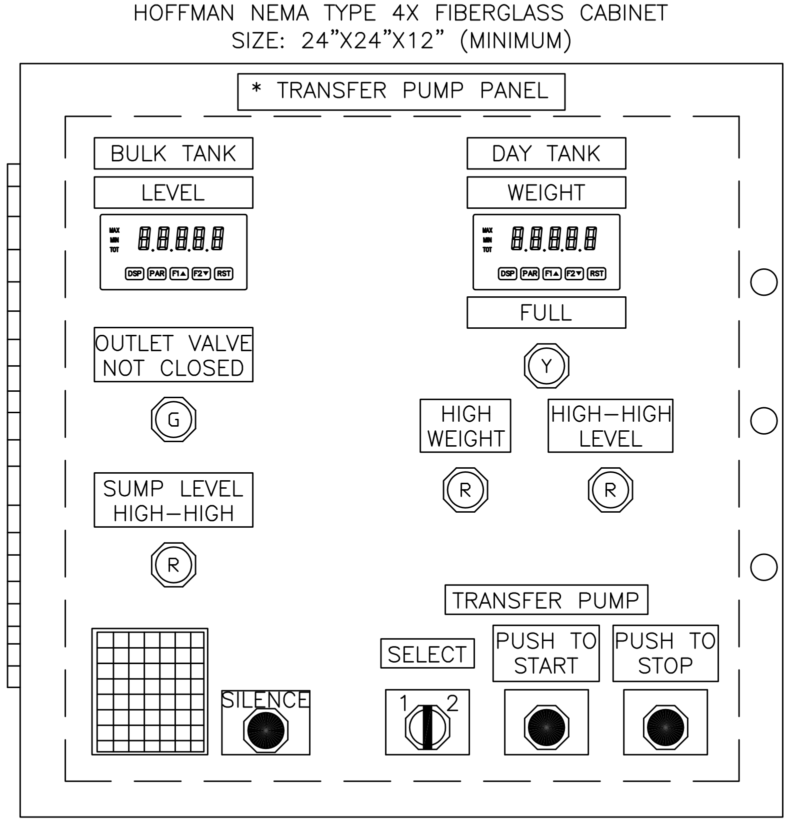


SMALL DAY TANK TRANSFER PUMP
CONTROL PANEL

REVISIONS	AMERICAN WATER STANDARD PROCESS SMALL DAY TANK TRANSFER PUMP CONTROL PANEL – DETAIL H6
	NEW JERSEY AMERICAN WATER
	AMERICAN WATER ENGINEERING 3906 CHURCH ROAD MT. LAUREL, NJ 08054 DRAWN BY D. JOBE PROJECT ENG'R APPROVED DATE 09–10–15 PROJECT IP NEW JERSEY AMERICAN WATER USE DIMENSIONS ONLY SCALE NOT TO SCALE
	USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES | 0201–0601–SD84

FOR COMMENTS

02010601SD84



LARGE DAY TANK TRANSFER PUMP CONTROL PANEL

REVISIONS	
	AMERICAN WATER STANDARD PROCESS LARGE DAY TANK TRANSFER PUMP CONTROL PANEL – DETAIL H7
	NEW JERSEY AMERICAN WATER
	AMERICAN WATER ENGINEERING 3906 CHURCH ROAD MT. LAUREL, NJ 08054 DRAWN BY D. JOBE PROJECT ENG'R APPROVED DATE 09–10–15 PROJECT IP NEW JERSEY AMERICAN WATER USE DIMENSIONS ONLY SCALE NOT TO SCALE
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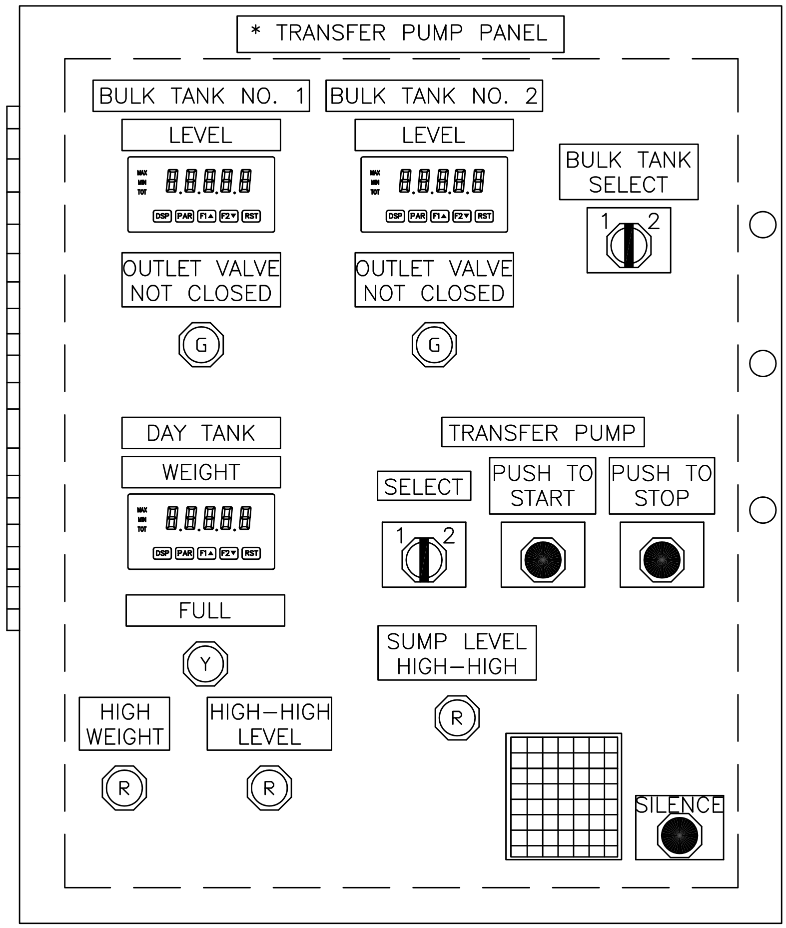
FOR COMMENTS

02010601SD85

HOFFMAN NEMA TYPE 4X FIBERGLASS CABINET
SIZE: 36"X24"X12" (MINIMUM)



LARGE DAY TANK TRANSFER PUMP
CONTROL PANEL

REVISIONS

AMERICAN WATER STANDARD
PROCESS
LARGE DAY TANK TRANSFER
PUMP CONTROL PANEL - DETAIL H8

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DATE 09-10-15
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FOR COMMENTS

02010601SD86

Appendix I

Miscellaneous Information

I-1. Hand Vacuum Pump to Test Backpressure Valves

Figure I-1.
Hand Vacuum Pump

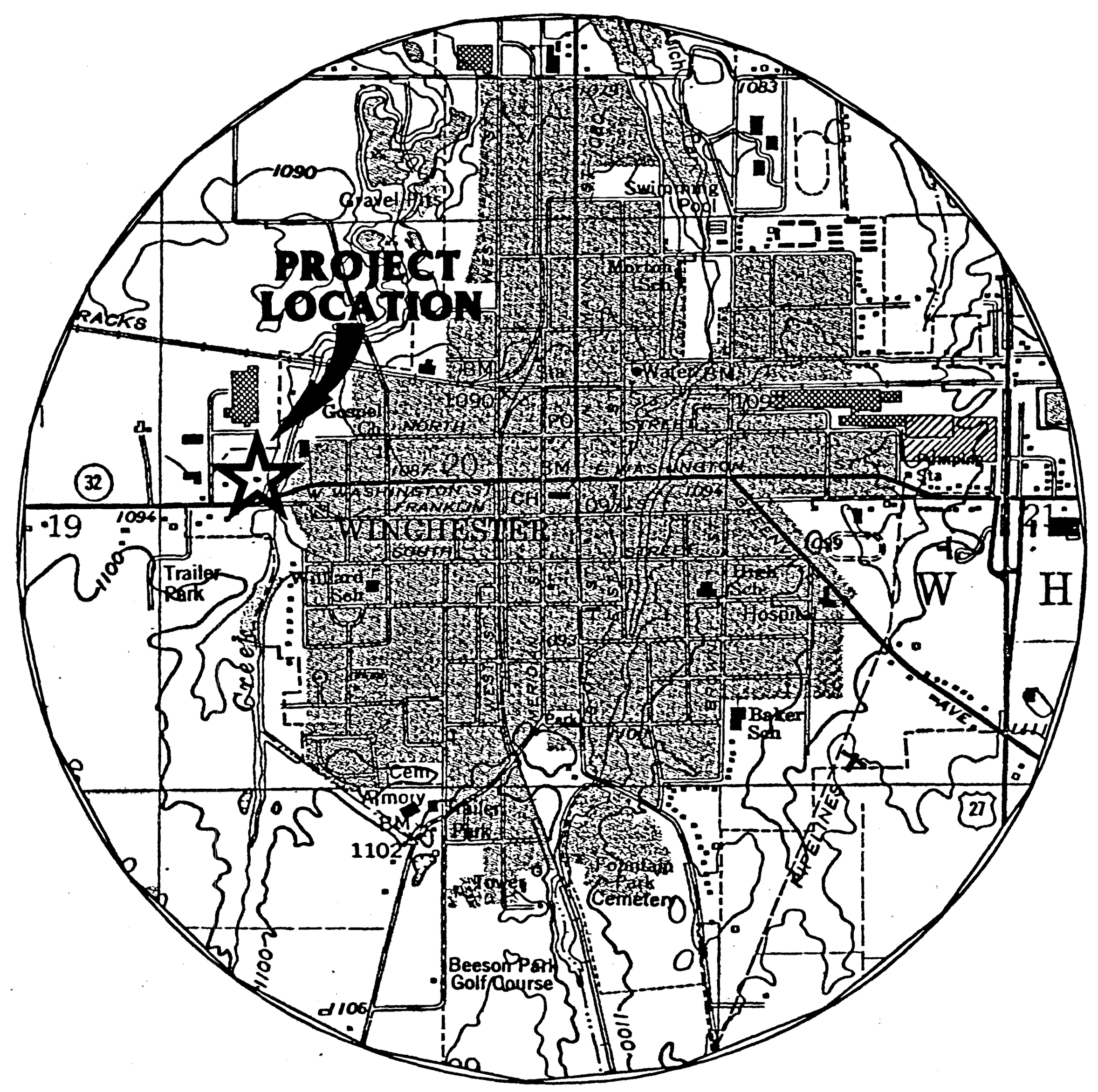
Example of pump that can be used to periodically test performance of series backpressure valves and vacuum breakers.

FILTER REPLACEMENT AND PLANT IMPROVEMENTS-2001

CONTRACT A: FILTER AND HIGH SERVICE BUILDING REPLACEMENT
CONTRACT B: BACKWASH MANAGEMENT FACILITIES
CONTRACT C: DEMOLITION AND RESTORATION

WINCHESTER OPERATION

INDIANA-AMERICAN WATER COMPANY, INC.



LOCATION MAP
SCALE: 1" = 3000'

N

"AS BUILT"

DRAWING INDEX:

DRAWING	GENERAL
–	COVER SHEET/SHEET INDEX
FD-1	PROCESS SCHEMATIC & CONCEPTUAL PLAN
	CONTRACT A
CA-1	SITE PLAN
CA-2	AERALATOR DETAILS
CA-3	AERALATOR FOUNDATION DETAILS
CA-4	HIGH SERVICE PUMP BUILDING PLAN VIEW
CA-5	HIGH SERVICE PUMP BUILDING ELEVATIONS
CA-6	HIGH SERVICE PUMPS
CA-7	HIGH SERVICE PUMP BUILDING ELECTRICAL PANELS
CA-8	HIGH SERVICE PUMP BUILDING ELECTRICAL PLAN
	CONTRACT B
CB-1	SITE PLAN
CB-2	LAGOON AND STRUCTURE DATA
CB-3	MISC SEWER DETAILS
CB-4	MISC SEWER DETAILS
	CONTRACT C
CC-1	SITE PLAN
CC-2	DEMOLITION SCHEDULE
CC-3	DEMOLITION DETAILS

PREPARED BY:

INDIANA-AMERICAN WATER COMPANY, INC.
ENGINEERING DEPARTMENT
555 E. COUNTY LINE RD., SUITE 201
GREENWOOD, INDIANA 46143
PHONE NUMBER: (317) 885-2400

CORPORATE OFFICE:
TED NITZA
555 EAST COUNTY LINE ROAD
SUITE 201
GREENWOOD, INDIANA 46143
PHONE NUMBER: (317) 885-2444

CONTRACT A
AWARD: APRIL, 2001
CONSTRUCTION: APRIL-AUGUST, 2001
COMPLETED: SEPTEMBER, 2001

CONTRACT B
BID: MAY, 2001
CONSTRUCTION: JUNE-AUGUST, 2001
COMPLETED: SEPTEMBER, 2001

CONTRACT C
BID: SEPTEMBER, 2001
CONSTRUCTION: SEPTEMBER-OCTOBER, 2001 (DEMOLITION)
COMPLETED: MAY, 2002 (RESTORATION)

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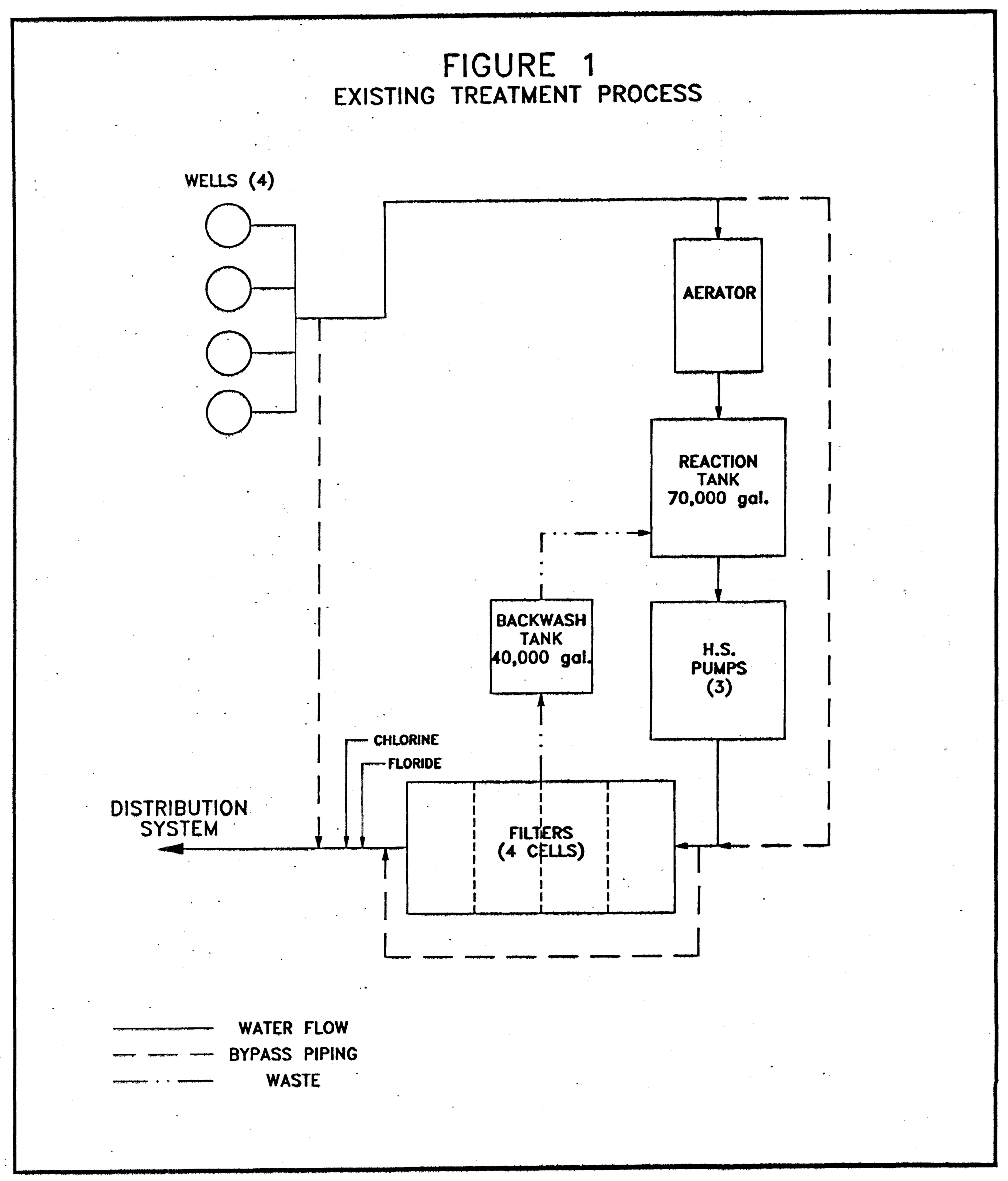
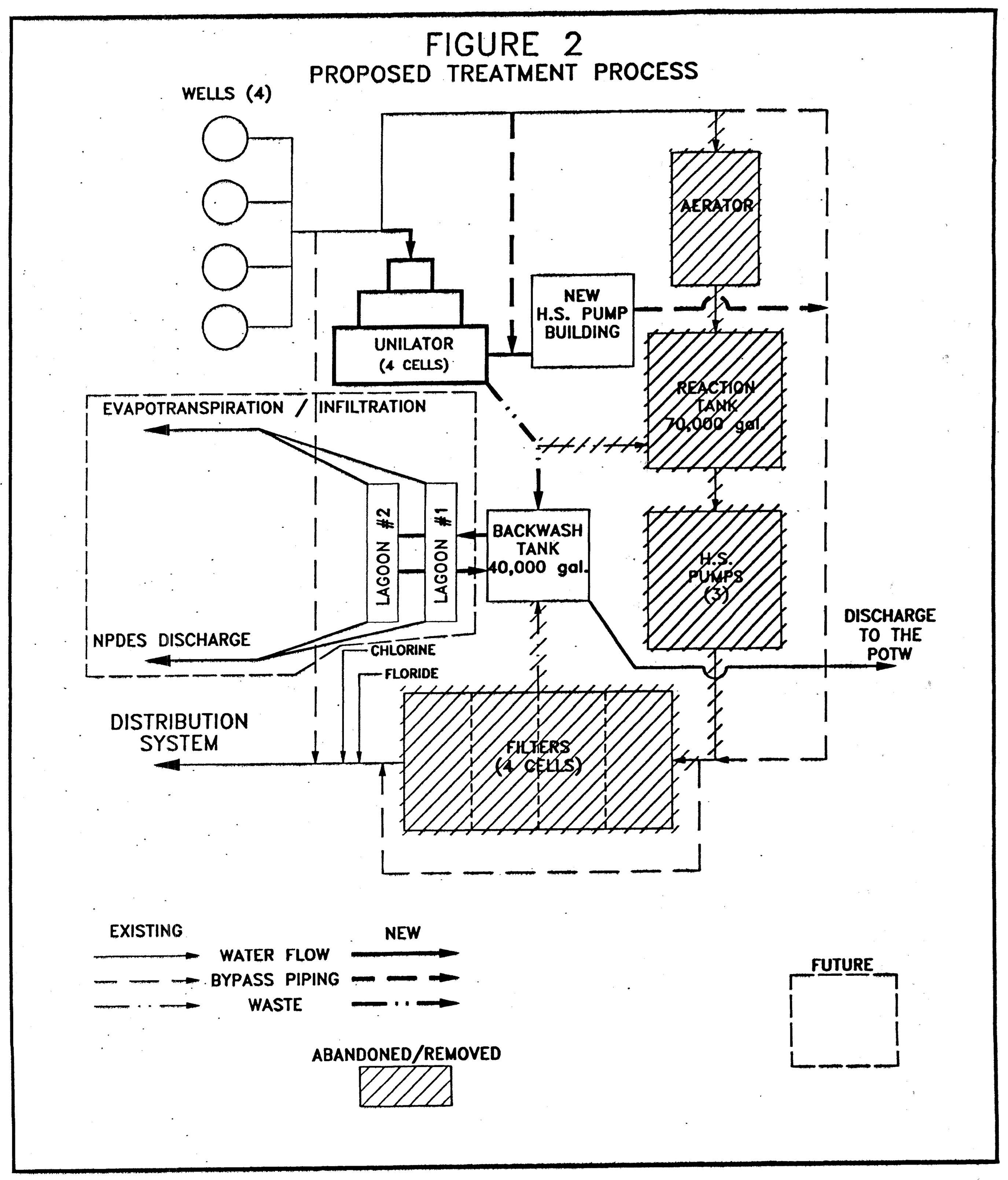
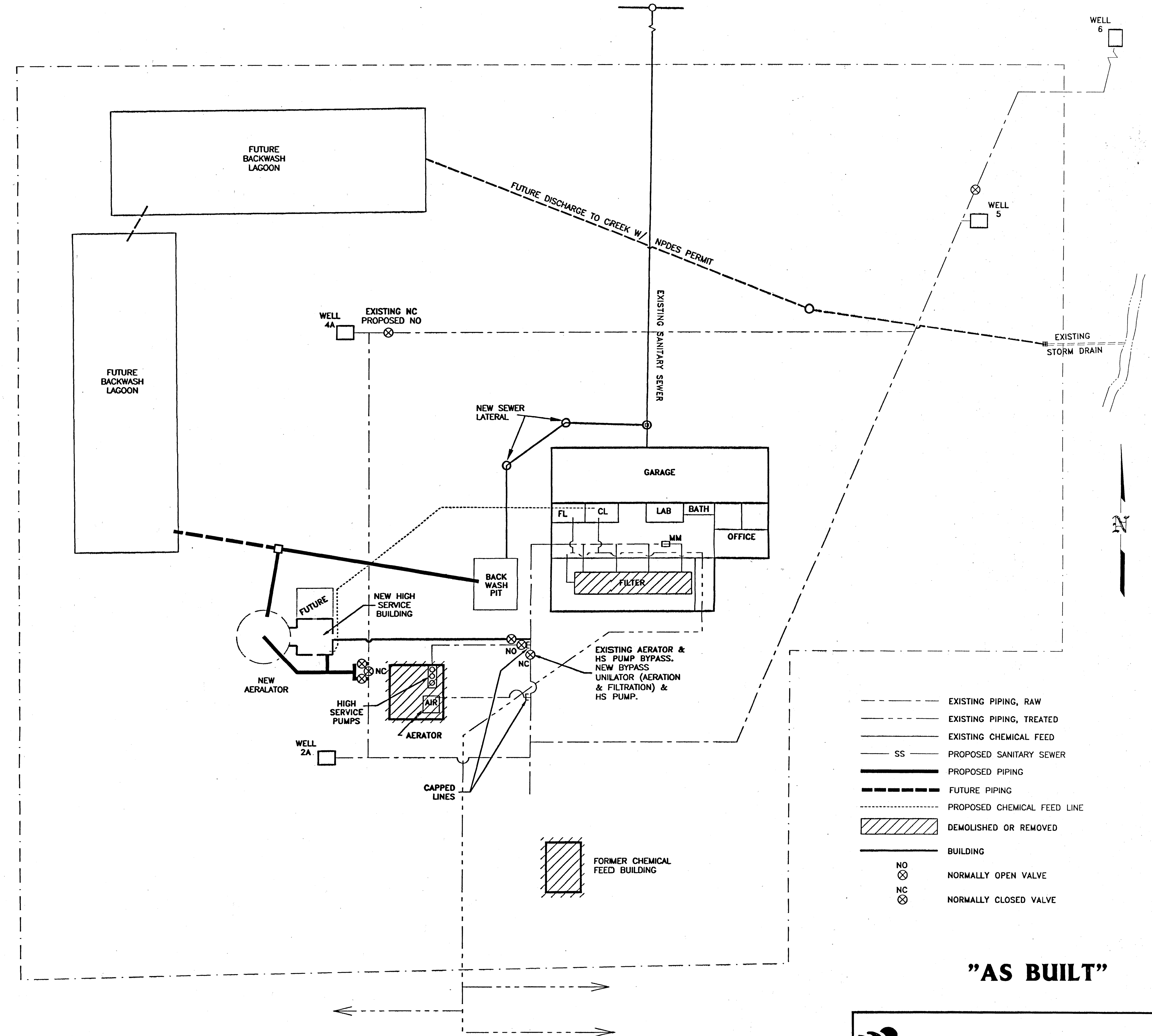
Dec 04, 2002 - 3:12pm

FLITER REPLACEMENT & PLANT IMPROVEMENTS-2001
WINCHESTER OPERATION





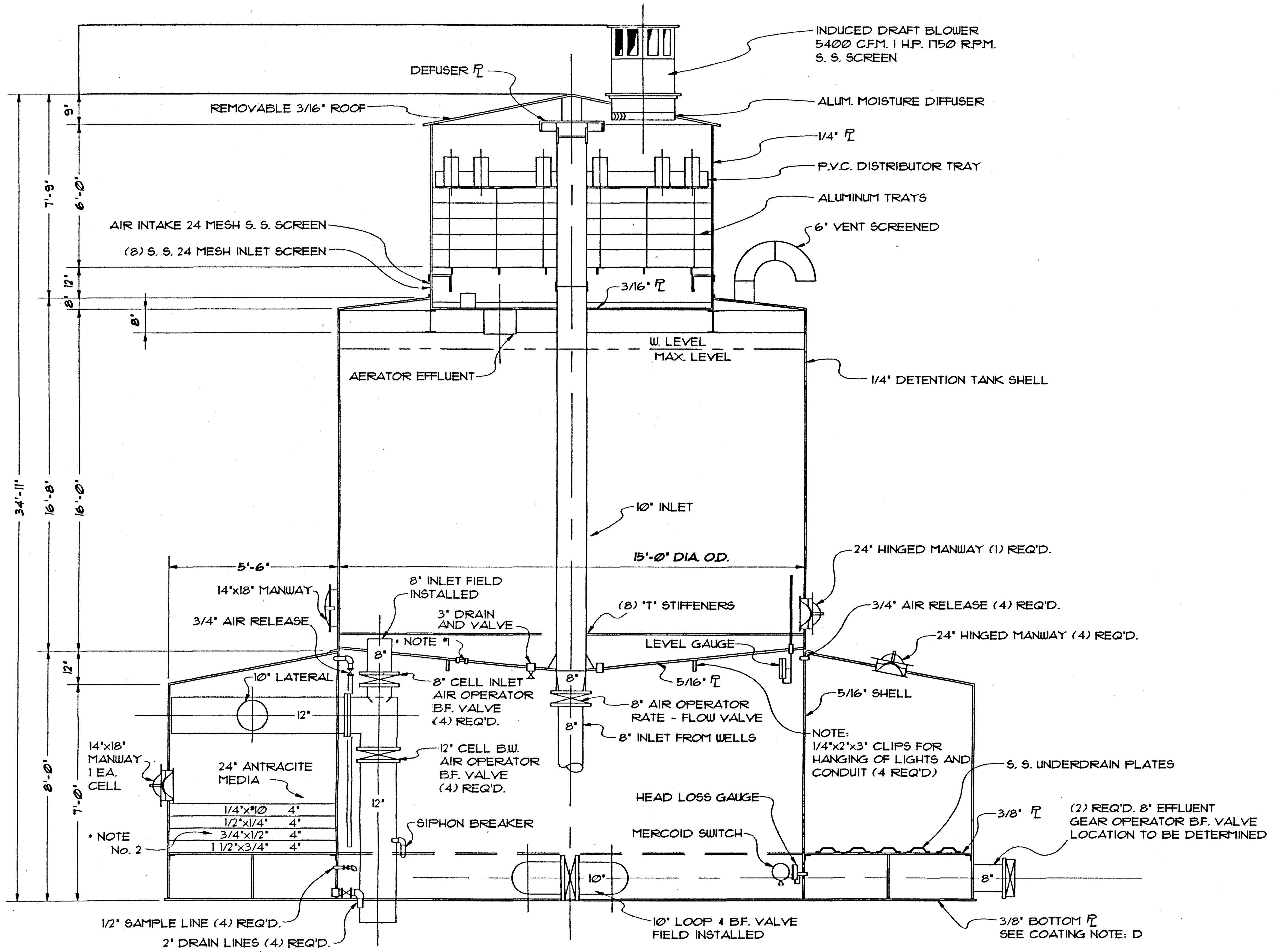


"AS BUILT"

Indiana-American Water Company, Inc.

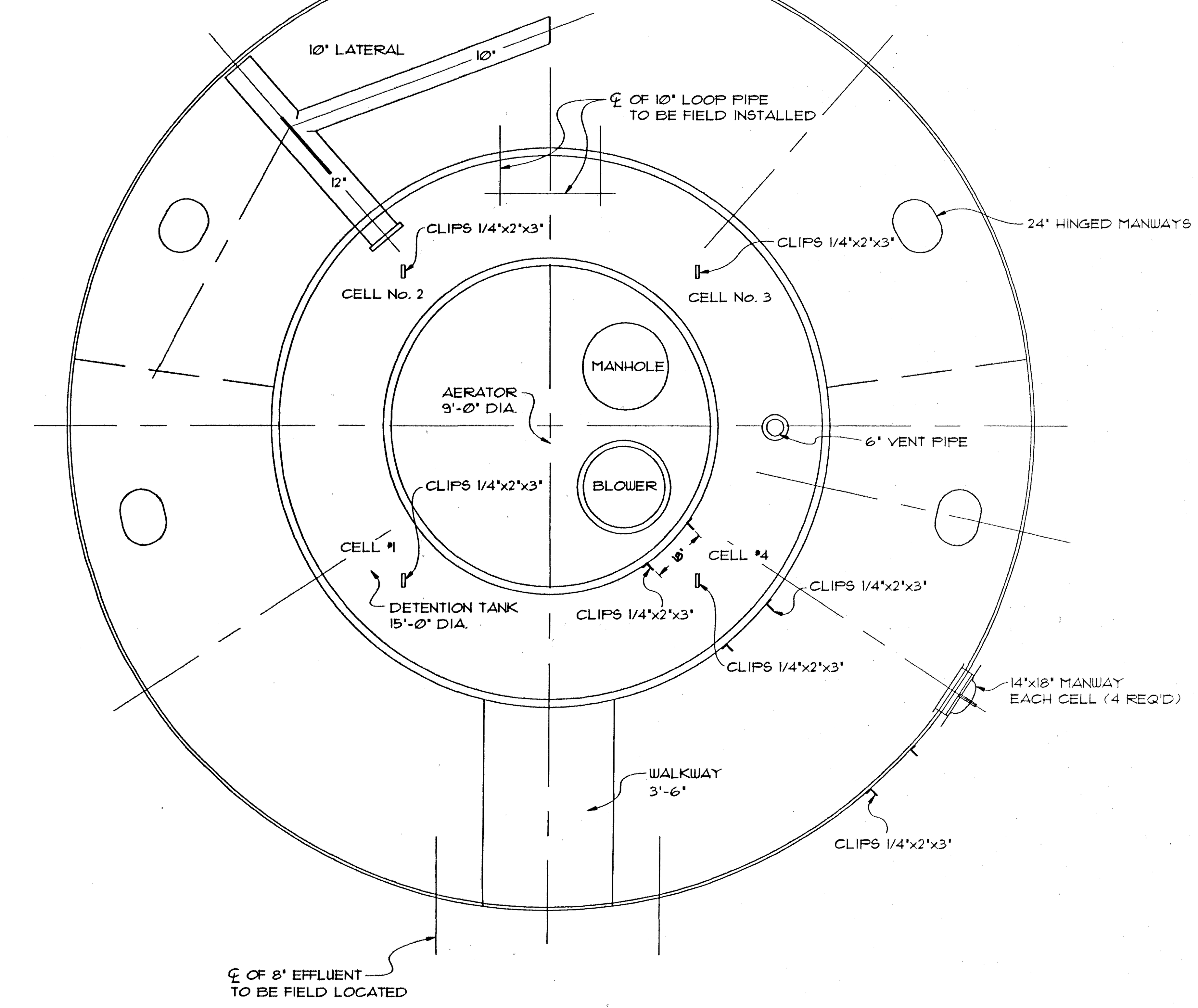
SCALE: 1" = 30'	WINCHESTER, INDIANA
REVISIONS	FILTER REPLACEMENT & PLANT IMPROVEMENTS–2001 PROCESS SCHEMATIC & CONCEPTUAL PLAN
DRAWN BY: R.K.B.	DATE: JAN., 2001
CHECKED:	DRAWING FD-1
AUTOCAD FILE: 48-2001-M001.DWG	APPROVED:


EMERGENCY SPILLWAY 1090.0
150''
33''
50'
20'
6" PVC
FUTURE
CP 2
WELL #5
6" PVC
EXISTING 6" SANITARY PVC
WELL #4A
2" MW
DO NOT DISTURB (5' RAD.)
APP. PROPERTY LINE
29'
EXISTING 4" CAST IRON WITH 21" COVER
40''
4" PVC
2" PVC FORCE
4" PVC
10" C.I.
PRE CL_2 TO FILTER
EXISTING CHEMICAL FEED ROOM
FL
CL_2
EXTRA PAIR OF SCADA WIRES
WINCHESTER WATER TREATMENT PLANT
5-2" PVC CASINGS, BOUND
FI
CI
METER
B.W. PIT
EH1
12" PVC
CONTRACT B
CONTRACT A
1-2" PVC CASING 24" DPT.
3-2" PVC CASINGS
EH3
12" DIP
12" C.I.
12" TAPPING SLEEVE & VALVE
10" DIP
40' GROUND ROD
CAP
ϕ=30'
3 - 8" GATE VALVES
3 - 8" x8"x8" TEES
1 - 10" x8" REDUCER
WELL #2A
8" PVC
CONDUIT POWER BUILDING & PUMPS (SEE ELECTRIC DRAWING) 24" DPT
2" CONDUIT SCADA CONTROL 24" DPT
GENERATOR
POWER POLE WEST
ELECTRIC BUILDING
POWER POLE EAST
CP3
APP. PROPERTY LINE
R/W
N
LEGEND
EH# - EXPLORATORY HOLE #
SB# - SOIL BORING #
- GRAVITY SEWER (WITH FLOW DIRECTION)
- FUTURE GRAVITY SEWER
- INFLUENT JUNCTION STRUCTURE SEE DETAIL #1
- CORE WITH PROTRUDING OUTLET SEE DETAIL #2
- TURNED UP INLET SEE DETAIL #3
- INFLUENT WITH HEADWALL SEE DETAIL #4
- BEEHIVE TYPE INLET/OUTLET SEE DETAIL #5
- MANHOLE WITH SOLID LID SEE DETAIL #7&8
- DOGHOUSE MANHOLE WITH SOLID LID SEE DETAIL #7&8
"AS BUILT"
Indiana-American Water Company, Inc.
SCALE: 1" = 20'
REVISIONS
R.K.B. 11/01 AS BUILT
WINCHESTER, INDIANA
FILTER REPLACEMENT & PLANT IMPROVEMENTS-2001 SITE PLAN
DRAWN BY: R.K.B.
DATE: MAR., 2001
CHECKED:
APPROVED:
AUTOCAD FILE: 48-2001-M001.DWG
DRAWING CA-1



• NOTE 1 (2) 1/2" COUPLING FOR CHEMICAL FEED LINE
• NOTE 2 FILTER SUPPORT GRAVEL 4" LAYERS REQUIRED

SECTION VIEW
SCALE: 3/8"=1'-0"



PLAN VIEW
SCALE: 3/8"=1'-0"

FILTER INFORMATION

FILTER RATE 1,000 G.P.M. TOTAL
RATE PER SQ. FT. 3 G.P.M.
FILTER AREA 334 TOTAL 83.5 PER CELL
BACKWASH RATE 12 G.P.M. / SQ. FT.
BACKWASH RATE 1,000 G.P.M.
DETENTION TANK APPROX. 20 MIN. 21,150 GAL.

PAINTING SCHEDULE

1. ALL EXTERIOR SURFACES TO BE SHOP ABRASIVE BLAST CLEANED TO SSPC-SP6, COMMERCIAL BLAST, AND GIVEN SHOP COAT TNEMEC #90-97 PRIMER, 2.5-3.5 MILS DRY FILM THICKNESS (DFT)
2. INTERIOR SURFACES OF AERATION SECTION, DETENTION TANK AND UPPER FILTER AREA FROM BAFFLE PLATE & UP, TO BE SHOP ABRASIVE BLAST CLEANED SSPC-SP10, NEAR WHITE BLAST, AND GIVEN SHOP 3 COAT TNEMEC #20-1211 (3.0-5.0 mils DFT) 20-1255 (4.0-6.0 mils DFT) 20AA-90 POT-POX (4.0-6.0 mils DFT) ALLOW 7-10 DAY CURE TIME (MIN.)
3. BLACK EPOXY COATING ON UNDERNEATH SIDE OF UNIT AND BETWEEN DOUBLE WALL CELL PLATES. TNEMEC SERIES 46H-413 (16 mils)

NOTES:

1. FILTER TO BE SHIPPED AS FOLLOWS:
   A. AERATION AND DETENTION SECTION SHIPPED AS ONE UNIT.
   B. FILTER SECTION IS SPLIT IN HALVES AND SHIPPED AS TWO PIECES.
2. SOME ITEMS HAVE BEEN ROTATED INTO THE SECTION VIEW FOR ILLUSTRATION PURPOSES ONLY. THIS SECTION IS NOT AN EXACT CROSS-SECTION @ A SPECIFIC LOCATION, BUT GENERAL IN NATURE

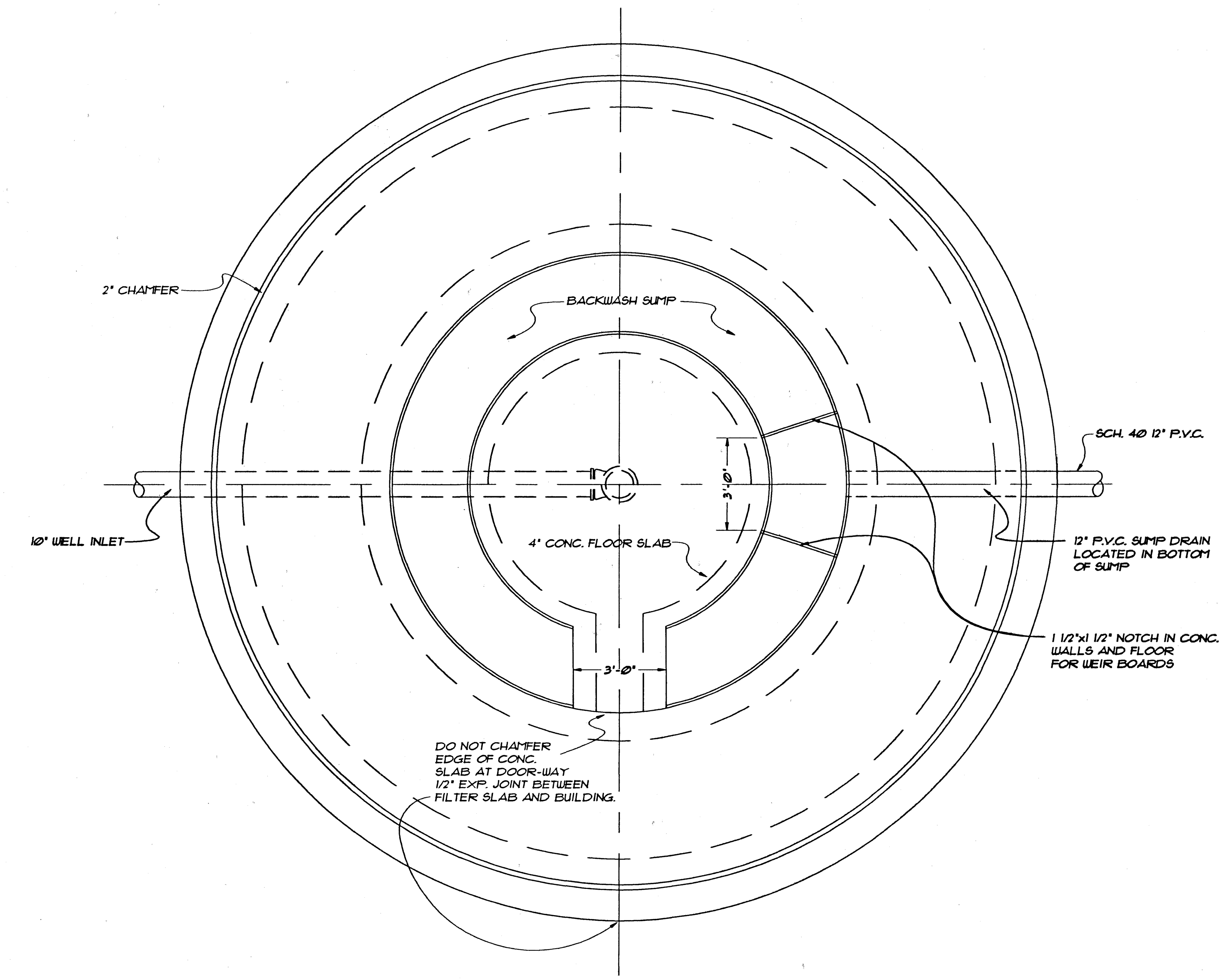
AS BUILT

BASTIN LOGAN WATER SERVICES INC.
237 W. MONROE STREET
FRANKLIN, IN 46131
(317) 738-4577
FAX (317) 738-9295

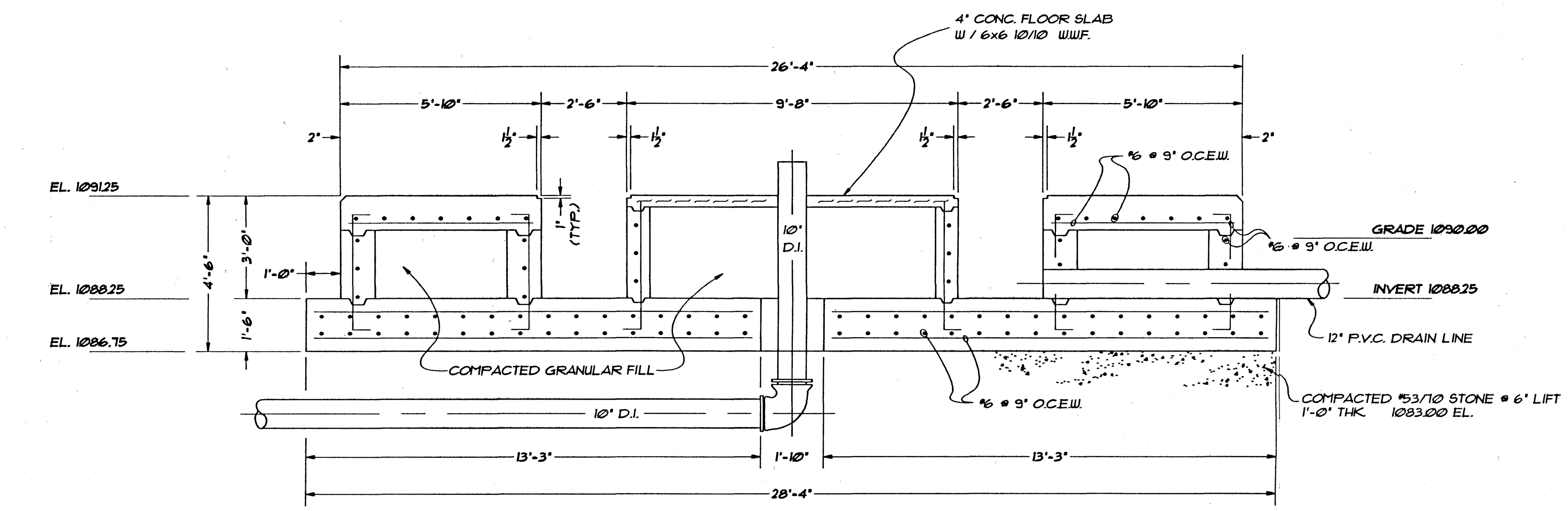
INDIANA-AMERICAN WATER CO., INC.
WINCHESTER, IN.
BASTIN LOGAN WATER SERVICES INC.

SCALE: 3/8"=1'	1,000 G.P.M. FILTER UNIT
REVISIONS	
J.L. 3/26/01	
DRAWN BY: R.D.E.	CHECKED: J.L.
DATE: MARCH, 2001	APPROVED:
CA-2	D-40,301

48-2001-M001.DWG



PLAN VIEW
SCALE: 3/8"=1'-0"



SECTION - FILTER BASE
SCALE: 3/8"=1'-0"

WT. PLANT STEEL 134,970 LBS.
OPERATING WT. 406,700 LBS.

AS BUILT

BASTIN LOGAN WATER SERVICES INC.
237 W. MONROE STREET
FRANKLIN, IN 46131
(317) 738-4577
FAX (317) 738-9298

INDIANA-AMERICAN WATER CO., INC.
WINCHESTER, IN.
BASTIN LOGAN WATER SERVICES INC.

SCALE: 3/8"=1'	1,000 G.P.M. FILTER UNIT
REVISIONS	
J.L. 3/26/01	
DRAWN BY: R.D.E.	CHECKED: J.L.
DATE: MARCH, 2001	APPROVED:
CA-3	D-40,300

C:/BL/2001/1000GPMH.DWG 2001

D:\DWGS\misc01\48-2001-M001.dwg
Dec 04, 2002 - 3:22pm

"AS BUILT"

PLAN VIEW

NOTE: BENCHMARK ELEV. 1084.28 WELL #4A FLOOR AT DOOR

BASTIN LOGAN WATER SERVICES INC.
237 W. MONROE STREET FRANKLIN, IN 46131 (317) 738-4577 FAX (317) 738-9296

SCALE: 1/2" = 1'	INDIANA AMERICAN WATER COMPANY, INC. WINCHESTER, IN.
REVISIONS	PLAN VIEW
DRAWN BY: R.B.	CHECKED: J.L.
DATE: MARCH, 2001	APPROVED:
SHEET	CA-4

NOTE: BLOCK BUILDING WALLS TO BE SEALED & PAINTED INTERIOR AND EXTERIOR WITH TNEMEC PAINT (WHITE) WATER PLANT TANK TNEMEC (TANK WHITE)

"AS BUILT"

BASTIN LOGAN WATER SERVICES INC. 237 W. MONROE STREET FRANKLIN, IN 46131 (317) 736-6577 FAX (317) 736-9296		
SCALE: 1/2"=1'	INDIANA AMERICAN WATER COMPANY, INC. WINCHESTER, IN.	
REVISIONS	ELEVATIONS	
DRAWN BY: R.B.	CHECKED: J.L.	SHEET
DATE: MARCH, 2001	APPROVED:	CA-5

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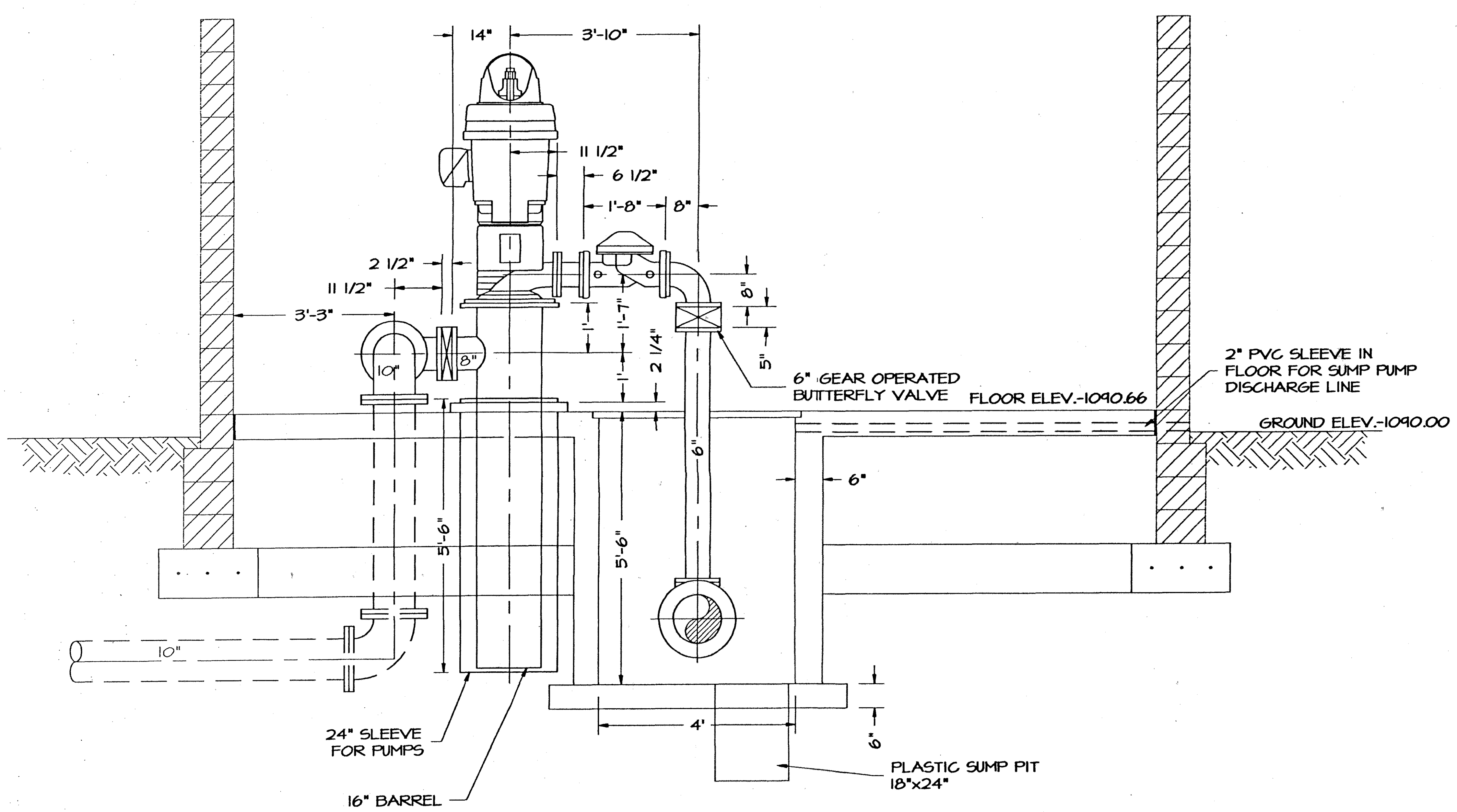
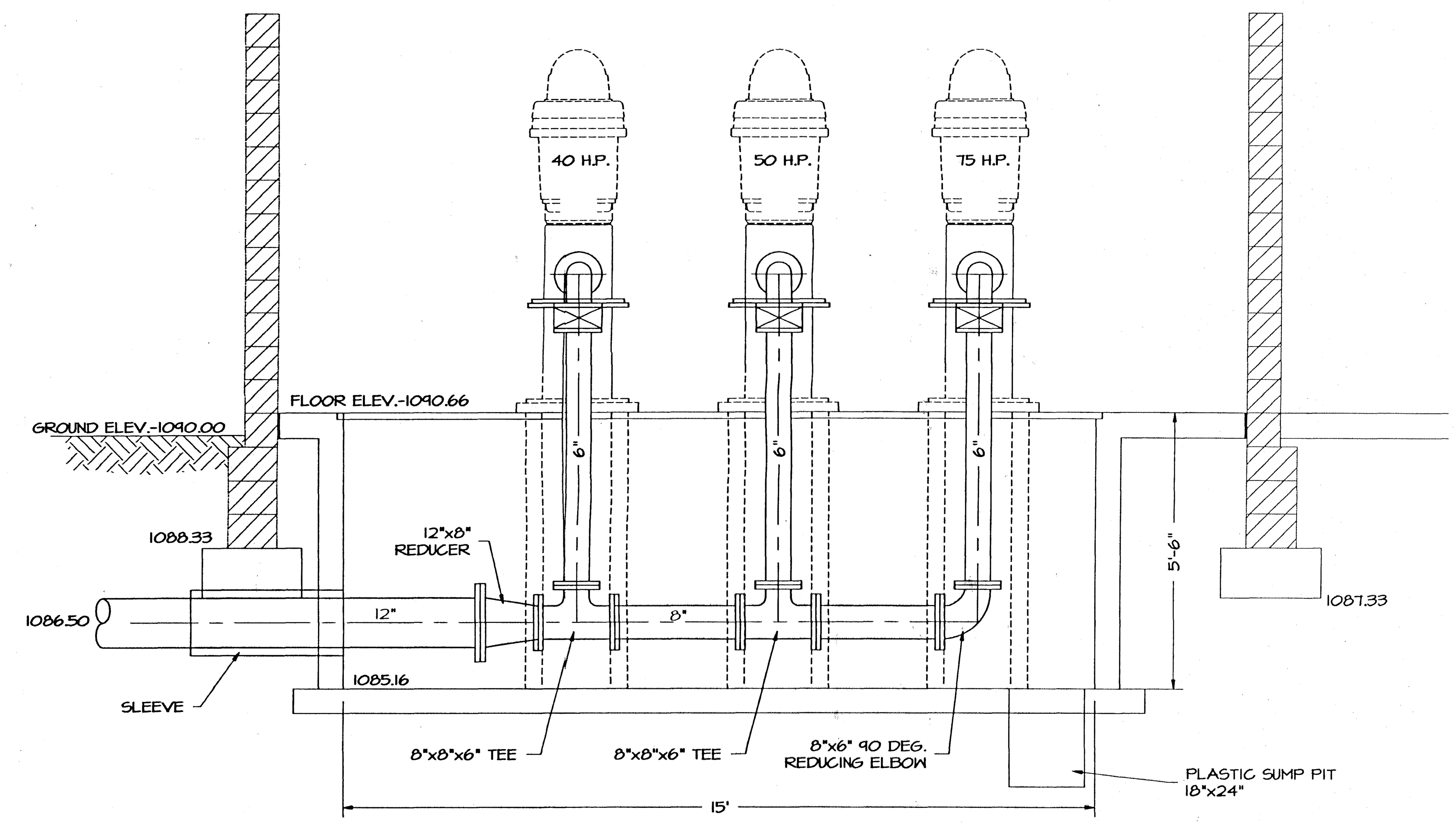


HIGH SERVICE PUMPS



HIGH SERVICE PUMPS DISCHARGE

"AS BUILT"

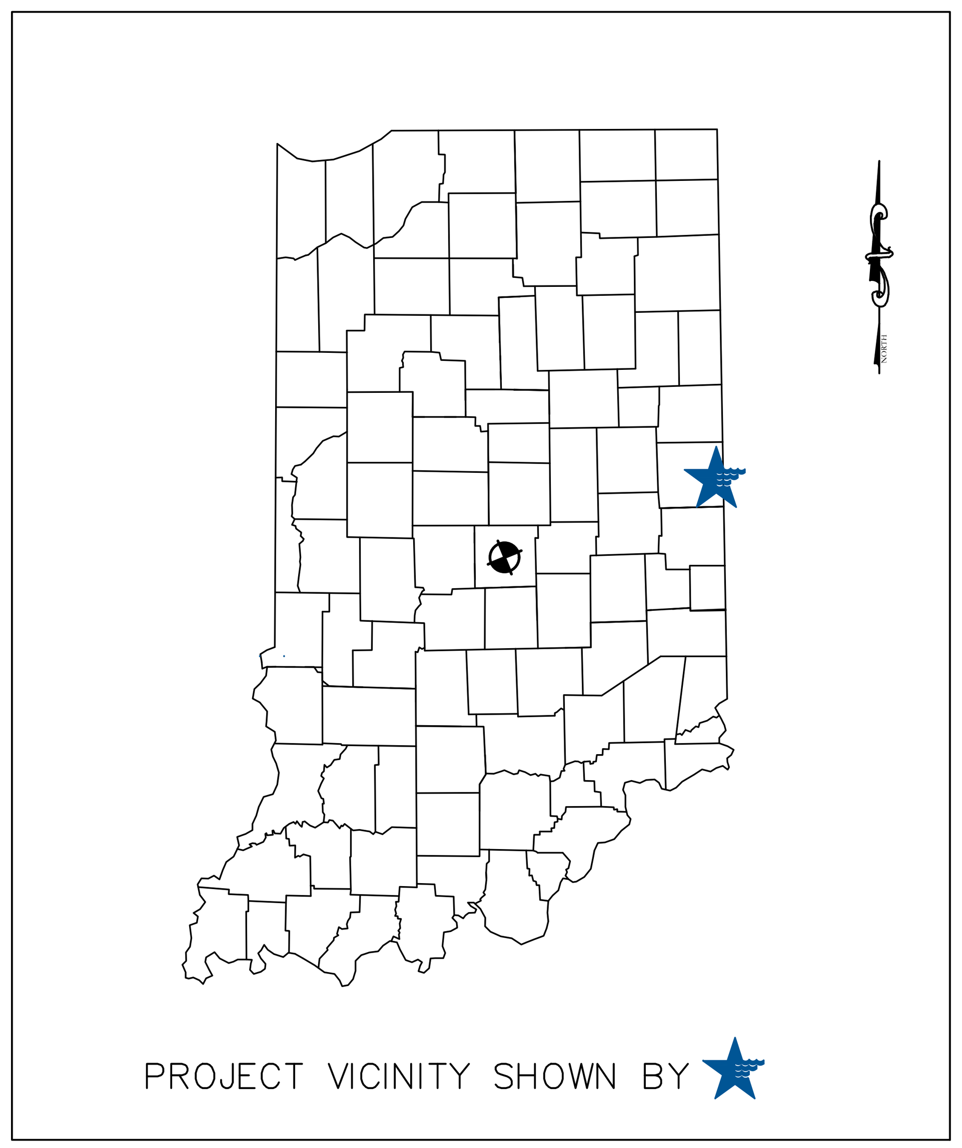
BASTIN LOGAN WATER SERVICES INC.
237 W. MONROE STREET
FRANKLIN, IN 46131
(317) 738-4577
FAX (317) 738-9295

SCALE: 1/2"=1'	INDIANA AMERICAN WATER COMPANY, INC. WINCHESTER, IN.
REVISIONS	HIGH SERVICE PUMPS
DRAWN BY: R.B.	CHECKED: J.L.
DATE: MARCH, 2001	APPROVED:
SHEET	CA-6


* NEW GROUND ROD 3/4" COPPER DRIVIN
TO 40'-0" CONNECT TO BOTH BUILDINGS
5 KW ELEC. HEATER W/ THERMOSTAT MOUNT AT CEILING LEVEL
MAIN BREAKER
240 V 3ph
200 AMP - MAIN
1-15 AMP 3Ø - AIR COMP.
1-15 AMP 3Ø - AERATOR
1-30 AMP 3Ø - HEATER
1-40 AMP 1Ø - 2 POLE TRANSFORMER
LIGHTING PANEL
60 AMP 1Ø
12 CIRCUIT
AERATOR
1 H.P.
3Ø
COMBINATION STARTER
200 A, 240 V 3Ø
DISC. H.S. PUMP
40 H.P.
NON FUSED
USE EXISTING COPPER SPADES IN PLACE OF FUSES
200 A, 240 V 3Ø
DISC.
50 H.P.
NON FUSED
USE EXISTING COPPER SPADES IN PLACE OF FUSES
400 A, 240 V 3Ø
DISC.
75 H.P.
NON FUSED
USE EXISTING COPPER SPADES IN PLACE OF FUSES
MOUNT ON COMP
AIR COMPRESSOR 1½ H.P.
AIR COMPRESSOR 1½ H.P.
ALTERNATOR PANEL
15 KVA TRANSFORMER 240 V./1Ø 240/120
8" SQ. DUCT.
BUILDING FLOOR
CONDUIT IN FLOOR SEE DWG. CA-8
2½ TO H.S. PUMP
2½ TO H.S. PUMP
3 TO H.S. PUMP
¾ TO AIR COMPRESSOR
* BUILDING GROUND - #2
3" P.V.C. CONDUIT
3-250 KCMIL
1 #4 GRD.
75 H.P.
2½" P.V.C. CONDUIT
3-2/0 WIRE
1 #4 GRD.
50 H.P.
2½" P.V.C. CONDUIT
3-2/0 WIRE
1 #4 GRD.
40 H.P.
2½" P.V.C. CONDUIT
3-3/0 WIRE
1 #2 GRD.
"AS BUILT"
BASTIN LOGAN WATER SERVICES INC.
SCALE: 1/2"=1'
REVISIONS
R.B. AS BUILT
INDIANA AMERICAN WATER COMPANY, INC.
WINCHESTER, IN.
ELECTRICAL PANELS
DRAWN BY: R.B.
CHECKED: J.L.
DATE: MARCH, 2001
APPROVED:
SHEET CA-7

48-2001-M001.DWG

INDIANA-AMERICAN WATER
ORTHOPHOSPHATE FEED SYSTEM
WINCHESTER, INDIANA



VICINITY MAP
N.T.S.

LOCATION MAP
N.T.S.

PLAN INDEX

SHEET #	SUBJECT
1	TITLE SHEET
2	GENERAL NOTES
3	OVERALL SITE PLAN
4	SITE PIPING PLAN
5	CHEMICAL FEED BUILDING IMPROVEMENTS
6	PHOSPHATE ROOM
7	LAB ROOM
8	AERATOR PLANT IMPROVEMENTS
9	PHOSPHATE FEED SCHEMATIC
E1	CHEMICAL FEED BUILDING ELECTRICAL PLAN
E2	CHEMICAL FEED BUILDING SYSTEM DIAGRAM
E3	CHEMICAL FEED BUILDING ELECTRICAL PLAN
E4	CHEMICAL FEED BUILDING NEW PLC WIRING DETAILS
M1	CHEMICAL FEED BUILDING MECHANICAL PLAN

DICK R. WEIGEL
REGISTERED
No. 910056
STATE OF
INDIANA
PROFESSIONAL ENGINEER

05/30/2018
DATE

DICK R. WEIGEL
REGISTERED ENGINEER NO. 910056
STATE OF INDIANA

INDIANA
AMERICAN WATER

DISTRICT OFFICE
WINCHESTER OPERATIONS
870 W. S.R. 32
WINCHESTER, IN 47394
(765) 962-0470 EXT. 223

CORPORATE OFFICE
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143
PHONE: (317) 807-2454
PROJECT MANAGER: JOSH DAVIS
joshua.davis@amwater.com

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER
ORTHOPHOSPHATE FEED SYSTEM
WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

REV. #	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

INDIANA
AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

FILE NAME: TITLE SHEET
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 1

GENERAL NOTES

1. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL THOROUGHLY DOCUMENT THE CONDITION OF THE EXISTING WORK AREAS (ACCESS ROADS, CULVERTS, STRUCTURES, ETC.) BY USE OF VIDEO RECORDING IN DVD FORMAT. ALL PRE-CONSTRUCTION VIDEOS SHALL BE LOGGED AND PRESENTED TO THE ENGINEER BEFORE THE ACTUAL CONSTRUCTION HAS STARTED.

2. UNLESS OTHERWISE INDICATED ALL MATERIALS SHALL BE IN STRICT COMPLIANCE WITH INDOT STANDARDS AND SPECIFICATIONS, LATEST EDITION.

3. PERSONS USING THIS DRAWING SHALL CONTACT LOCAL UTILITY COMPANIES FOR EXACT LOCATIONS OF UNDERGROUND UTILITIES. UTILITIES SHOWN ARE APPROXIMATE AND FOR REFERENCE AND BIDDING PURPOSES ONLY. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO PROPERLY LOCATE AND COORDINATE ALL WORK AROUND EXISTING UTILITIES.

4. CONTRACTOR SHALL COMPLY TO ALL REQUIREMENTS OF PERMITS AND AGENCY REQUIREMENTS, HEREIN MADE PART OF THE CONTRACT DOCUMENTS BY REFERENCE, INCLUDING THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT PERMIT, AND LOCAL, COUNTY, AND STATE CODES AND REGULATIONS. CONTRACTOR SHALL ARRANGE AND PAY FOR ALL INSPECTIONS, PERMITS, APPROVALS, TESTS, AND OTHER ASSOCIATED COSTS REQUIRED TO CONSTRUCT THE WORK IN COMPLIANCE TO APPLICABLE CODES AND AGENCY REQUIREMENTS.

5. CONTRACTOR SHALL AT MINIMUM, PROVIDE TRAFFIC CONTROL AS REQUIRED TO SAFELY PROTECT THE GENERAL PUBLIC, THE CONTRACTOR'S WORK FORCES AND THE WORK. TRAFFIC CONTROL SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITION OF THE INDIANA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, AND THE INDIANA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS, SPECIAL PROVISIONS, STANDARD DETAILS AND GENERAL INSTRUCTIONS TO FIELD EMPLOYEES.

6. CONTRACTOR TO PROVIDE EROSION CONTROL TO SATISFACTION OF THE SOIL CONSERVATION SERVICE AND 327 IAC 15-5 (RULE 5).

7. SAFETY PROVISIONS FOR THE WORK SHALL BE IN FULL COMPLIANCE WITH ALL APPLICABLE RULES AND REGULATIONS OF THE INDIANA OSHA AND ANY OTHER LOCAL, STATE, OR FEDERAL AGENCY HAVING JURISDICTION. IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS OF THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THE REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT TO BE LIMITED TO NORMAL WORKING HOURS. THE OPTION OF THE OWNER AND OR ENGINEER TO CONDUCT CONSTRUCTION REVIEW OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES, IN, ON OR NEAR THE PROJECT, AS WELL AS MAINTAINING ALL BARRICADES, WARNING SIGNS, FLASHING LIGHTS AND TRAFFIC CONTROL DURING CONSTRUCTION. CONTRACTOR TO COMPLY WITH ALL OSHA REGULATIONS, REQUIREMENTS, SAFETY MEETING REQUIREMENTS AND AGENCY REQUIREMENTS FOR TRAFFIC CONTROL AND SAFETY PRECAUTIONS, AND THERE WILL BE NO SEPARATE OR ADDITIONAL PAYMENT FOR THIS WORK.

8. IN GREEN AREAS, STRIP ALL TOPSOIL – SAVE FOR REUSE AND HAUL AWAY EXCESS, UPON APPROVAL.

9. PLACE MINIMUM 6" TOPSOIL IN ALL DISTURBED AREAS, SEED, FERTILIZE, STRAW AND MAINTAIN UNTIL GROWTH IS ESTABLISHED. ALL EXCESS EXCAVATED MATERIAL SHALL BE DISPOSED OF BY THE CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWINGS OR IN SPECIFICATIONS OR DIRECTED OTHERWISE BY THE OWNER.

10. CUT AND FILL TO GRADES SPECIFIED.

11. CONTRACTOR SHALL LOCATE IMPROVEMENTS NOT SPECIFIED BY DIMENSIONS OR SCALE, WITH AUTHORIZED OWNER REPRESENTATIVE.

12. ALL COSTS REQUIRED TO CONSTRUCT THE WORK AS GENERALLY INTENDED AND SPECIFIED HEREIN SHALL BE CONSIDERED BY THE CONTRACTOR AND BE INCLUDED IN HIS BID. NO ADDITIONAL PAYMENT WILL BE CONSIDERED FOR CONTRACTOR'S FAILURE TO MAKE SUCH CONSIDERATION.

13. CONTRACTOR SHALL ARRANGE AND PAY FOR ALL INSPECTIONS, PERMITS, APPROVALS TO APPLICABLE CODES AND AGENCY REQUIREMENTS. OWNER WILL OBTAIN IDEM CONSTRUCTION PERMIT.

14. THE CONTRACTOR SHALL MAKE ALL MEASUREMENTS AND CHECK ALL DIMENSIONS NECESSARY FOR THE PROPER INSTALLATION OF THE WORK SHOWN ON THE DRAWINGS AND/OR NOTED WITHIN THE SPECIFICATIONS. DURING THE PROSECUTION OF THE WORK, HE SHALL MAKE ALL NECESSARY MEASUREMENTS TO PREVENT MISFITTING IN SAID WORK. LOCATIONS, SIZES AND ELEVATIONS ARE APPROXIMATE. ADJUST LOCATIONS AS REQUIRED TO MISS EXISTING UTILITIES, SUBJECT TO COORDINATION AND APPROVAL OF AUTHORIZED OWNERS REPRESENTATIVE.

15. CONTRACTOR SHALL MAINTAIN UTILITY SEPARATIONS AS REQUIRED BY STATE AGENCY STANDARDS.

16. CONTRACTOR SHALL COORDINATE DEPTHS ACCORDINGLY TO ELIMINATE CONFLICTS. WATER MAINS SHALL BE LAID WITH A MINIMUM OF 10 FEET HORIZONTAL SEPARATION BETWEEN THE MAIN AND SEWER LINES (OUTSIDE OF PIPE TO OUTSIDE OF PIPE). WHENEVER WATER MAINS MUST CROSS OVER SEWERS, THE WATER MAIN SHALL BE LAID AT SUCH AN ELEVATION THAT THE TOP OF THE SEWER IS AT LEAST 18 INCHES BELOW THE BOTTOM OF THE WATER MAIN, AT A MINIMUM ANGLE OF 45 DEGREES MEASURED FROM THE CENTERLINE OF THE TWO PIPES AND MAINTAINED FOR A MINIMUM DISTANCE OF 10 FEET FROM EITHER SIDE OF THE SEWER TO THE OUTSIDE EDGE OF THE WATER MAIN. A SHORTER SEPARATION DISTANCE MAY BE USED IF THE SANITARY SEWER MEETS ALL WATER MAIN PRESSURE TESTING REQUIREMENTS AS DESCRIBED IN 327 IAC 8-3.2-8; SECTION 8(a) 1 OF 327 IAC 3-6-8; OR ASTM D2241-96b, STANDARD SPECIFICATION FOR POLYVINYL CHLORIDE (PVC) PRESSURE RATED PIPE AND HAVING A SDR OF 21, THE SANITARY AND WATER MAINS ARE NOT IN CONTACT AND ANY SANITARY SEWER JOINTS ARE COMPRESSION TYPE JOINTS THAT ARE PLACED EQUAL DISTANCE FROM THE WATER MAIN, AND THE SANITARY SEWER AND WATER MAIN ARE LAID IN SEPARATE TRENCHES.

17. CONTRACTOR SHALL ONLY WORK WITHIN RIGHT OF WAY, CITY'S PROPERTY, AND/OR EASEMENT LIMITS SHOWN UNLESS ARRANGEMENTS ARE MADE BY CONTRACTOR WITH OTHER PROPERTY OWNERS IN THE AREA.

18. ALL NEW DUCTILE IRON MAIN SHALL BE C-151 RATED AT 250 PSI.

19. ALL NEW WATER MAIN SHALL HAVE A MINIMUM OF 54" GROUND COVER FROM FINISHED GRADE TO TOP OF PIPE EXCEPT AT TRANSITION/CONNECTION TO EXISTING MAINS.

20. TRACER WIRE, #10 GAUGE COPPER, PLASTIC INSULATED WIRE TO BE ATTACHED DIRECTLY TO THE CENTERLINE OF THE WATER MAIN. PLASTIC CAUTION TAPE "WATER LINE BURIED BELOW", MINIMUM OF 3-INCH WIDE, BURIED DIRECTLY ABOVE THE WATER MAIN 18"-24" BELOW FINISH GRADE SHALL BE PROVIDED.

Indiana 811
Know what's below.
Call before you dig.
Call 811 or 800-382-5544 Before you Dig!

CITY OF WINCHESTER / RANDOLPH COUNTY UTILITY CONTACTS

CABLE TV:	ELECTRIC:	TELEPHONE:
INSIGHT COMMUNICATIONS 2450 S. HENDERSON ST. BLOOMINGTON, IN 47401 (812) 355-7822	AMERICAN ELECTRIC POWER CO. AREA 4 5000 N. WHEELING AVE MUNCIE, IN. 47304 (765) 751-6582	VERIZON NORTH INC. 8001 WEST JEFFERSON BLVD FORT WAYNE, IN. 46804 (260) 461-3641
WATER:	**SEWER:**	**GAS:**
INDIANA AMERICAN WATER CO. 870 W. S.R. 32 WINCHESTER, IN 47394 (765) 962-0470 EXT. 223	CITY OF WINCHESTER 901 N. WEST ST. WINCHESTER, IN 47394 (765) 584-1331	OHIO VALLEY GAS CORP. P.O. BOX 469 WINCHESTER, IN. 47394-0469 (765) 584-5501

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

REV. #	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

DICK R. WEIGEL
REGISTERED
No. 910056
STATE OF INDIANA
PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

FILE NAME: GENERAL NOTES
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 2

ASSUMED MERIDIAN

OVERALL SITE PLAN

SCALE: 1"= 20'

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

REV. #	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

DICK R. WEIGEL
REGISTERED
No. 910056
STATE OF INDIANA
PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER

ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

FILE NAME: OVERALL SITE PLAN
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 3


CLEANOUT
EXISTING 10" C.I. WATER LINE
CHEMICAL FEED BUILDING
BACK WASH PIT
3 - 2" PVC CONDUITS REROUTED HERE DUE TO CONFLICT WITH EXISTING AIR COMPRESSOR IN THE AERATOR BLDG
EXISTING (5) 2" PVC CASINGS
EXISTING STORMWATER BASIN
EXISTING 8" PVC WATER LINE
EXISTING ELECTRICAL LINE
CLEANOUT
EXISTING TELEPHONE LINE
AERATOR PLANT
EXISTING 12" D.I.P. WATER LINE
ADDED 4" PERIMETER DRAIN TO DRAIN GROUND/RAIN WATER BACK TO EXISTING STORMWATER BASIN
EXISTING 12" C.I. WATER LINE
(3) NEW 2" PVC CONDUITS EACH CARRYING (2) CHEMICAL FEED TUBES
EXISTING 10" D.I.P. WATER LINE
EXISTING ELECTRICAL LINE
EXISTING 8" PVC WATER LINE
EXISTING CONDUIT POWER BUILDING & PUMPS 2" CONDUIT SCADA CONTROL 24" DPT
WELL 2A
GENERATOR
ELECTRICAL FEED BUILDING
ASSUMED MERIDIAN
CONTRACTOR NOTES:
1. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF THE EXISTING UTILITY LINES PRIOR TO INSTALLATION OF THE PROPOSED CONDUITS.
2. EXISTING UTILITIES SHOWN ARE BASED ON 2001 RECORD DRAWINGS AND MAY NOT REFLECT CURRENT SITE CONDITIONS.
3. CONDUIT RUNS SHALL USE LONG SWEEP 90'S.
SITE PIPING PLAN
SCALE: 1"= 10'
DISTRICT OFFICE: WINCHESTER OPERATIONS
PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA
WBS R10-01Q1.17-P-0009
REV. # DATE REVISIONS
7 6 5 4 3 2 1
DICK R. WEIGEL REGISTERED No. 910056 STATE OF INDIANA PROFESSIONAL ENGINEER
INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT 153 NORTH EMERSON AVENUE GREENWOOD, INDIANA 46143
FILE NAME: SITE PIPING PLAN
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 4


C (SEE SHEET 6)
ORTHOPHOSPHATE CHEMICAL TO BE DELIVERED HERE, CHEMICAL IS STORED HERE DURING SUMMER MONTHS
14'-5"
NEW STORAGE DIVIDER
EXISTING STORAGE DIVIDER
EXISTING STORAGE DIVIDER
EXISTING STORAGE DIVIDER
D D (SEE SHEET 6)
C
24'-6 1/2"
7'-7"
7'-7 1/2"
7'-7"
32'-0"
±4" (TYP.)
31'-0"
67'-10"
23'-5"
13'-5"
GARAGE
(3) NEW 1/2" PVC PIPES FOR EXISTING CHLORINE AND FLUORIDE TUBING, REFER TO CONDUIT DETAIL SCHEMATIC (A).
EXISTING 3/4" HOT & COLD WATER LINES TO REMAIN
NEW PHOSPHATE ANALYZER PANEL AND SAMPLER, MOUNT ON NEW BACKBOARD. SEE SHEET E1 FOR DETAILS.
EXISTING 3/4" COLD WATER LINE TO EXISTING EYEWASH. UPSIZE TO 1". INSTALL TEMPERING VALVE AT EXISTING EYEWASH. SEE SHEET 7.
INSTALL NEW 1" COLD WATER LINE TO NEW EYEWASH & CHEMICAL SHOWER
EXISTING 3/4" HOT WATER LINE TO REMAIN
BATH
LAB ROOM
EXISTING FLUORIDE ROOM
EXISTING CHLORINE ROOM
EXISTING HOT AND COLD WATER LINES
EXISTING FLUORIDE AND CHLORINE ANALYZER AND SAMPLER
EXISTING EYEWASH STATION
NEW 1" HOT WATER LINE TO EXISTING EYEWASH STATION
W.H.
EXISTING 30 GALLON GAS WATER HEATER TO REMAIN
EXISTING 2" PVC CONDUITS
REROUTE EXHAUST PIPE DIRECT TO EXTERIOR IN LIEU OF PENETRATING INTERIOR WALL TO STORAGE ROOM
(3) NEW 1/2" PVC SCH. 80 PIPES FOR PRE & POST CHLORINE AND FLUORIDE. ROUTE ABOVE FLUORIDE, CHLORINE AND PHOSPHATE ROOMS. ATTACH TO WALL AS REQUIRED. REFER TO CONDUIT DETAIL SCHEMATIC (A).
NEW EYEWASH AND CHEMICAL SHOWER
INSTALL NEW 1" HOT WATER LINE FROM NEW WATER HEATER TO NEW EYEWASH & CHEMICAL SHOWER (ALSO CONNECT TO EXISTING EYEWASH STATION)
1" COLD TO WATER METER, THEN ROUTE WITH HW LINE BACK TO HALLWAY
OFFICE
PROPOSED 3'x7', 18 GAUGE STEEL ENTRANCE DOOR WITH PANIC BAR AND 2'-0"x2'-6" WINDOW. PROVIDE STEEL FRAME TO MATCH. DOOR SHOULD BE KEYED TO MATCH EXISTING FL & CL DOORS.
CHEMICAL TOTE SCALE READOUT
INSTALL HW AND CW LINES TO NEW TMV. THEN SPLIT AFTER TMV TO BOTH EYE WASH/SHOWER STATIONS.
CEILING HEIGHT 13'-6"±
CHEMICAL SPILL PAD PLACED UNDERNEATH DRUM SCALE (60.5 GALLON CAPACITY)
WALL MOUNTED EMERGENCY EYEWASH BOTTLES
NEW PHOSPHATE ROOM
PROPOSED CHEMICAL TOTE (15 GALLONS) (SEE PHOSPHATE FEED SCHEMATIC ON SHEET 9 FOR DETAILS)
NEW 1" HOT WATER LINE TO NEW EYEWASH & CHEMICAL SHOWER
CHEMICAL TOTE SCALE (30"x30") (CONNECT TO SCALE READ OUT AS REQUIRED)
EXISTING 3/4" COLD WATER LINE TO BE UPSIZED TO 1". RECONNECT AND SECURE AS REQUIRED.
IN-LINE EXHAUST FAN
PROPOSED PERISTALTIC TYPE PUMPS, INSTALL PER MANUFACTURER'S RECOMMENDATIONS (TYP. OF 2)
WM
WH
6" PVC SCH 80 90° BEND DOWN WITH INSECT SCREEN
6" PVC SCH 80 90° BEND
8'-0"
NEW 74 GALLON GAS WATER HEATER
WATER HEATER FLUE PIPE.
(1) NEW 1/2" PVC SCH. 80 PIPE FOR ORTHOPHOSPHATE CHEMICAL. ROUTE WITH ROOM VENT. REFER TO CONDUIT DETAIL SCHEMATIC (B).
PUMP SKID, INSTALL PER MANUFACTURER'S RECOMMENDATIONS
NEW 1" COLD WATER LINE TO NEW WATER HEATER
PROPOSED PHOSPHATE ROOM VENT (ABOVE), 6" PVC SCH 80, ROUTE THROUGH EXISTING WALL PORTS. SEAL OPENINGS – SEE M1.
STORAGE CEILING HEIGHT 12'-8"±
ORTHOPHOSPHATE CHEMICAL STORAGE LOCATION (WINTER MONTHS)
(4) NEW 1/2" PVC SCH. 80 PIPES FOR CHEMICALS. ATTACH TO WALL AS REQUIRED.
SEE SECTION B-B ON SHEET 6
EXISTING 1 1/2" COLD WATER LINE TO REMAIN
ASSUMED MERIDIAN
50'-0"
TRANSITION FROM PVC SCH. 80 PIPING TO POLYETHYLENE TUBING BEFORE ENTERING EXCAVATED AREA. SEE SECTION B-B ON SHEET 6. MATCH CONDUIT DETAIL SCHEMATIC (C).
CHEMICAL BUILDING IMPROVEMENTS
SCALE: 1/4"= 1'-0"
CONTRACTOR NOTES:
1. CONTRACTOR SHALL ENSURE THAT THE PHOSPHATE ROOM IS SEALED AND VENTED.
2. CONTRACTOR SHALL INSTALL TUBING WITHIN THE CONDUITS AND PULL THROUGH TO THE AERATOR PLANT. SEE CONDUIT DETAIL (C) THIS SHEET.
3. ALL PVC PIPING SHALL BE SCHEDULE 80. USE LONG SWEEP 90'S FOR TUBING CONDUIT.
4. ASBESTOS SHALL BE REMOVED PRIOR TO THE INSTALLATION OF THE PHOSPHATE CHEMICAL FEED.
5. 3/8" POLYETHYLENE TUBING SHALL BE USED FOR CHEMICAL TUBING.
ASBESTOS ABATEMENT NOTES:
1. THE ASBESTOS CONTAINING SURFACES THAT ARE REMOVED BY THE ASBESTOS ABATEMENT SUBCONTRACTOR (APPENDIX K & L) SHALL BE REPLACED. CEILINGS OVER INTERIOR ROOMS SHALL BE FINISHED PER SECTION A-A ON SHEET 6. WALL PANELS SHALL BE REPLACED WITH GYPSUM WALL BOARD. EXPOSED WALL SURFACES TO BE PAINTED.
1/2" PVC SCH. 80 PIPE FOR PRE CHLORINE
1/2" PVC SCH. 80 PIPE FOR POST CHLORINE
1/2" PVC SCH. 80 PIPE FOR FLUORIDE
CONDUIT DETAIL SCHEMATIC (A)
NOT TO SCALE
1/2" PVC SCH. 80 PIPE FOR ORTHOPHOSPHATE
CONDUIT DETAIL SCHEMATIC (B)
NOT TO SCALE
2" PVC SCH. 80 CONDUIT WITH FLUORIDE AND ORTHOPHOSPHATE INJECTION TUBING
2" PVC SCH. 80 CONDUIT WITH (2) SPARE INJECTION TUBES
2" PVC SCH. 80 CONDUIT WITH PRE CHLORINE AND POST CHLORINE INJECTION TUBING
CONDUIT DETAIL SCHEMATIC (C)
NOT TO SCALE
DISTRICT OFFICE: WINCHESTER OPERATIONS
PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA
WBS R10-01Q1.17-P-0009
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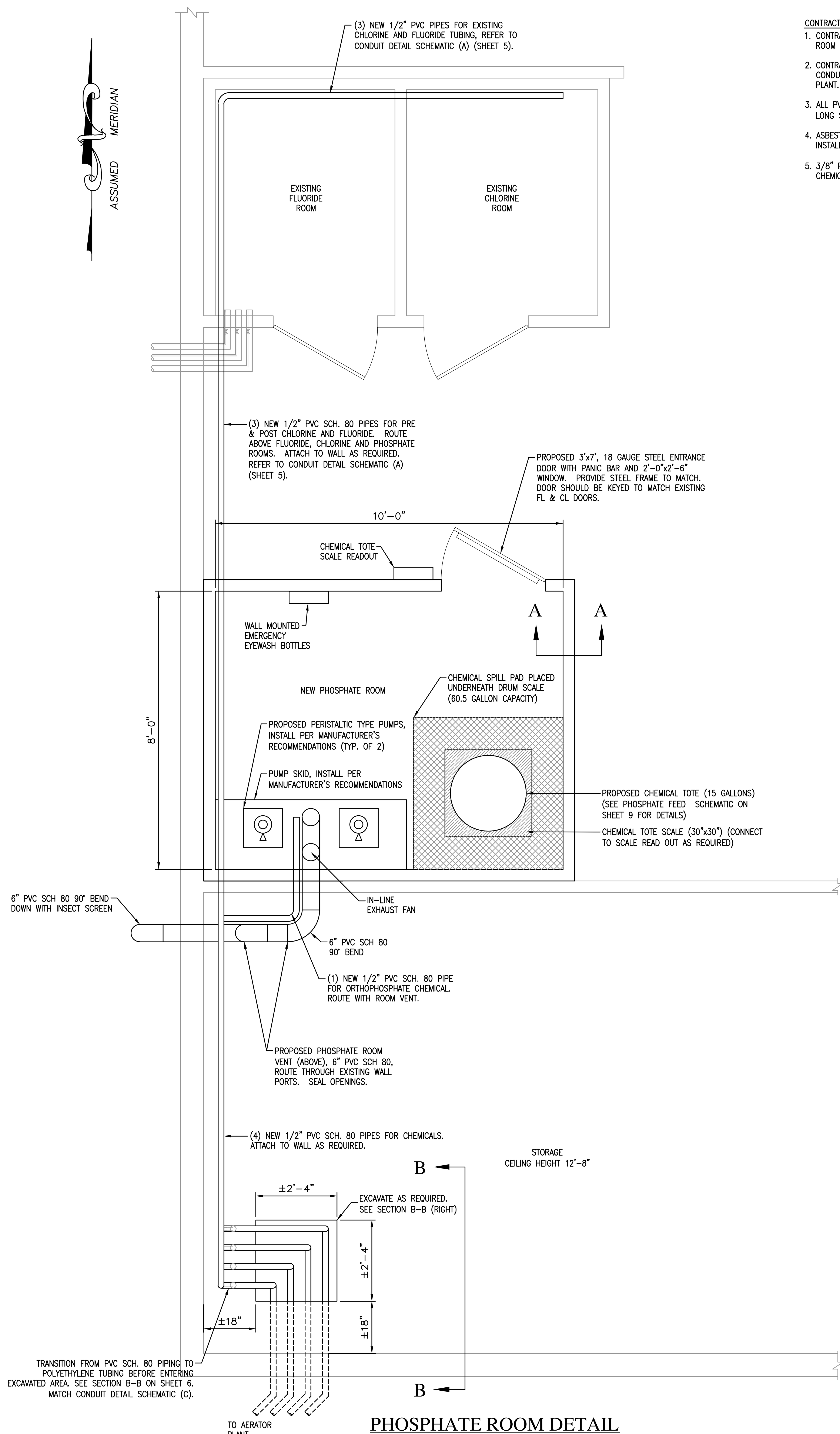
DICK R. WEIGEL REGISTERED No. 910056 STATE OF INDIANA PROFESSIONAL ENGINEER
INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT 153 NORTH EMERSON AVENUE GREENWOOD, INDIANA 46143
FILE NAME: CHEMICAL FEED BUILDING IMPROVEMENTS
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 5

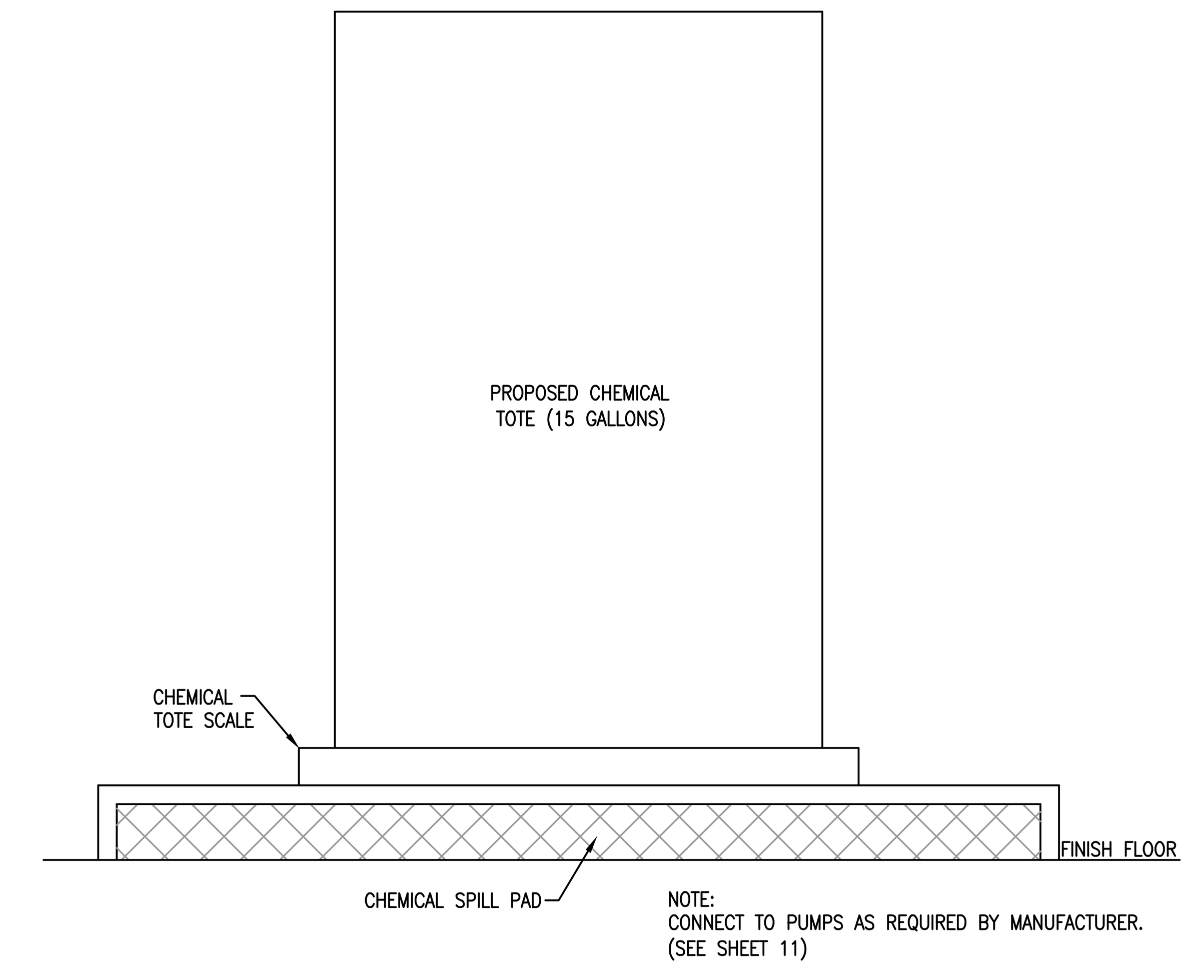


PHOSPHATE ROOM DETAIL

SCALE: 1/2"= 1'-0"

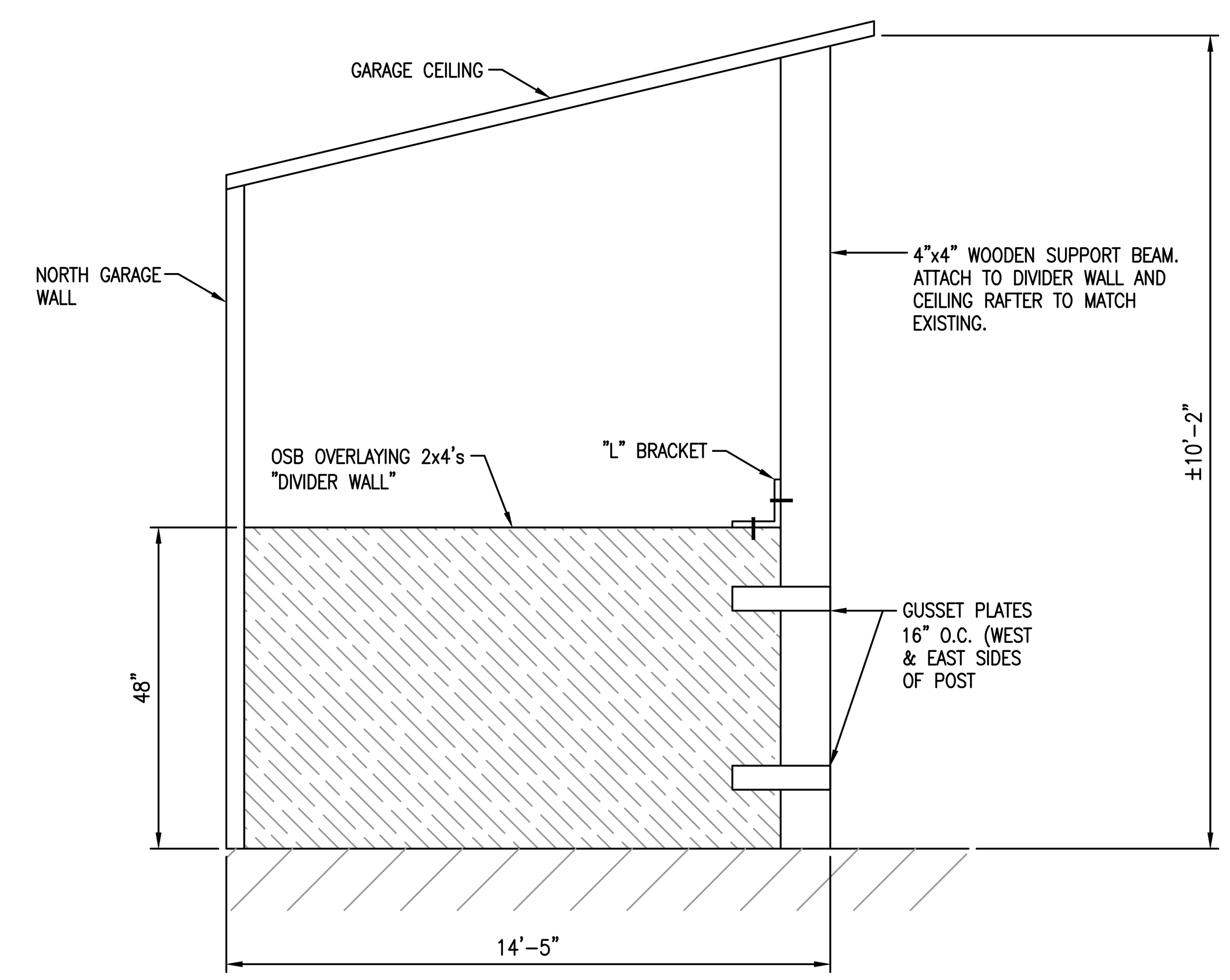
CONTRACTOR NOTES:

1. CONTRACTOR SHALL ENSURE THAT THE PHOSPHATE ROOM IS SEALED AND VENTED.
2. CONTRACTOR SHALL INSTALL TUBING WITHIN THE CONDUITS AND PULL THROUGH TO THE AERATOR PLANT. SEE CONDUIT DETAIL THIS SHEET.
3. ALL PVC PIPING SHALL BE SCHEDULE 80. USE LONG SWEEP 90'S FOR TUBING CONDUIT.
4. ASBESTOS SHALL BE REMOVED PRIOR TO THE INSTALLATION OF THE PHOSPHATE CHEMICAL FEED.
5. 3/8" POLYETHYLENE TUBING SHALL BE USED FOR CHEMICAL TUBING.



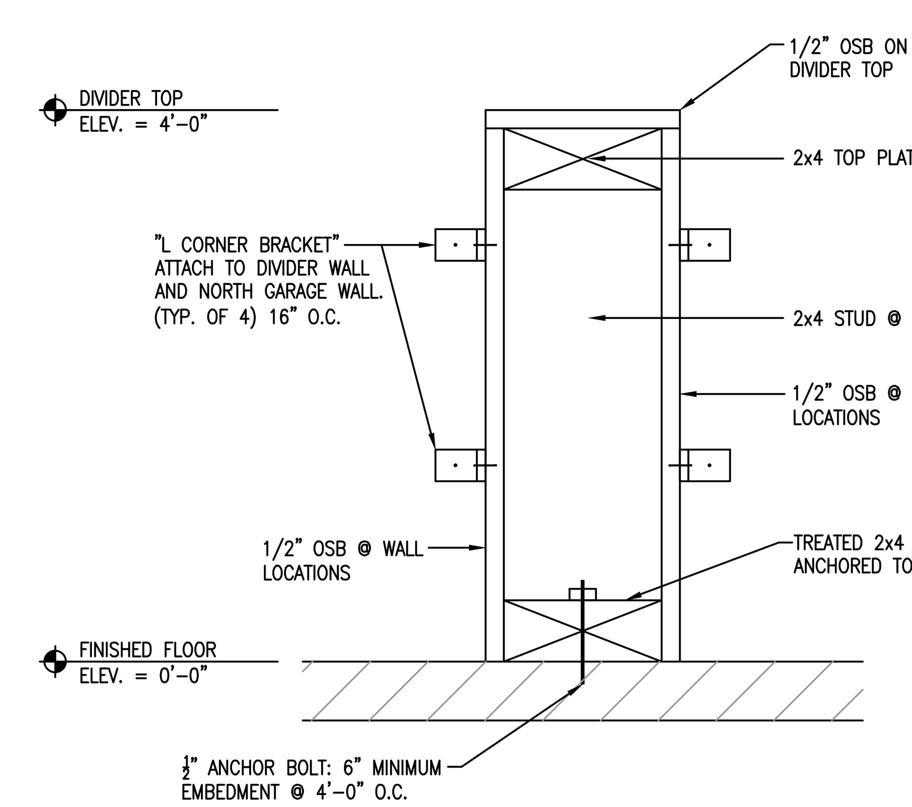
CHEMICAL TOTE SIDE VIEW DETAIL

NOT TO SCALE



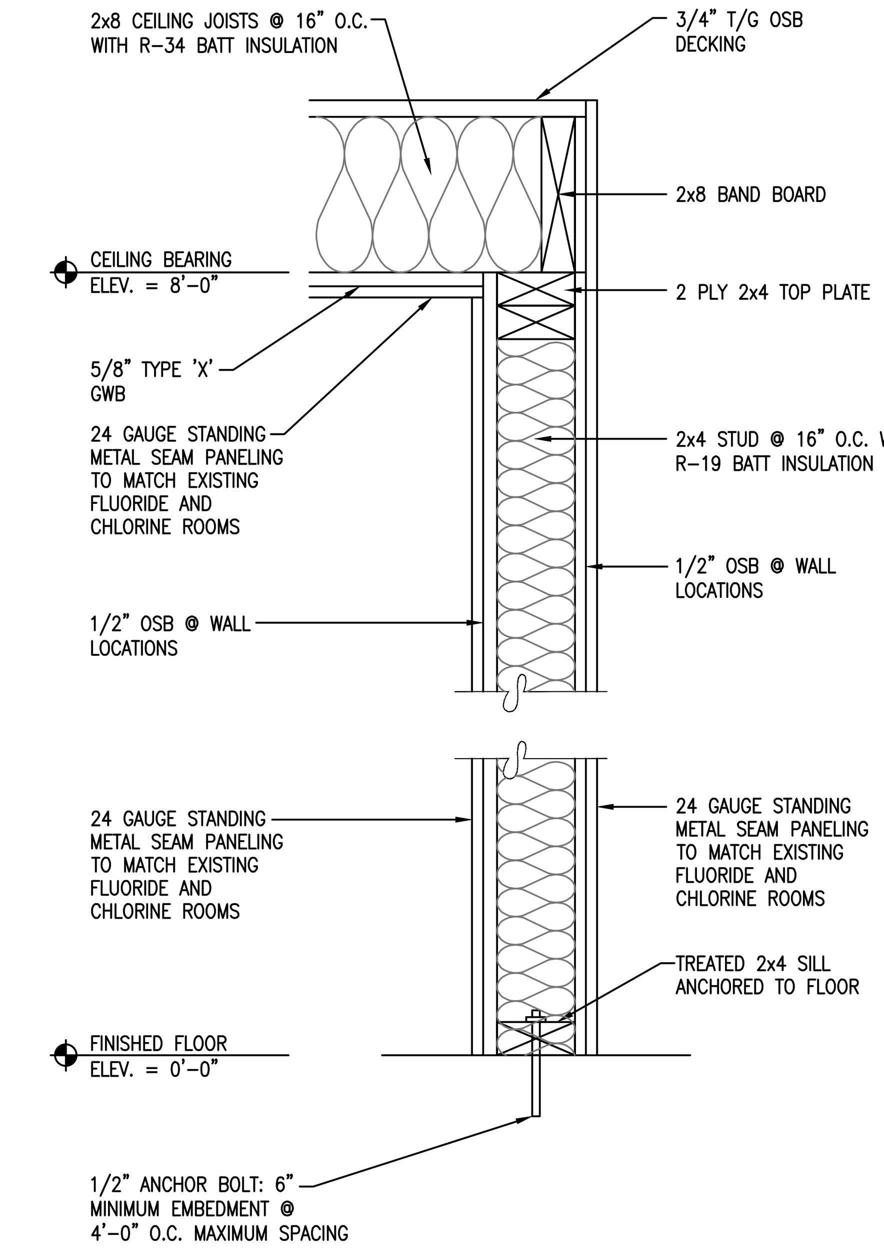
SECTION C-C

NOT TO SCALE



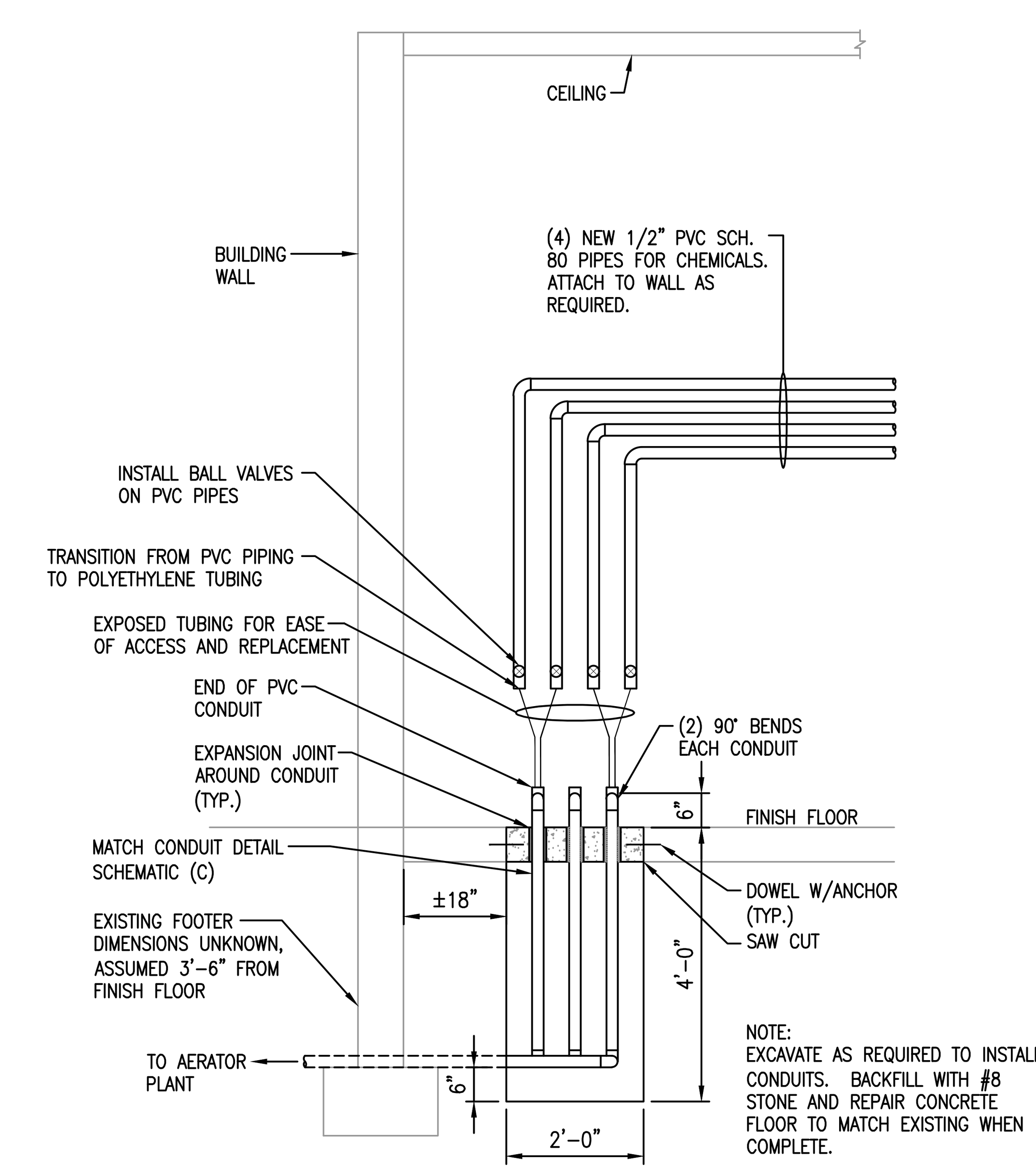
SECTION D-D

NOT TO SCALE



SECTION A-A

NOT TO SCALE



SECTION B-B

NOT TO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

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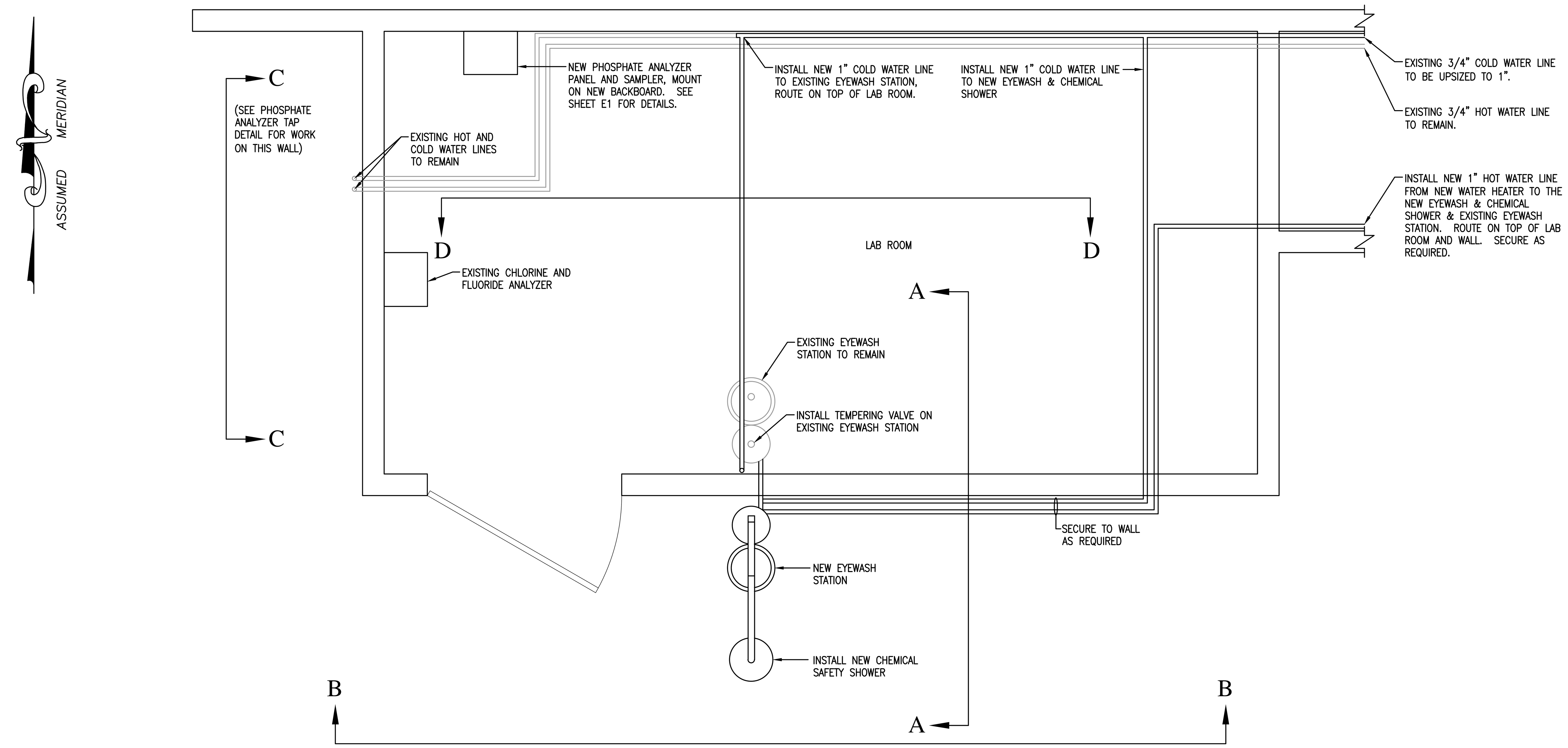
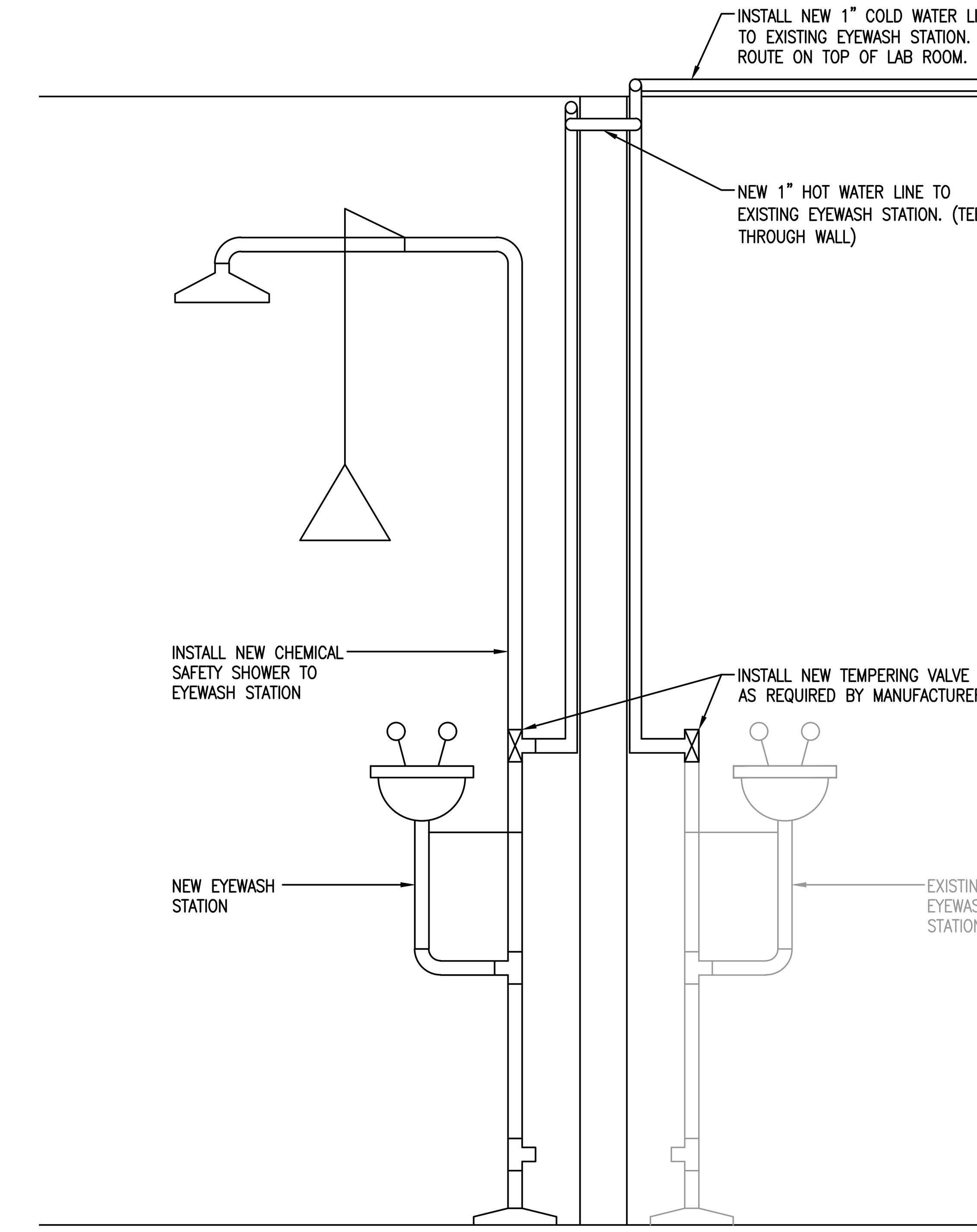
DICK R. WEIGEL REGISTERED No. 910056 STATE OF INDIANA PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

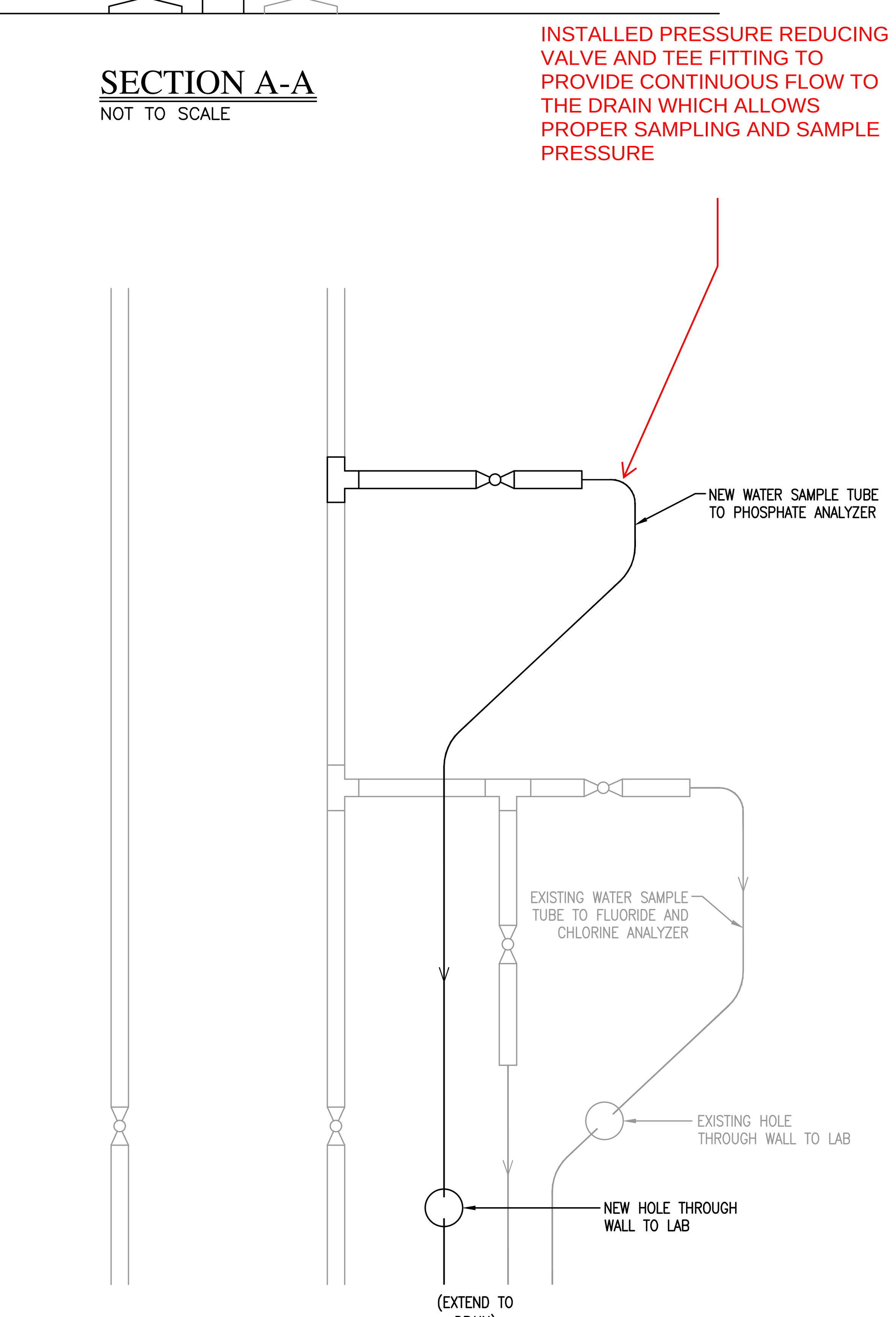
FILE NAME: PHOSPHATE ROOM
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 6

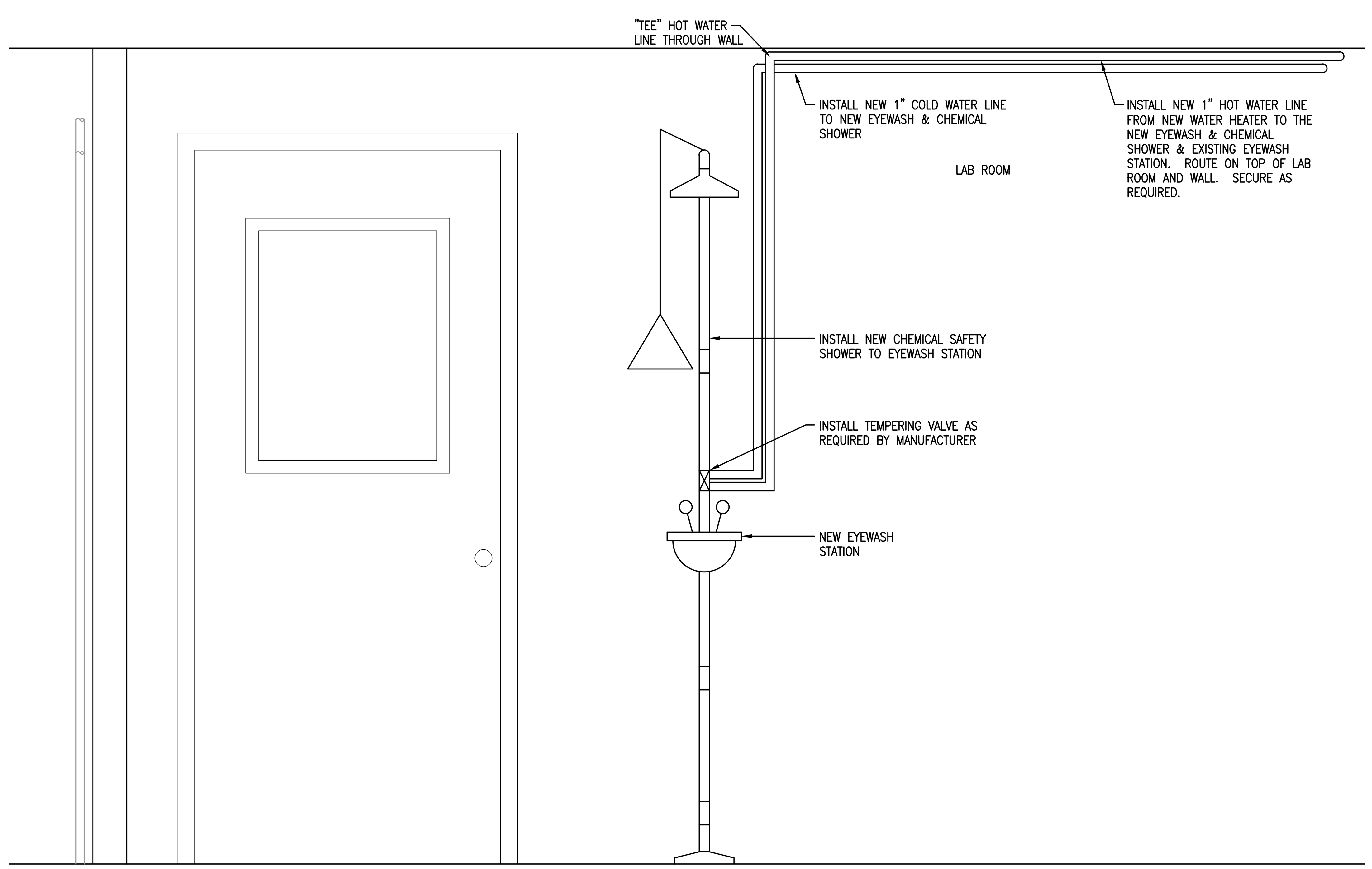


LAB ROOM
NOT TO SCALE

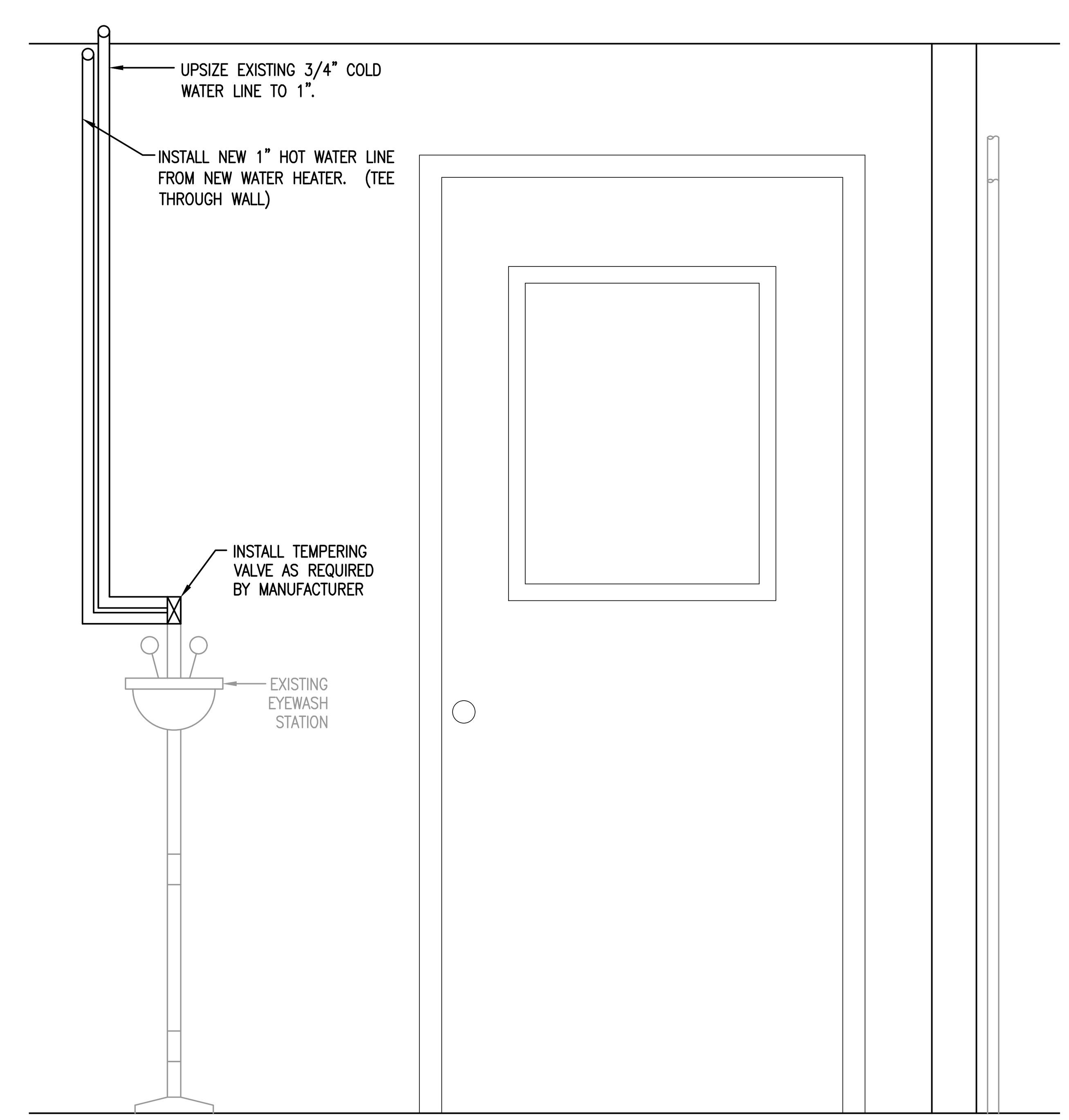


SECTION A-A
NOT TO SCALE





SECTION B-B
NOT TO SCALE



SECTION D-D
NOT TO SCALE

PHOSPHATE ANALYZER TAP DETAIL (SECTION C-C)
NOT TO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

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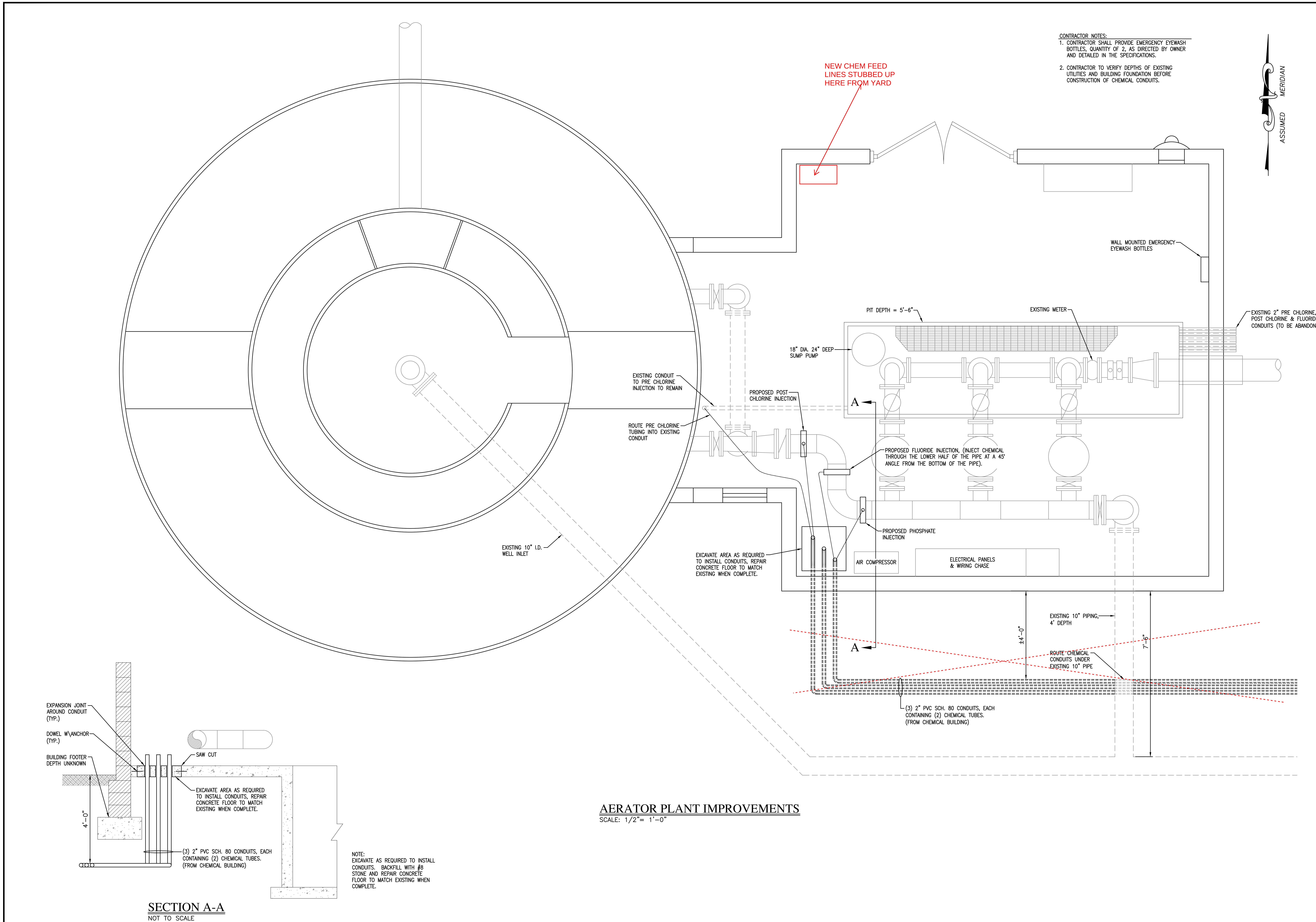
DICK R. WEIGEL
REGISTERED
No. 910056
STATE OF INDIANA
PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

FILE NAME: LAB ROOM
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 7



AERATOR PLANT IMPROVEMENTS
SCALE: 1/2"= 1'-0"

SECTION A-A
NOT TO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

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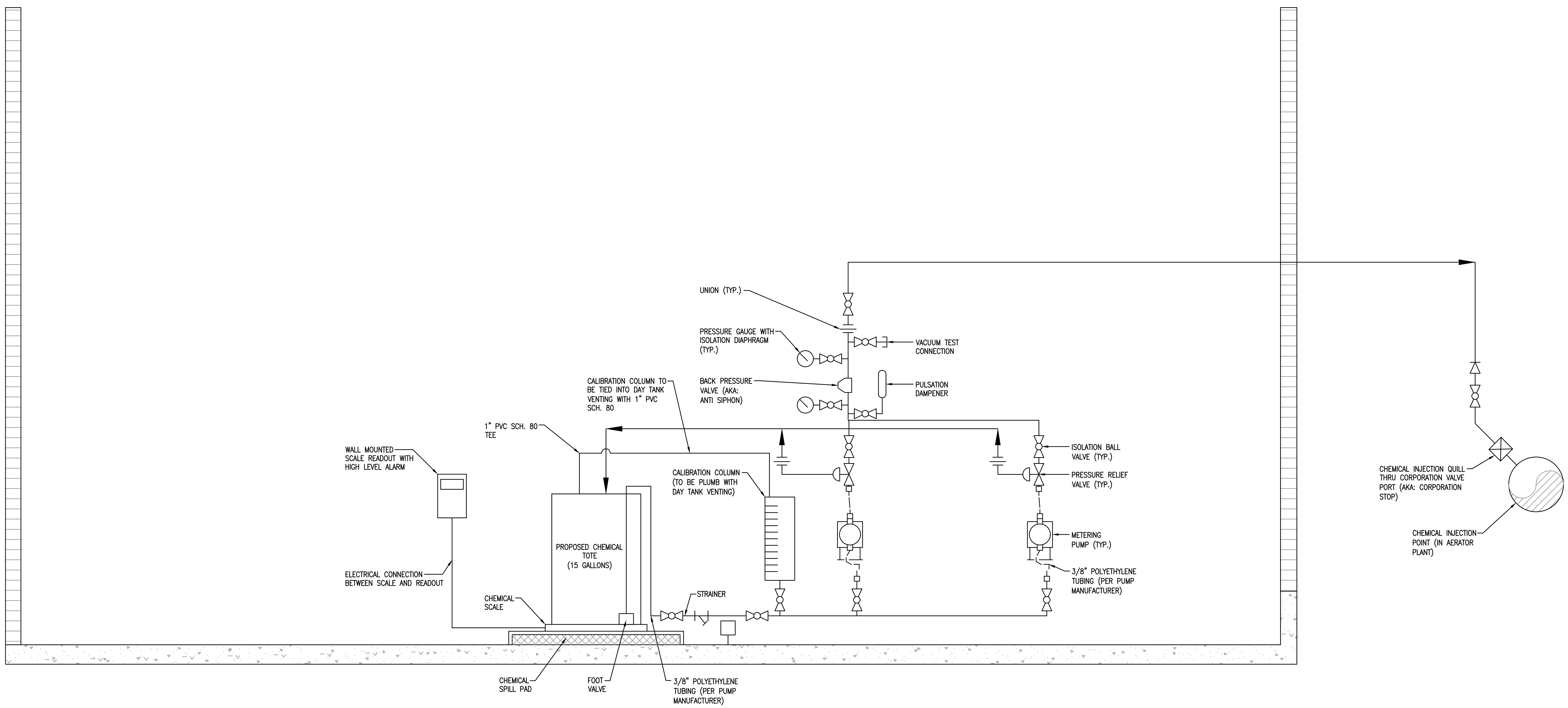
INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

FILE NAME: AERATOR PLANT IMPROVEMENTS
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 8

NOTES:

1. DO NOT LOCATE VALVES MORE THAN 6'-0" A.F.F.
2. 3/8" POLYETHYLENE TUBING USED FOR CHEMICAL TUBING FROM DAY TANK, TO PUMPS AND INJECTION POINT.



PHOSPHATE FEED SCHEMATIC

NOT TO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

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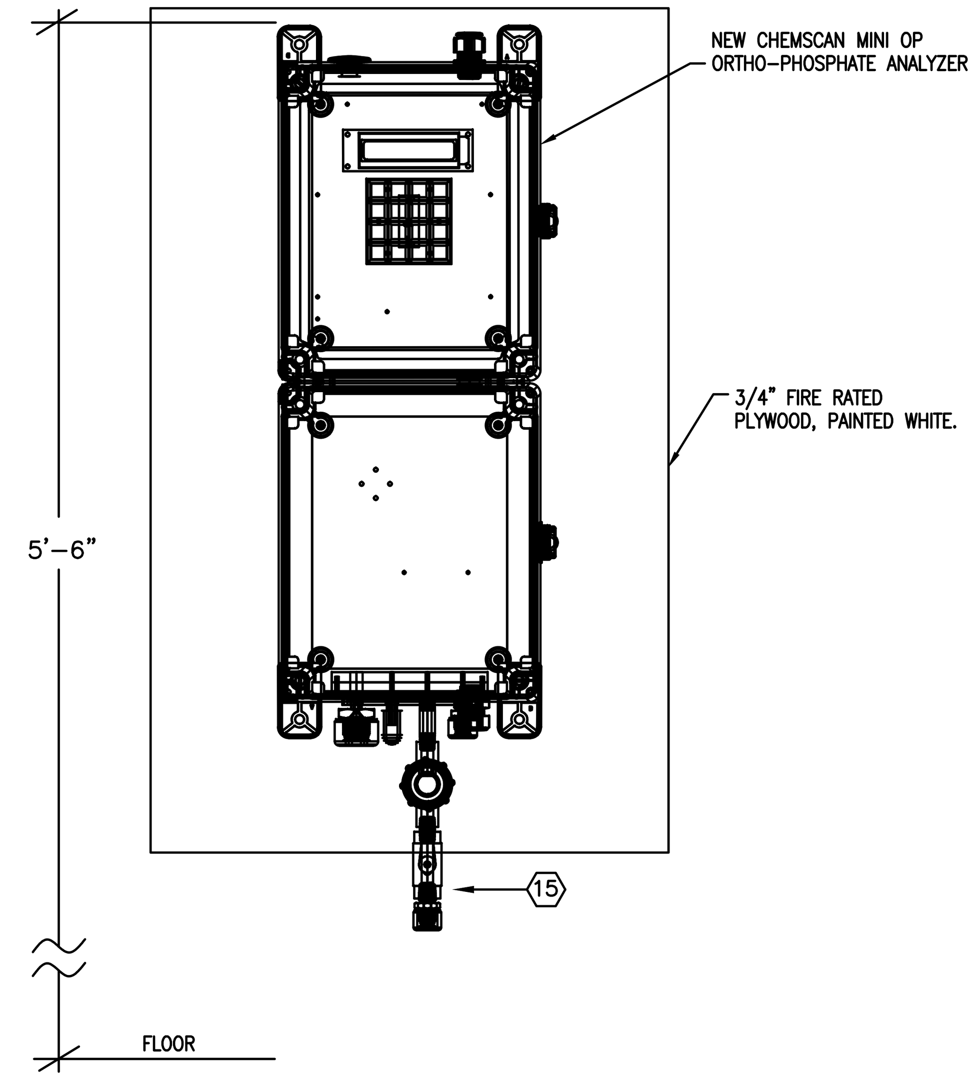
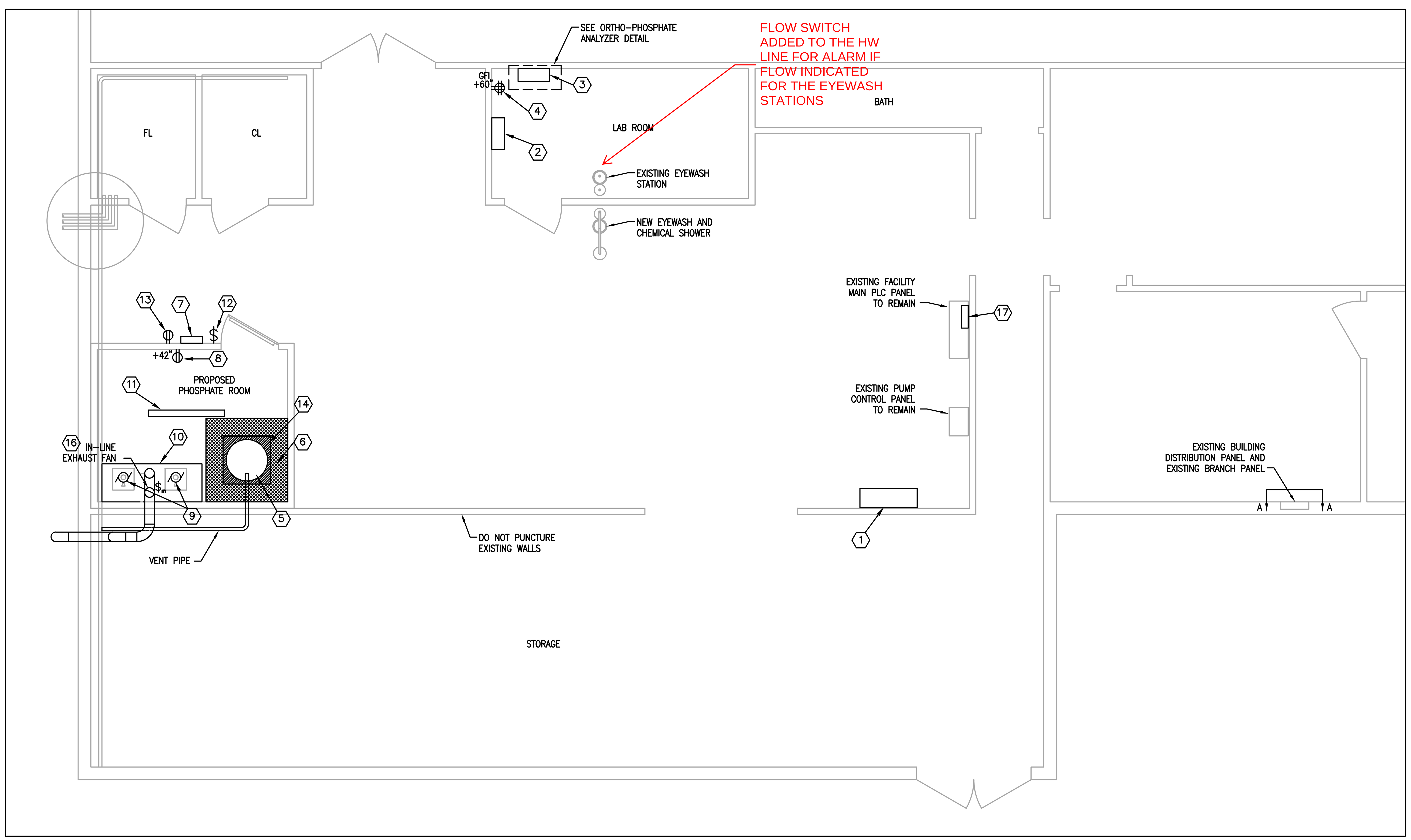
153 NORTH EMERSON AVENUE
GREENWOOD, INDIANA 46143

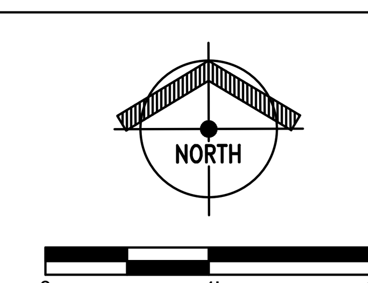
FILE NAME: PHOSPHATE FEED SCHEMATIC
DATE: MAY 30, 2018
DESIGNED BY: MP
DRAWN BY: DMW
SCALE: AS NOTED
SHEET 9



ORTHO–PHOSPHATE ANALYZER DETAIL

NO SCALE





CHEMICAL FEED BUILDING ELECTRICAL PLAN

SCALE: 1/4" = 1'–0" (WHEN PLOTTED AT 22"X34")

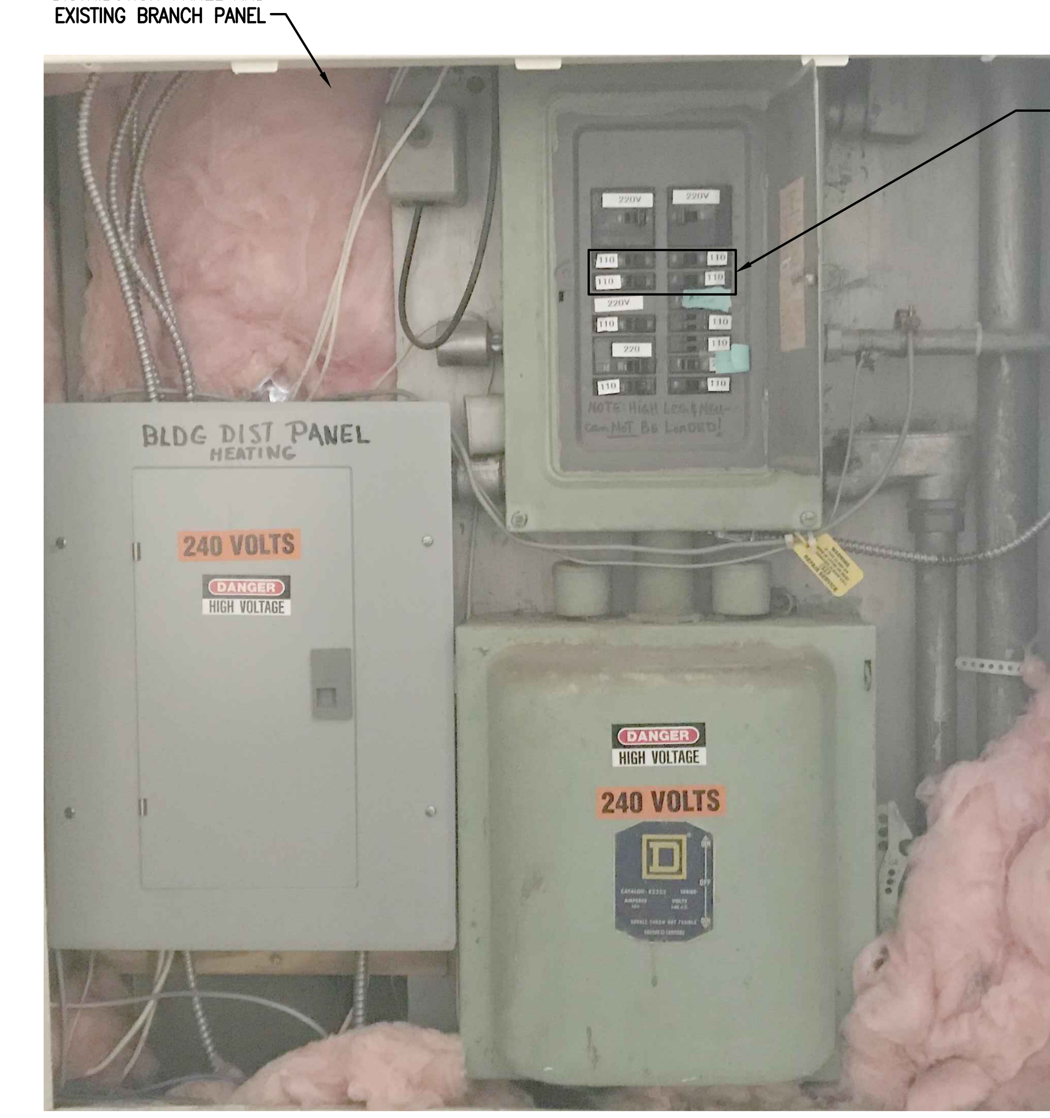
ELECTRICAL GENERAL NOTES:

1. ALL NEW ELECTRICAL EQUIPMENT, PULL BOXES AND CONDUIT RUN LOCATIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL COORDINATE NEW WORK WITH EXISTING CONDITIONS AS NECESSARY.
2. SEE CHEMICAL FEED SYSTEM DIAGRAM.

ELECTRICAL KEYED NOTES:

1. NEW ORTHOPHOSPHATE PLC PANEL; CIRCUIT #1. SEE PANEL LAYOUT SHEETS E3 AND E4.
2. EXISTING FLUORIDE AND CHLORINE ANALYZER AND SAMPLER TO BE RELOCATED; SEE DETAIL.
3. NEW ORTHO–PHOSPHATE ANALYZER PANEL AND SAMPLER, MOUNT ON NEW BACKBOARD; SEE DETAIL.
4. EXTEND CIRCUIT FROM EXISTING RECEPTACLE ON ROOF OF LAB ROOM STRUCTURE FOR NEW PHOSPHATE ANALYZER, GFI. 2–#12, 1–#12 GND, 3/4" C.
5. NEW PHOSPHATE CHEMICAL TANK; LOCATED ON NEW SCALE PAD.
6. NEW CHEMICAL SPILL PAD; LOCATED BELOW SCALE.
7. NEW SCALE INDICATOR FOR PHOSPHATE TANK, MOUNT TO EXTERIOR WALL OF NEW STRUCTURE. LABEL SCALE "PHOSPHATE WEIGHT".
8. NEW 20A, GFI, CONVENIENCE RECEPTACLE; CIRCUIT #2.
9. NEW METERING PUMPS MOUNTED ON PUMP SKID, CIRCUIT #2.
10. NEW PUMP SKID.
11. NEW 4' LED SEALED/GASKETED LIGHT, SURFACE MOUNTED, LITHONIA XWMLED, 1800LM; INTERCEPT EXISTING LIGHTING CIRCUIT; CIRCUIT #3.
12. NEW DEDICATED SWITCH FOR EXHAUST FAN AND LIGHT FIXTURE.
13. NEW 20A RECEPTACLE FOR NEW SCALE READER; CIRCUIT #2.
14. NEW ELECTRONIC CHEMICAL DRUM SCALE
15. SAMPLE TUBING, EXTEND TO TESTING PORT.
16. PROVIDE 120V CIRCUIT FOR NEW IN–LINE EXHAUST FAN. CIRCUIT #4, 2–#12, 1–#12 GND, 3/4" C. INCLUDE SQUARE–D 2510 LOCAL DISCONNECT.
17. EXISTING ETHERNET SWITCH.

EXISTING BUILDING DISTRIBUTION PANEL AND EXISTING BRANCH PANEL



REPLACE (4) EXISTING BREAKERS WITH TANDEM BREAKERS, USE NEW AVAILABLE CIRCUITS FOR NEW ELECTRICAL WORK. (SQUARE–D QO) (4) ADDITIONAL CIRCUITS ADDED AND DESIGNATED AS #1, #2, AND #3. USE #4 AS SPARE.

SECTION A–A

NO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

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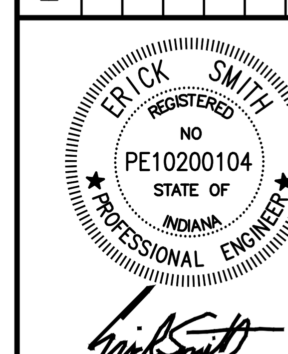
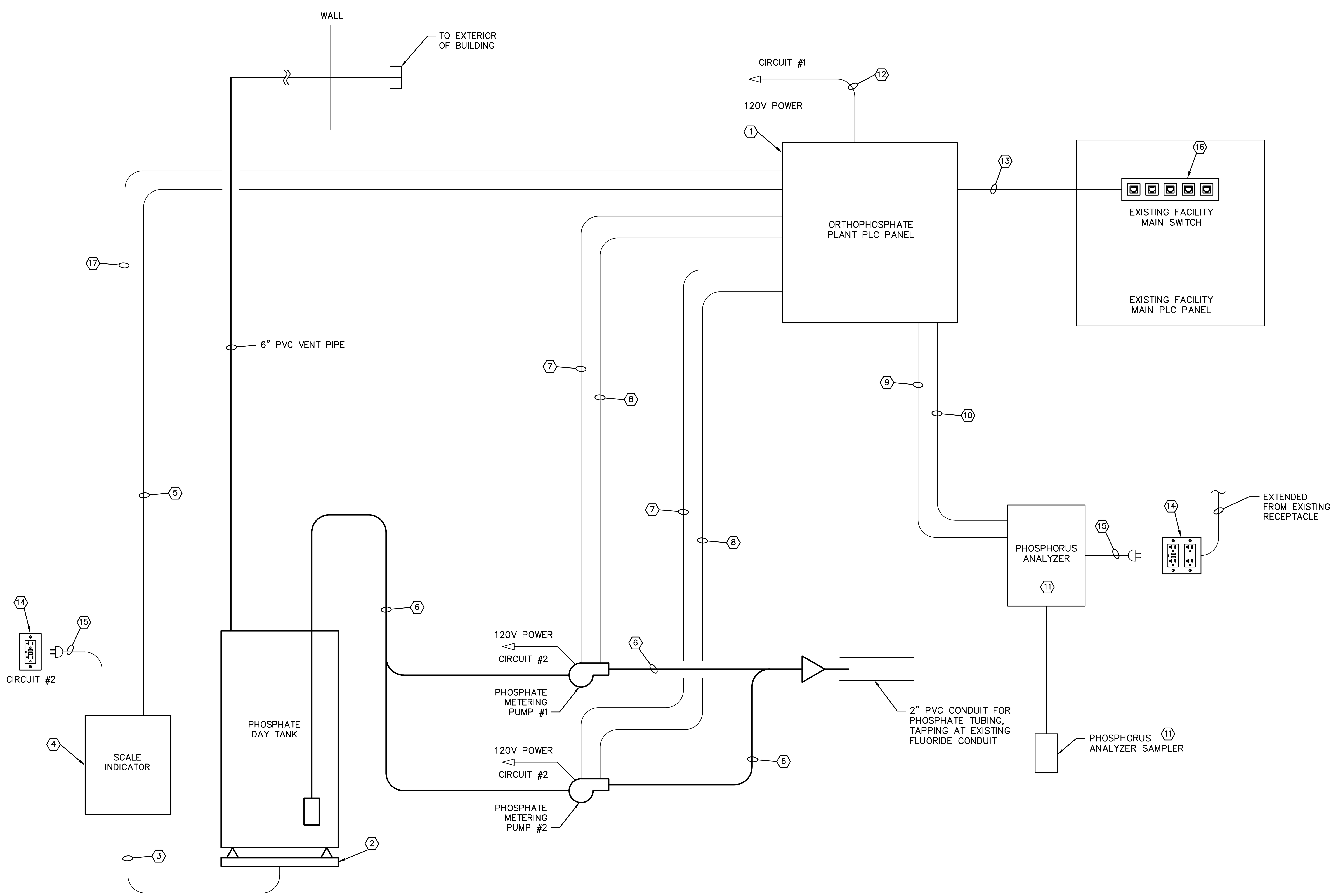


INDIANA AMERICAN WATER

ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143

FILE NAME: CHEMICAL FEED BUILDING ELECTRICAL PLAN
DATE: MAY 10, 2018
DESIGNED BY: CEB, ES, JTH
DRAWN BY: JTH
SCALE: AS NOTED
SHEET: E1



CHEMICAL FEED SYSTEM DIAGRAM

NO SCALE

ELECTRICAL GENERAL NOTES:

ALL NEW ELECTRICAL EQUIPMENT, PULL BOXES AND CONDUIT RUN LOCATIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL COORDINATE NEW WORK WITH EXISTING CONDITIONS AS NECESSARY.

ELECTRICAL KEYED NOTES:

1. NEW ORTHOPHOSPHATE PLC PANEL.
2. NEW CHEMICAL DRUM SCALE, 1000lb CAPACITY, SIZED FOR 21.375" HEIGHT x 26.125" DIAMETER DRUM. CHEM–SCALE WITH TUF COAT COATING. #30DR10LP.
3. SCALE INSTRUMENTATION CABLE, FURNISHED WITH SCALE; SLEEVED IN 1" C.
4. DIGITAL SCALE INDICATOR, SOLO G2 #SRG2–1.
5. 2–#14 LOW LEVEL, 2–#14 ALARM, 1–#14 SHARED GROUND, ALL IN 3/4" C.
6. 2" PVC CONDUIT FOR PHOSPHATE PIPING.
7. SPEED CONTROL, 4–20MA, TSP #18, BELDEN #8760.
8. 2–#14 FAIL, 2–#14 WARNING, 1–#14 SHARED GROUND, ALL IN 3/4" C.
9. 2–#14 INITIATE, 2–#14 WARNING, 2–#14 ALARM, 1–#14 SHARED GROUND, ALL IN 3/4" C.
10. 4–20mA, TSP #18, BELDEN #8760.
11. NEW PHOSPHORUS ANALYZER INDICATOR AND SAMPLER.
12. PROVIDE AVAILABLE 120V FROM EXISTING 120V POWER PANEL CIRCUIT FOR NEW ORTHOPHOSPHATE PLC PANEL, 2–#12 CU., 1–#12 CU. GND, ALL IN 3/4" C.
13. CAT 5E ETHERNET NETWORK CABLE, 3/4" C.
14. 20A, GFI, RECEPTACLE. SEE SHEET E1 FOR EXACT LOCATION.
15. CORD/CORD CAP SUPPLIED BY MANUFACTURER.
16. LOCATED IN EXISTING MAIN PLC PANEL; SEE SHEET E1 FOR EXACT LOCATION.
17. 2–#14 HIGH LEVEL, 2–#14 ALARM, 1–#14 SHARED GROUND, ALL IN 3/4" C.

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

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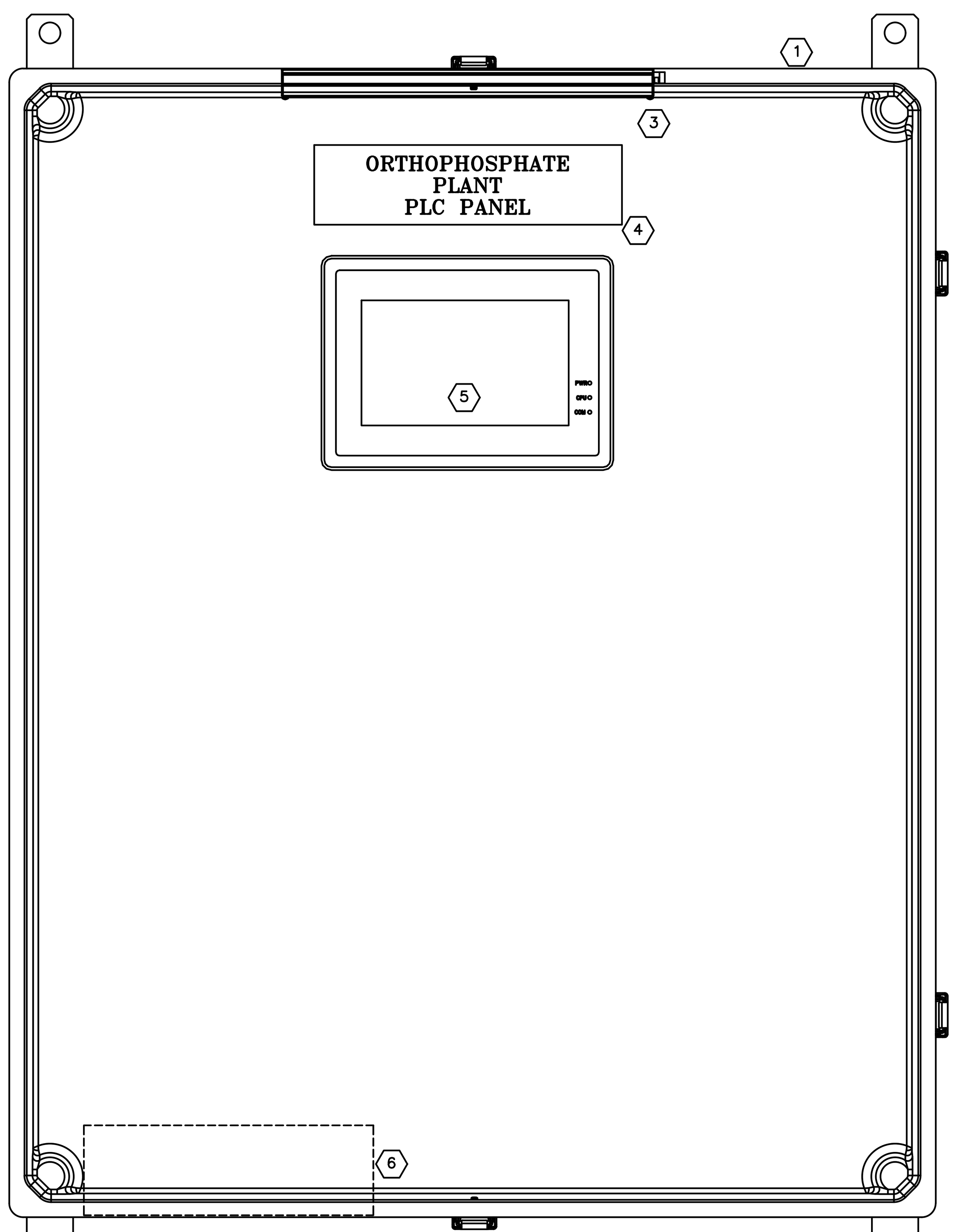
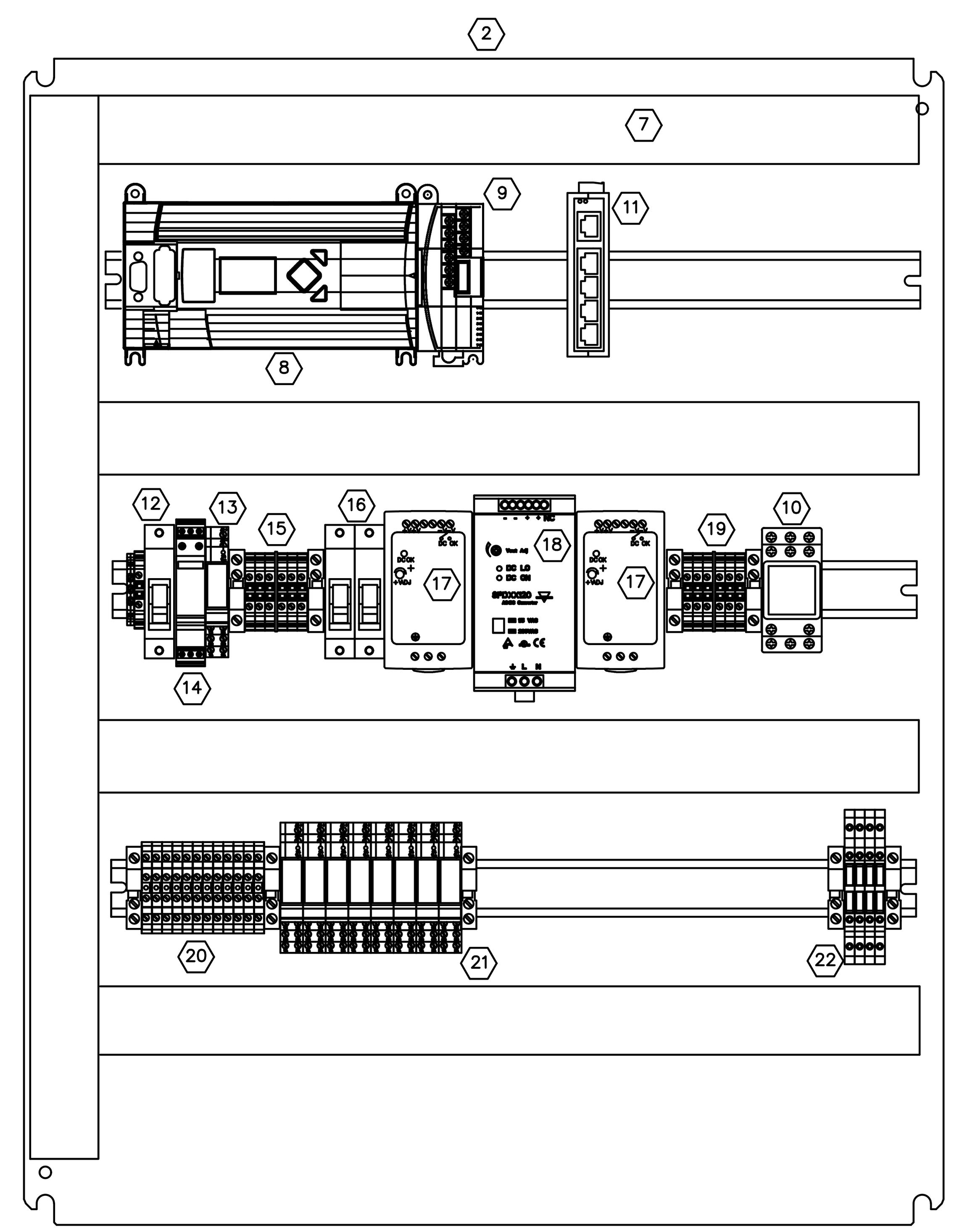
ERICK SMITH REGISTERED NO PE10200104 STATE OF INDIANA PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143

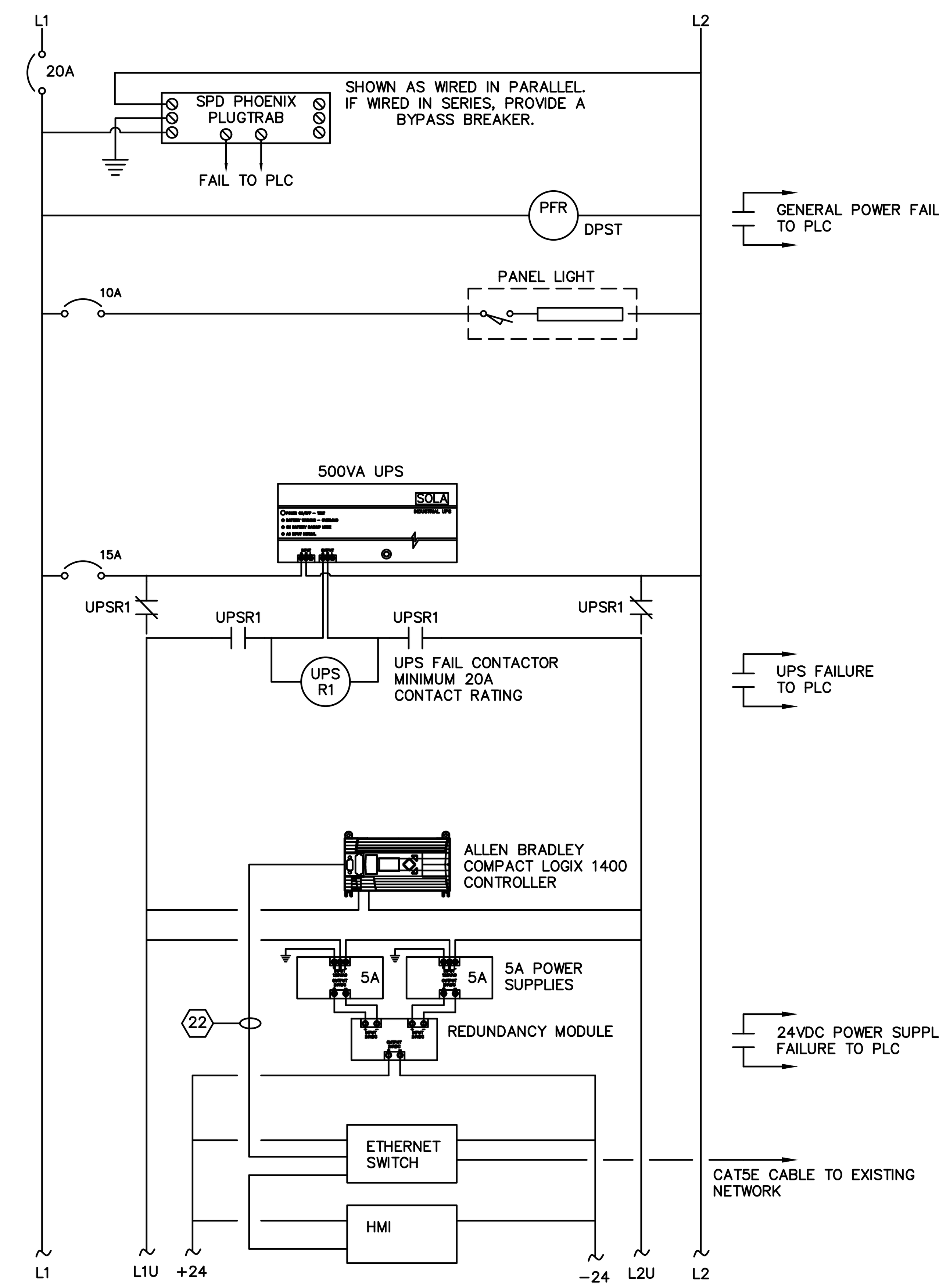
FILE NAME: CHEMICAL FEED BUILDING SYSTEM DIAGRAM
DATE: MAY 10, 2018
DESIGNED BY: CEB, ES, JTH
DRAWN BY: JTH
SCALE: AS NOTED
SHEET E2



EXTERIOR ENCLOSURE VIEW



INTERIOR ENCLOSURE VIEW



POWER WIRING DIAGRAM

SCOPE OF WORK NOTES:

THE PANEL LAYOUT SHOWN IS INTENDED TO ESTABLISH THE SCOPE OF WORK AND EXPECTATIONS. FINAL LAYOUT AND DETAILS SHALL BE THE RESPONSIBILITY OF THE MOTOR CONTROL PANEL FABRICATOR. SUBMIT SHOP DRAWINGS FOR REVIEW.

ELECTRICAL KEYED NOTES:

1. PROVIDE NEW NEMA12, PAINTED, STEEL – MINIMUM 30"X24"X8".
2. PROVIDE NEW INTERIOR EQUIPMENT PANEL 30"X24".
3. LED PANEL LIGHT.
4. BLACK ON WHITE IDENTIFICATION LABEL.
5. 7" TOUCH DISPLAY SIMILAR TO MAPLE SYSTEMS HMI5070P.
6. MINIMUM 500VA UPS; DOUBLE ON-LINE CONVERSION.
7. WIRE DUCT – AS REQUIRED.
8. ALLEN BRADLEY MICROLOGIX 1400 PLC.
9. ALLEN BRADLEY MICROLOGIX ANALOG INPUT MODULE.
10. UPS BYPASS RELAY.
11. 5 PORT INDUSTRIAL ETHERNET SWITCH.
12. MAIN 120VAC POWER CIRCUIT BREAKER.
13. POWER FAIL RELAY. RELAY TO REPORT TO SCADA UPON LOSS OF POWER.
14. 120V CONTROL POWER SURGE PROTECTION DEVICE.
15. 120V CONTROL POWER DISTRIBUTION TERMINAL BLOCKS.
16. 3A 24VDC POWER SUPPLY CIRCUIT BREAKERS.
17. 120VAC/24VDC 5A POWER SUPPLIES.
18. POWER SUPPLY REDUNDANCY MODULE.
19. 24VDC POWER DISTRIBUTION TERMINAL BLOCKS.
20. FIELD TERMINATION BLOCKS.
21. DIGITAL OUTPUT ISOLATION RELAYS.
22. PHOENIX CONTACT ANALOG ISOLATORS – SIMILAR TO P/N: 2864406.

ORTHO PHOSPHATE PLC CONTROL PANEL LAYOUT

NO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

REV. #	DATE	REVISIONS
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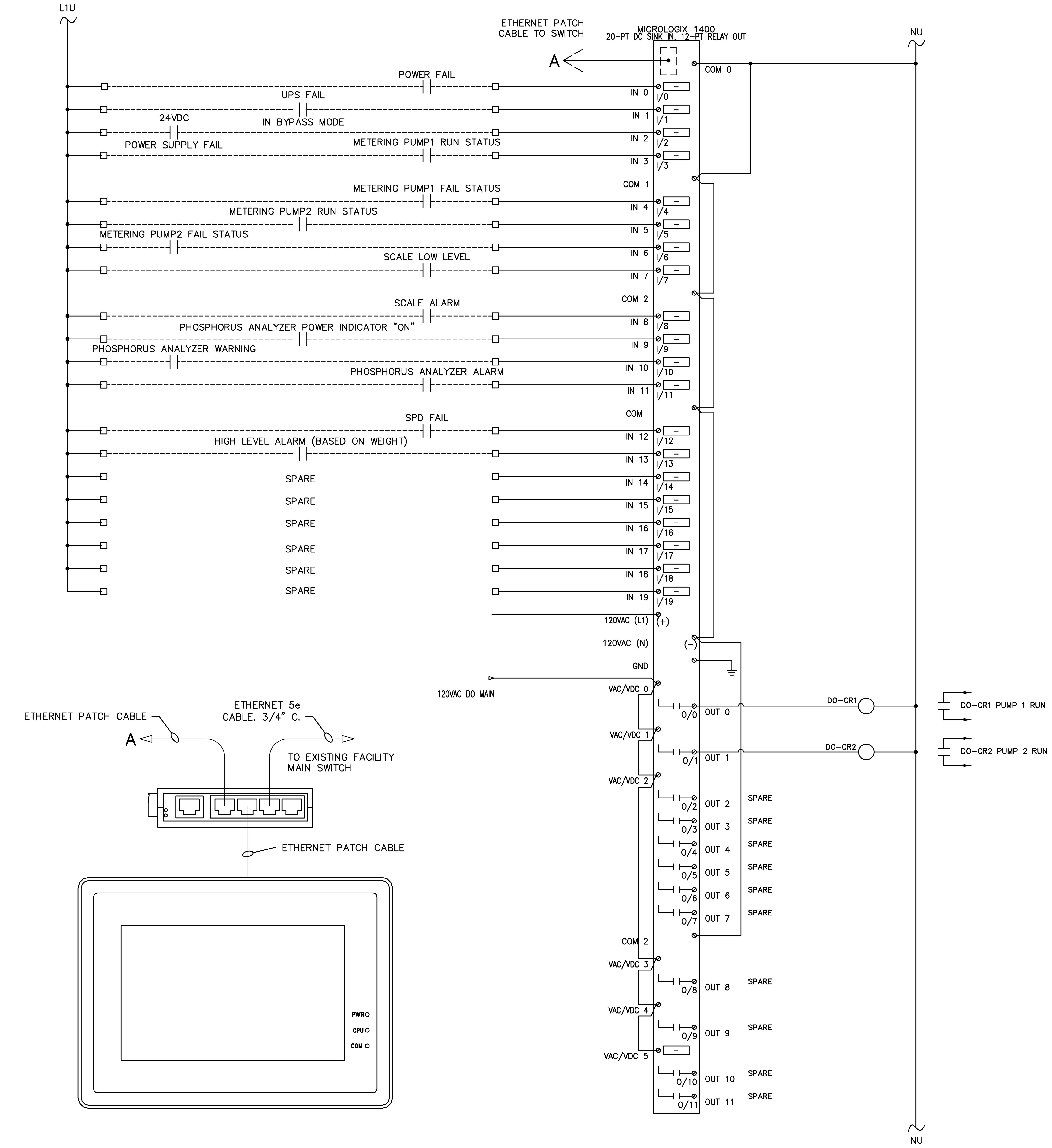
ERICK SMITH REGISTERED NO PE10200104 STATE OF INDIANA PROFESSIONAL ENGINEER

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143

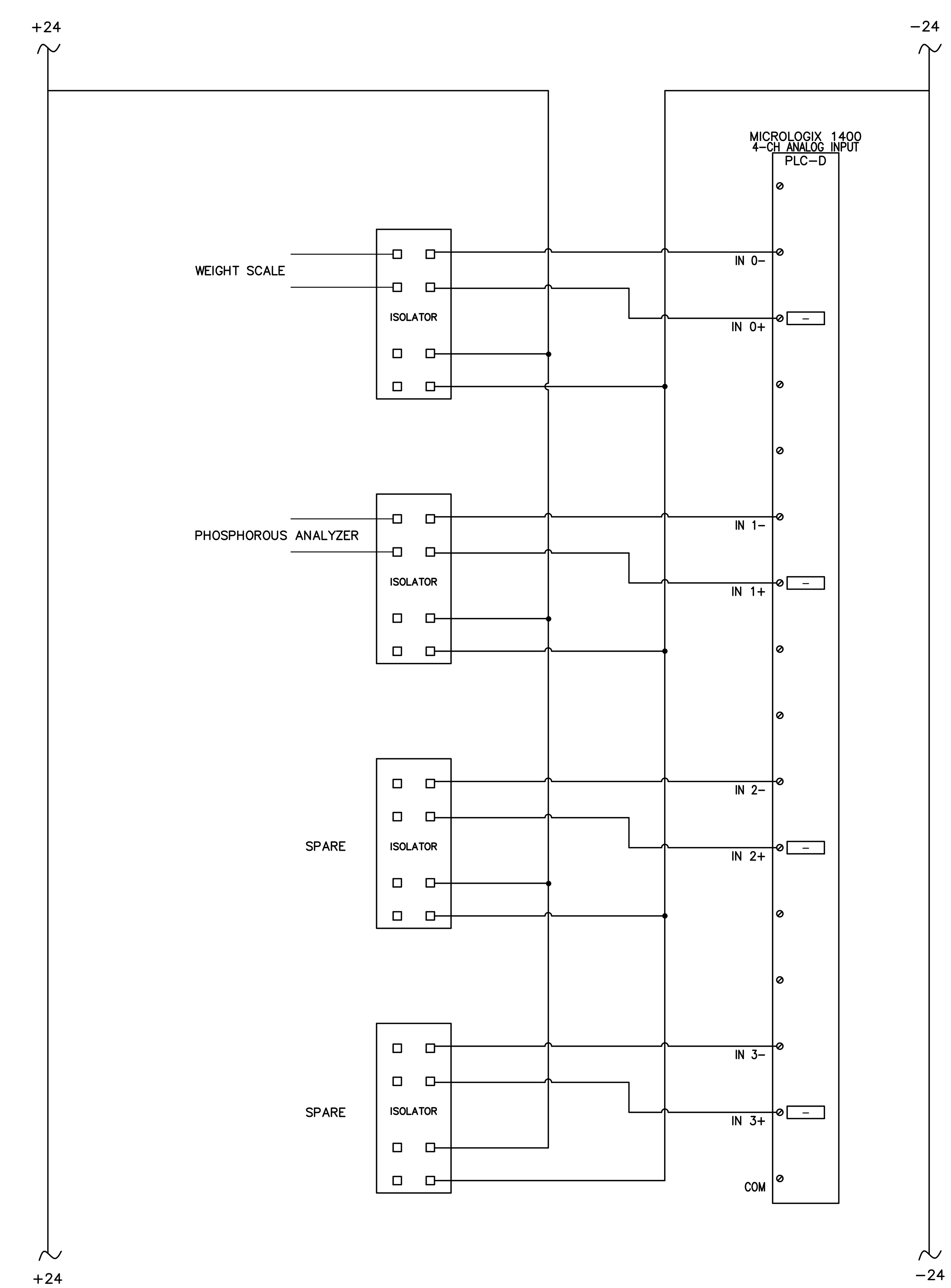
FILE NAME: CHEMICAL FEED BUILDING ELECTRICAL PLAN
DATE: MAY 10, 2018
DESIGNED BY: ES, JR
DRAWN BY: JR
SCALE: AS NOTED
SHEET E3



DIGITAL INPUT/OUTPUT BASE WIRING

SCOPE OF WORK NOTES:

THE PANEL LAYOUT SHOWN IS INTENDED TO ESTABLISH THE SCOPE OF WORK AND EXPECTATIONS. FINAL LAYOUT AND DETAILS SHALL BE THE RESPONSIBILITY OF THE MOTOR CONTROL PANEL FABRICATOR. SUBMIT SHOP DRAWINGS FOR REVIEW.



ANALOG INPUT MODULE 1 WIRING DETAIL

ORTHO PHOSPHATE PLC CONTROL PANEL LAYOUT

NO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

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ERICK SMITH
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INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143

FILE NAME: CHEMICAL FEED BUILDING NEW PLC WIRING DETAILS
DATE: MAY 10, 2018
DESIGNED BY: ES, JR
DRAWN BY: JR
SCALE: AS NOTED
SHEET E4

FAN SCHEDULE

MARK	MODEL NUMBER	LOCATION	SERVING	DESIGN AIRFLOW (CFM)	FAN RPM	E.S.P. (IN. H2O)	SOUND (SONES)	DRIVE TYPE	ELECTRICAL DATA: MOTOR HP	ELECTRICAL DATA: MOTOR VOLTS	ELECTRICAL DATA: MOTOR PHASE	ELECTRICAL DATA: STARTER/VFD	ELECTRICAL DATA: DISCONNECT	CONTROL	ACCESSORIES	MARK
EF-1	SQ-60-D	ABOVE PH. RM	PHOSPHATE RM	130	1550	0.10	3.9	DIRECT	1/40	115	1	STARTER BY E.C.	BY MFR.	1	1, 7	EF-1

CONTROL:
1. SWITCH
2. EMS
3. SPACE THERMOSTAT
4. OCCUPANCY SENSOR
5. CO SENSOR
6. PRESSURE SENSOR

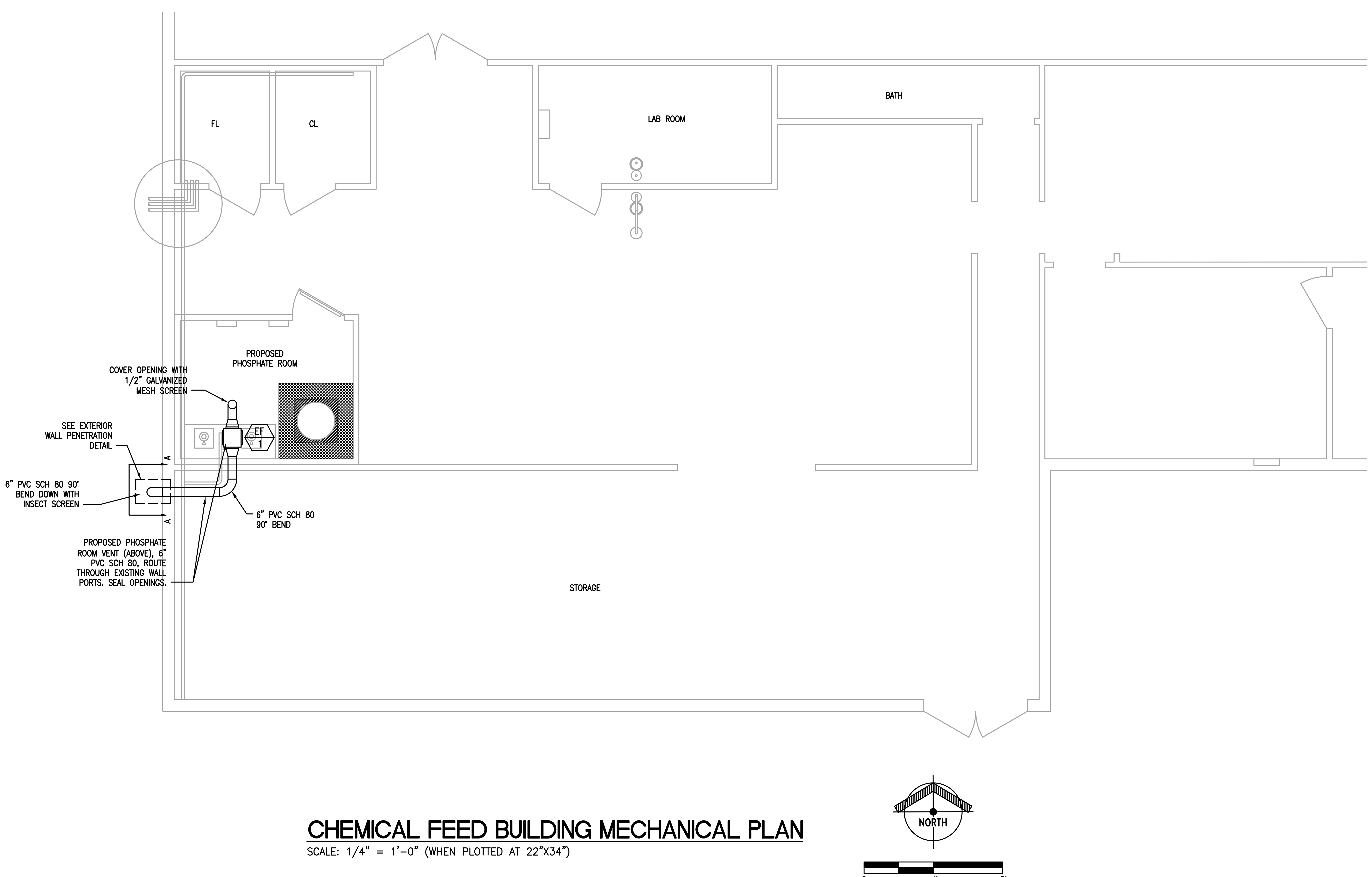
ACCESSORIES / OPTIONS:
1. BACKDRAFT DAMPER
2. THERMOSTAT
3. BIRD SCREEN
4. INSECT SCREEN
5. ROOF CURB
6. WEATHER COVER
7. VIBRATION ISOLATORS
8. EQUIPMENT SUPPORTS
9. CURB MOUNT ROOF JACK
10. WALL COLLAR
11. WALL SHUTTER
12. WALL SHUTTER - MOTORIZED
13. WALL CAP
14. MOTORIZED DAMPER
15. SPEED CONTROLLER
16. 2 SPEED / 1 WINDING
17. FAN GUARD / SCREEN
18. FILTERS
19. COMPANION FLANGES
20. HINGED FRAMES
21. INSULATED HOUSING FOR SOUND CONTROL
22. SPARK / EXPLOSION PROOF
23. CHEMICAL RESISTANCE
24. HIGH TEMPERATURE
25. CURB ADAPTOR

NOTES: 1. BASIS OF DESIGN: GREENHECK

MECHANICAL GENERAL NOTES:

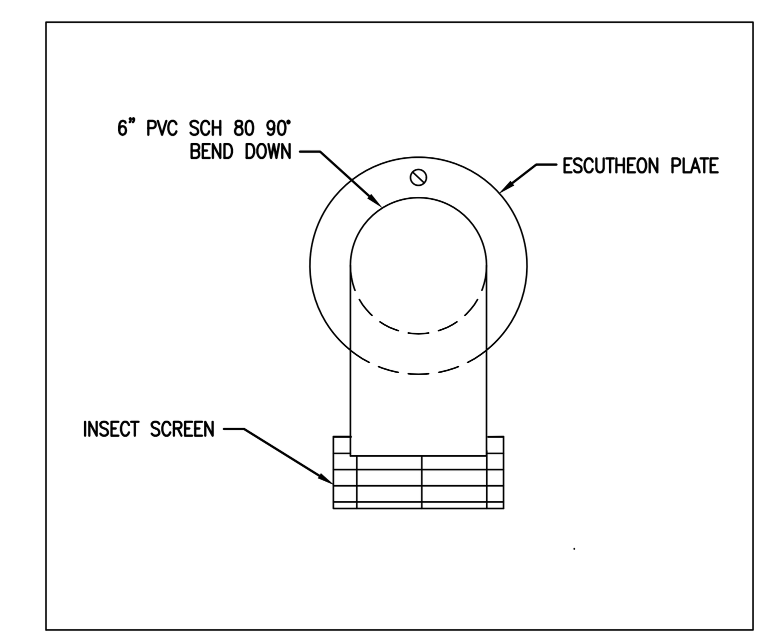
ALL DUCT CONNECTED TO EF-1 SHALL CONFIRM TO ASTM E84, 25150 FLAME/SMOKE SPREAD.

EF-1 SHALL BE IN-LINE EXHAUST FAN EQUIVALENT TO GREENHECK MODEL "SQ" SEE SCHEDULE THIS SHEET. ACCEPTABLE MANUFACTURERS: GREENHECK, CAPTIVE AIR, ACME ENGINEERING, COOK, LOREN COMPNAY, JENNFAN, PENN VENTILATION COMPANIES, OR TWIN CITY FANS.



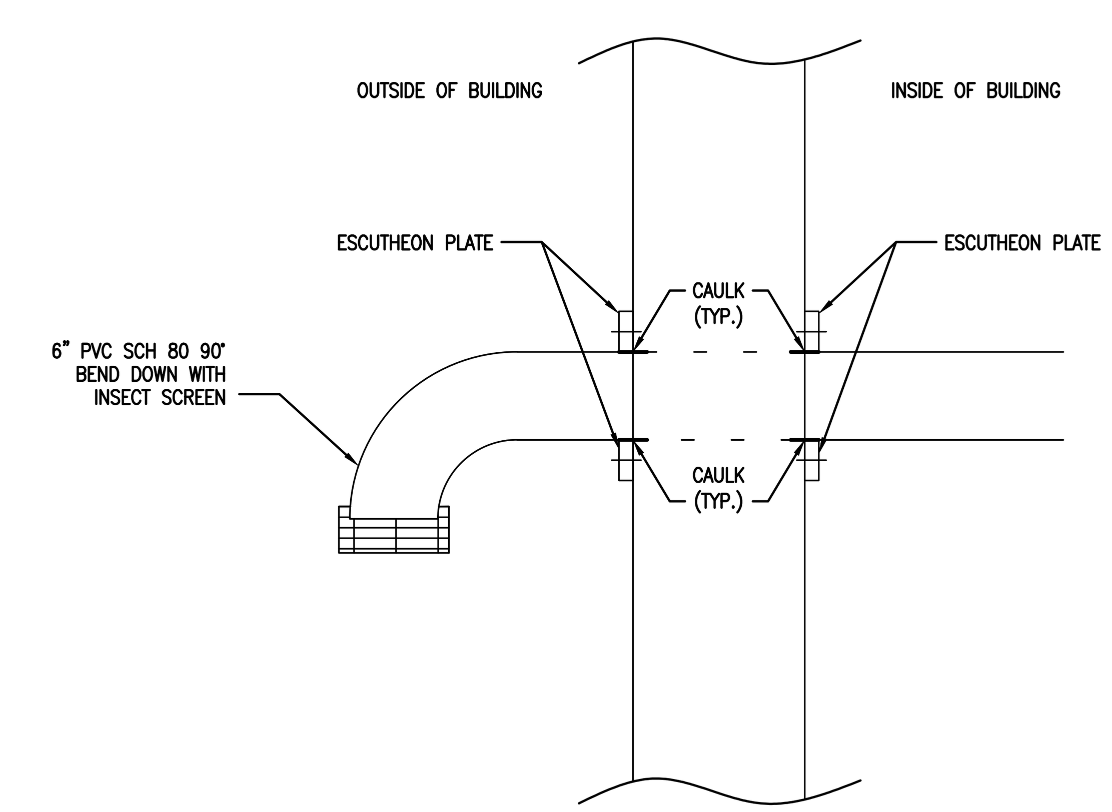
CHEMICAL FEED BUILDING MECHANICAL PLAN

SCALE: 1/4" = 1'-0" (WHEN PLOTTED AT 22"X34")



SECTION A-A

NO SCALE



EXTERIOR WALL PENETRATION DETAIL

NO SCALE

DISTRICT OFFICE: WINCHESTER OPERATIONS

PROJECT: INDIANA AMERICAN WATER ORTHOPHOSPHATE FEED SYSTEM WINCHESTER, INDIANA

WBS R10-01Q1.17-P-0009

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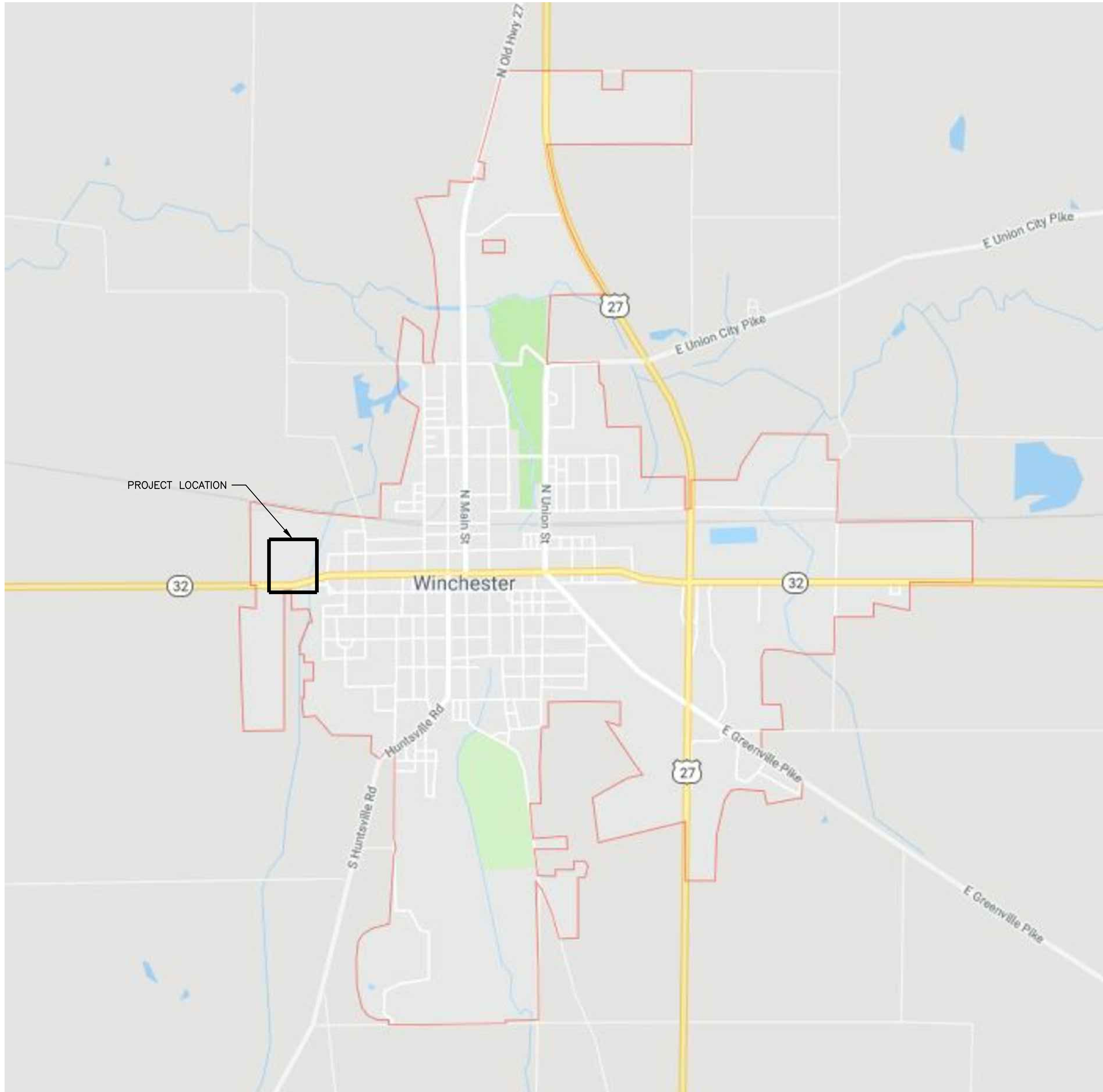
ENGINEERING DEPARTMENT
153 NORTH EMERSON AVENUE
GREENWOOD, IN 46143

FILE NAME: CHEMICAL FEED BUILDING MECHANICAL PLAN
DATE: MAY 10, 2018
DESIGNED BY: ES, VB
DRAWN BY: VB
SCALE: AS NOTED
SHEET: M1



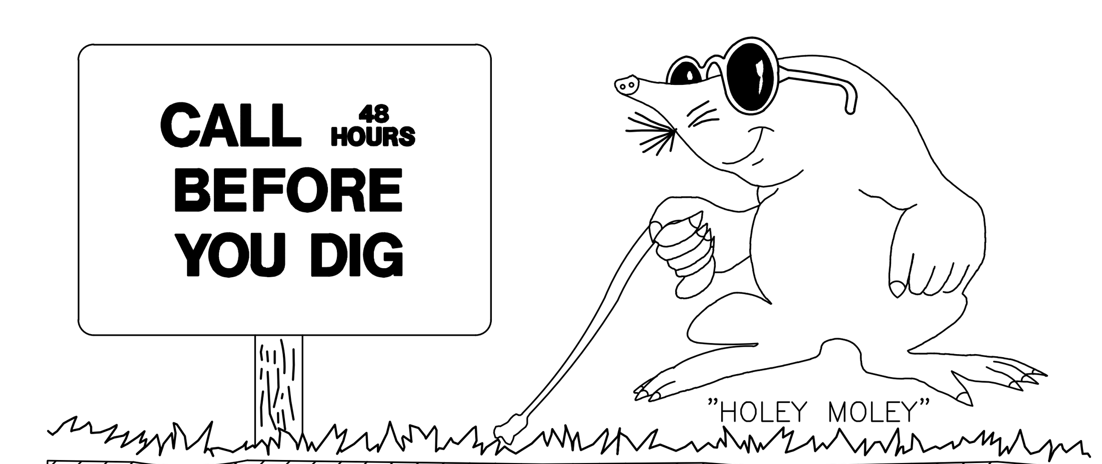
N

LOCATION PLAN

NOT TO SCALE

DRAWING INDEX

SHEET NUMBER	SHEET TITLE
E-1	LOCATION PLAN AND DRAWING INDEX
E-2	OVERALL ELECTRICAL SITE PLAN
E-3	ELECTRIC CONTROL BUILDING ELECTRICAL PLAN – DEMO
E-4A	ELECTRIC CONTROL BUILDING ELECTRICAL PLAN – NEW WORK
E-4B	ELECTRIC CONTROL BUILDING ELECTRICAL PLAN – NEW WORK
E-5	HSP BUILDING ELECTRICAL PLAN – DEMO
E-6	HSP BUILDING ELECTRICAL PLAN – NEW WORK
E-7	OFFICE BUILDING ELECTRICAL PLAN – ALTERNATE #2
E-8	ELECTRICAL ONE-LINE DIAGRAM – DEMO
E-9	ELECTRICAL ONE-LINE – NEW WORK
E-10	ELECTRICAL ONE-LINE – NEW WORK CONTINUED
E-11	ELECTRICAL DETAILS



1-800-382-5544

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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JEREMY E. FARRER
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SDA PROJECT #2019108

INDIANA AMERICAN WATER
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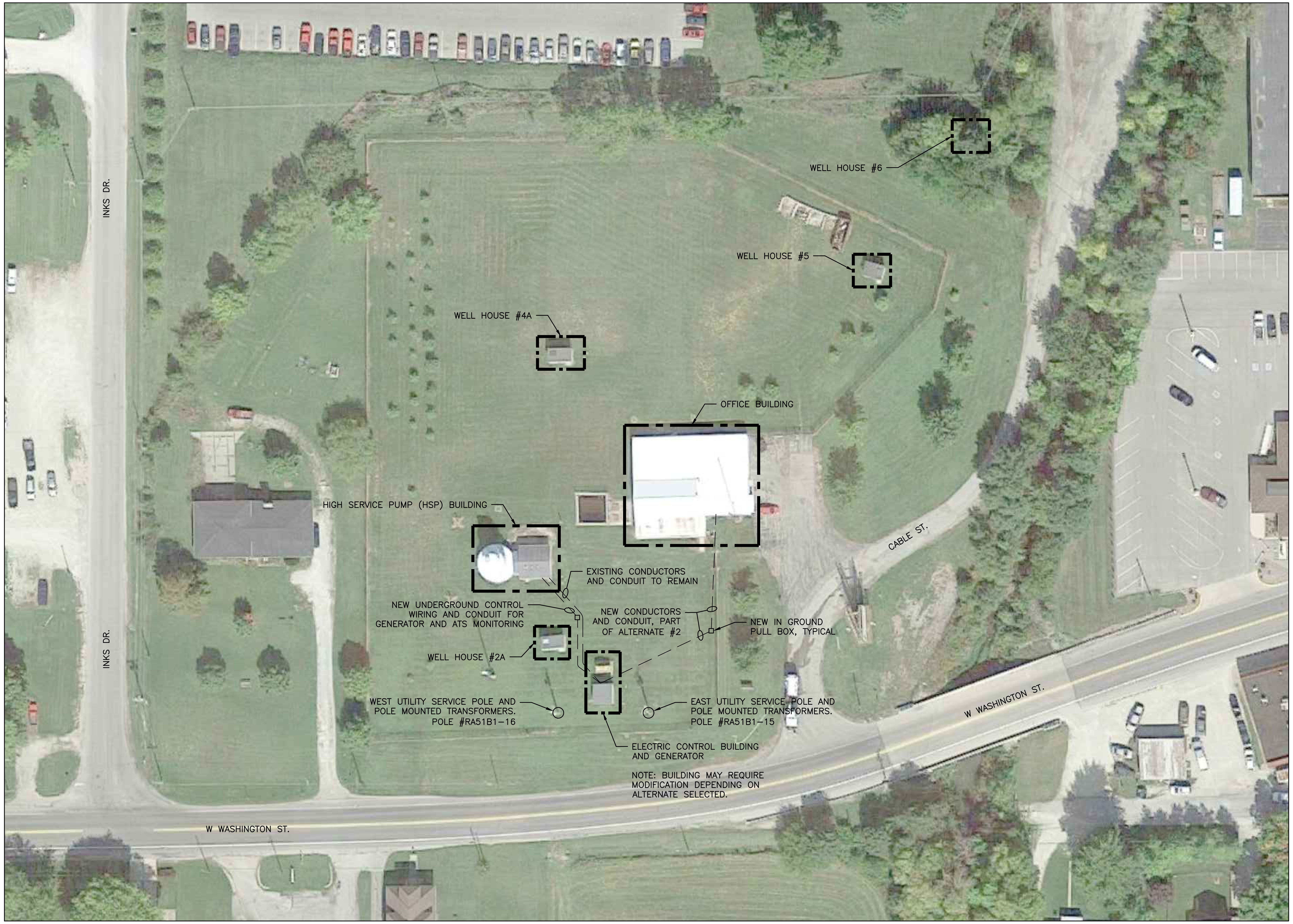
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE
LOCATION PLAN AND DRAWING INDEX

DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET E-1



N

OVERALL ELECTRICAL SITE PLAN

SCALE: 1"=40'-0"

0 40' 80'

GENERAL ELECTRICAL NOTES:

A. LOCATE ALL EXISTING PIPING AND UTILITIES BEFORE INSTALLING UNDERGROUND CONDUITS; PROTECT ALL EXISTING INSTALLATIONS.

B. ALL BELOW GRADE CONDUIT SHALL BE SCH. 80 PVC. ALL TRANSITIONS (90 DEGREE ELBOW) FROM BELOW GRADE TO ABOVE GRADE SHALL BE GALVANIZED RIGID STEEL. ALL ABOVE GRADE CONDUIT SHALL BE RIGID ALUMINUM; INCLUDING INDOORS. COAT ALL RIGID ALUMINUM CONDUITS WHERE IN CONTACT WITH EARTH OR CONCRETE WITH OXIDATION RESISTANT COATING.

C. PROVIDE PUTTY TYPE DUCT SEAL FOR ALL UNDERGROUND CONDUIT OPENINGS IN OUTDOOR EQUIPMENT.

D. MAINTAIN 3' SEPARATION BETWEEN 480V POWER CONDUITS AND LOW VOLTAGE (NETWORK, 24V DC CONTROL, OR INTRINSICALLY SAFE CIRCUIT) CONDUITS. MAINTAIN 1' SEPARATION BETWEEN 120V POWER CONDUITS AND LOW VOLTAGE (NETWORK, 24V DC CONTROL, OR INTRINSICALLY SAFE CIRCUIT) CONDUITS.

E. WHERE CONDUIT CROSSES UNDER EXISTING OR FUTURE PAVEMENT, CONDUIT SHALL BE GALVANIZED RIGID STEEL. SAW CUT AND REPAIR EXISTING PAVEMENT AS NECESSARY.

F. ANTI-CORROSION SUBSTANCE SHALL BE USED AS A BARRIER BETWEEN ALL DISSIMILAR METALS TO PREVENT CORROSION. USE IDEAL NOALOX ANTI-OXIDANT COMPOUND OR APPROVED EQUAL.

G. WIRE AND CONDUIT ROUTES AND ELECTRICAL EQUIPMENT LOCATIONS ARE APPROXIMATE, FIELD VERIFY EXACT INSTALLATIONS.

H. ALL WIRING, CONDUIT, AND TERMINATIONS FURNISHED AND INSTALLED BY CONTRACTOR.

I. SEE ONE-LINE DIAGRAM FOR WIRING AND CONDUIT REQUIREMENTS.

J. CONTRACTOR SHALL COORDINATE NEW SERVICE(S) AND TRANSFORMER(S) WITH UTILITY.

K. EXISTING CONDITION INFORMATION PROVIDED ON THIS DRAWING WAS OBTAINED BY SITE VISIT OBSERVATIONS AND FROM ORIGINAL CONSTRUCTION DRAWINGS WHEN AVAILABLE. CONTRACTOR SHALL VERIFY THE SCOPE OF WORK BY SITE INSPECTION PRIOR TO BIDDING. THIS DRAWING SHALL BE CONSIDERED INCOMPLETE AND USED FOR REFERENCE ONLY.

L. CONTRACTOR SHALL VERIFY ALL EXISTING POWER DISTRIBUTION AND CIRCUIT SOURCES PRIOR TO WORK.

M. ROOMS WITH ELECTRICAL EQUIPMENT RATED 800A OR MORE SHALL HAVE PANIC HARDWARE INSTALLED ON DOORS INTENDED FOR EGRESS.

N. RELABEL ALL EQUIPMENT THAT HAS ITS VOLTAGE CHANGED.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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INDIANA AMERICAN WATER
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153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE
OVERALL ELECTRICAL SITE PLAN

DATE:	11/15/2019
DESIGNED BY:	JEF
DRAWN BY:	TEAM
SCALES:	AS NOTED
SHEET	E-2

1

EXISTING 120/240V PANELBOARD TO BE GUTTED AND USED AS SPLICE BOX.

EXISTING WIREWAY TO REMAIN AND BE USED FOR SPLICES.

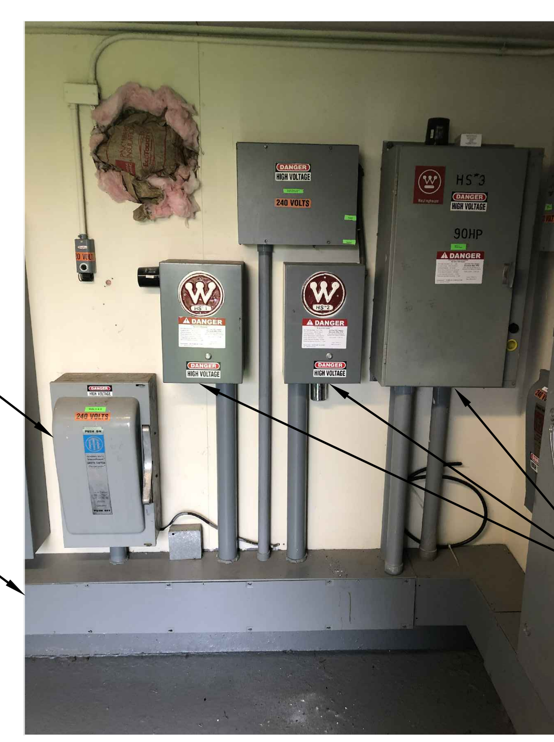
EXISTING WIREWAY TO REMAIN AND BE USED FOR SPLICES.

NORTHWEST CORNER IMAGE

NOT TO SCALE

EXISTING WELL 5/6 DISCONNECT TO BE REMOVED.

EXISTING WIREWAY TO REMAIN AND BE USED FOR SPLICES.

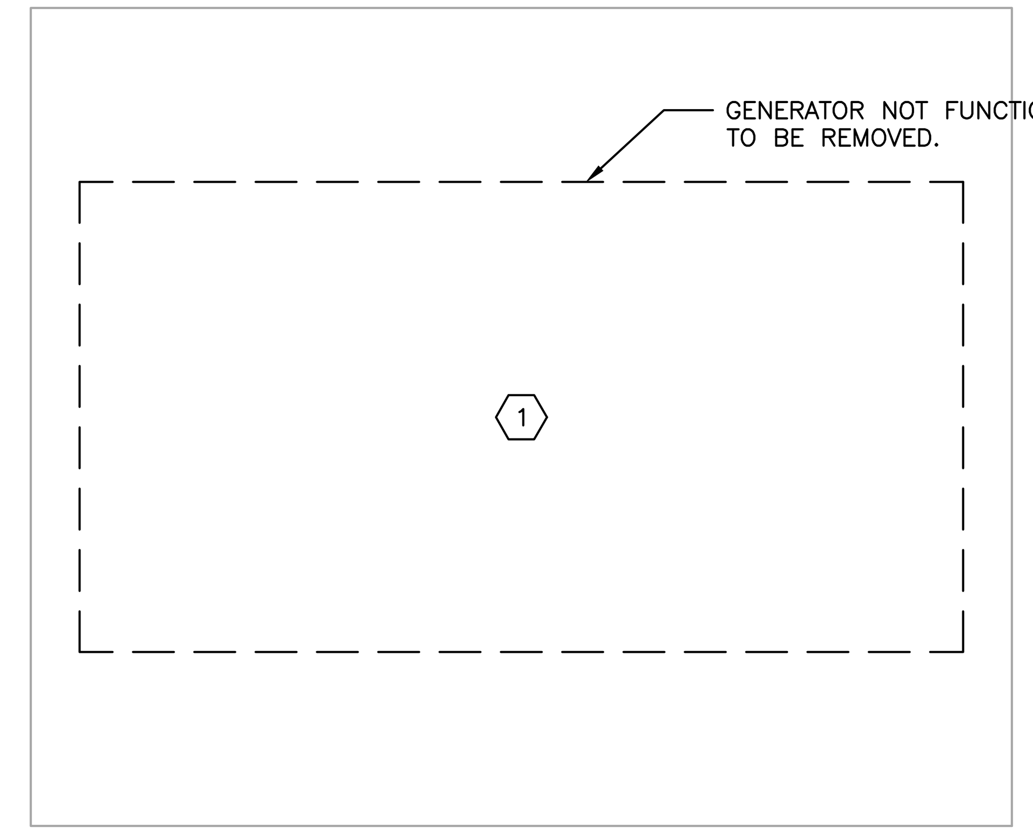


EXISTING HIGH SERVICE PUMP MOTOR STARTERS TO BE REMOVED.

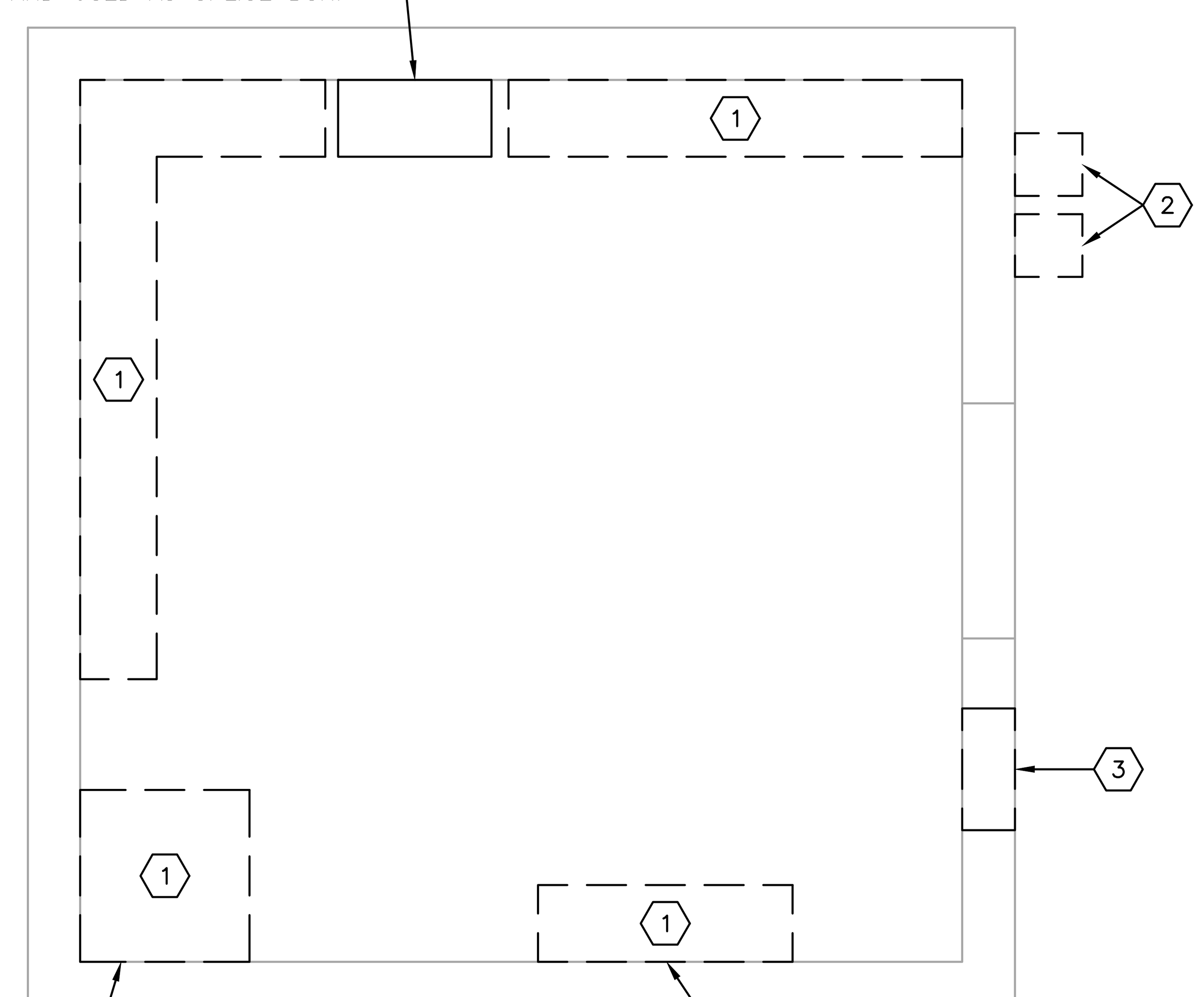
PARTIAL WEST WALL IMAGE

NOT TO SCALE

GENERATOR NOT FUNCTIONAL, TO BE REMOVED.



EXISTING 120/240V PANELBOARD TO BE GUTTED AND USED AS SPLICE BOX.



ELECTRICAL EQUIPMENT AND CAGE TO BE REMOVED FIRST.

EXISTING UTILITY/GENERATOR MANUAL TRANSFER SWITCH (MTS) TO BE REMOVED FIRST.

N

ELECTRIC CONTROL BUILDING ELECTRICAL PLAN - DEMO

SCALE: 1/2"=1'-0"

0 1' 2' 4'

GENERAL ELECTRICAL DEMO NOTES:

A. WHERE POSSIBLE, COMPLETE NEW CONSTRUCTION BEFORE DEMOLITION OF EXISTING EQUIPMENT TO MINIMIZE DOWNTIME. COORDINATE EQUIPMENT OUTAGES WITH OWNER.

B. DISCONNECT AND COMPLETELY REMOVE ALL CONDUIT, WIRE, BOXES, ETC. TO BE RENDERED OBSOLETE BY THIS WORK, UNLESS OTHERWISE NOTED.

C. REMOVE OBSOLETE WIRE BACK TO ITS SOURCE, CUT OFF CONDUIT FLUSH WITH WALL, FLOOR, OR CEILING. WHERE CONDUIT IS CUT OFF IN A VISIBLE LOCATION, PATCH AND PAINT TO MATCH EXISTING SURFACE.

D. REMOVE FROM THE SITE AND DISPOSE OF ALL REMOVED ELECTRICAL AND/OR OTHER MATERIALS UNLESS OTHERWISE NOTED. OWNER HAS FIRST RIGHT OF REFUSAL ON ALL REMOVED EQUIPMENT AND MATERIALS.

E. CONTRACTOR SHALL TAKE NECESSARY MEANS TO PROTECT AND SUPPORT CABLES TO PREVENT DAMAGE DURING CONSTRUCTION. PROTECT EXISTING SYSTEMS AND CABLING DURING CONSTRUCTION.

F. MAINTAIN CONTINUITY OF EXISTING CIRCUITS AFFECTED BY DEMOLITION WORK. VERIFY THAT EQUIPMENT TO REMAIN IS FUNCTIONAL AFTER DEMOLITION.

ELECTRICAL KEYED NOTES:

1. EXISTING ELECTRICAL EQUIPMENT AND ASSOCIATED WIRING AND CONDUIT IN THIS AREA TO BE REMOVED.

2. EXISTING ELECTRIC UTILITY METER AND METER BASES TO BE REMOVED.

3. EXISTING AC UNIT TO BE REMOVED AND WALL TO BE SEALED TO MATCH THE REST OF THE BUILDING.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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1	12/09/19	ADDENDUM #1

JEREMY E. FARRER REGISTERED No. PE11500293 STATE OF INDIANA PROFESSIONAL ENGINEER

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SDA PROJECT #2019108

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE
ELECTRIC CONTROL BUILDING ELECTRICAL PLAN - DEMO

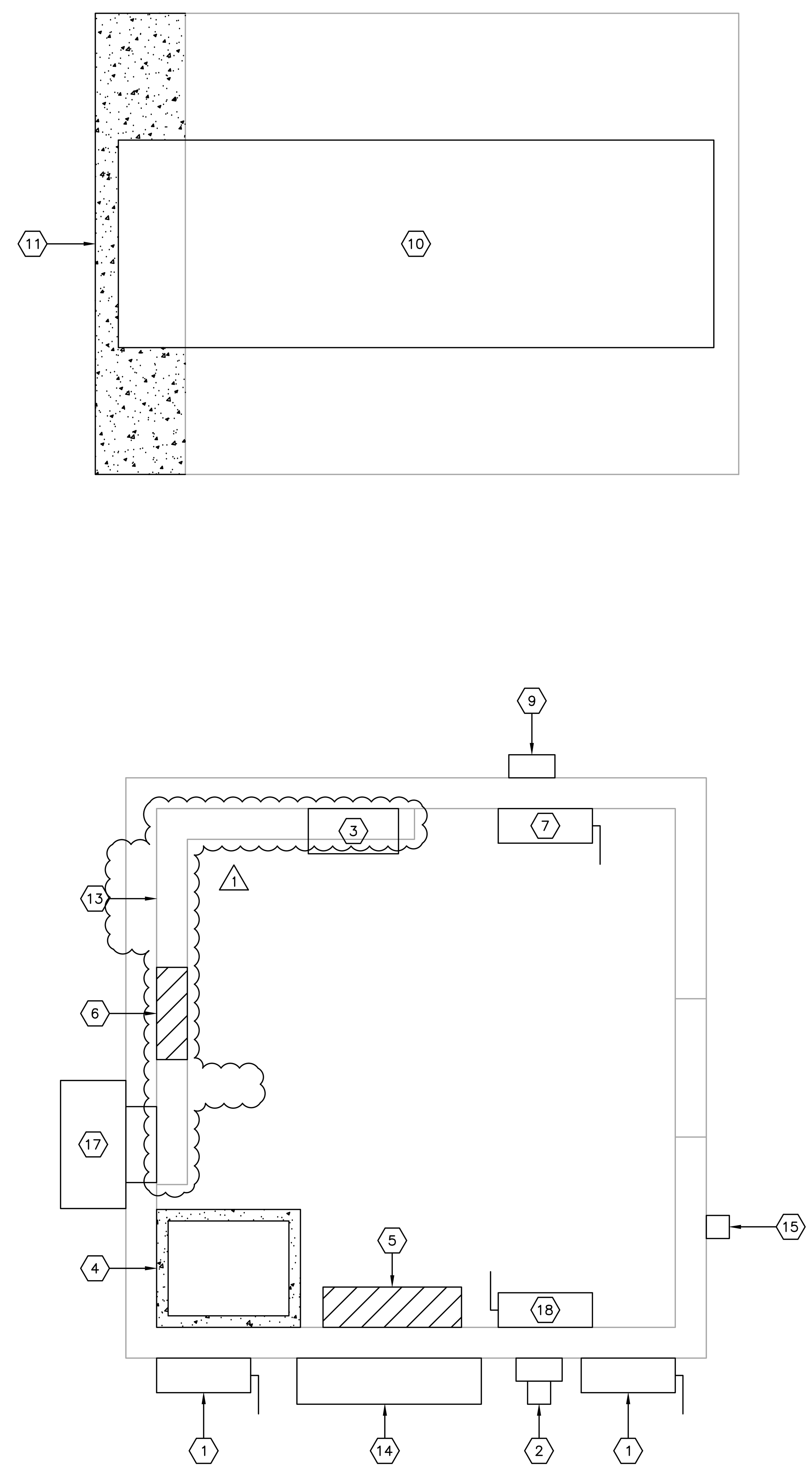
DATE: 11/15/2019

DESIGNED BY: JEF

DRAWN BY: TEAM

SCALES: AS NOTED

SHEET E-3



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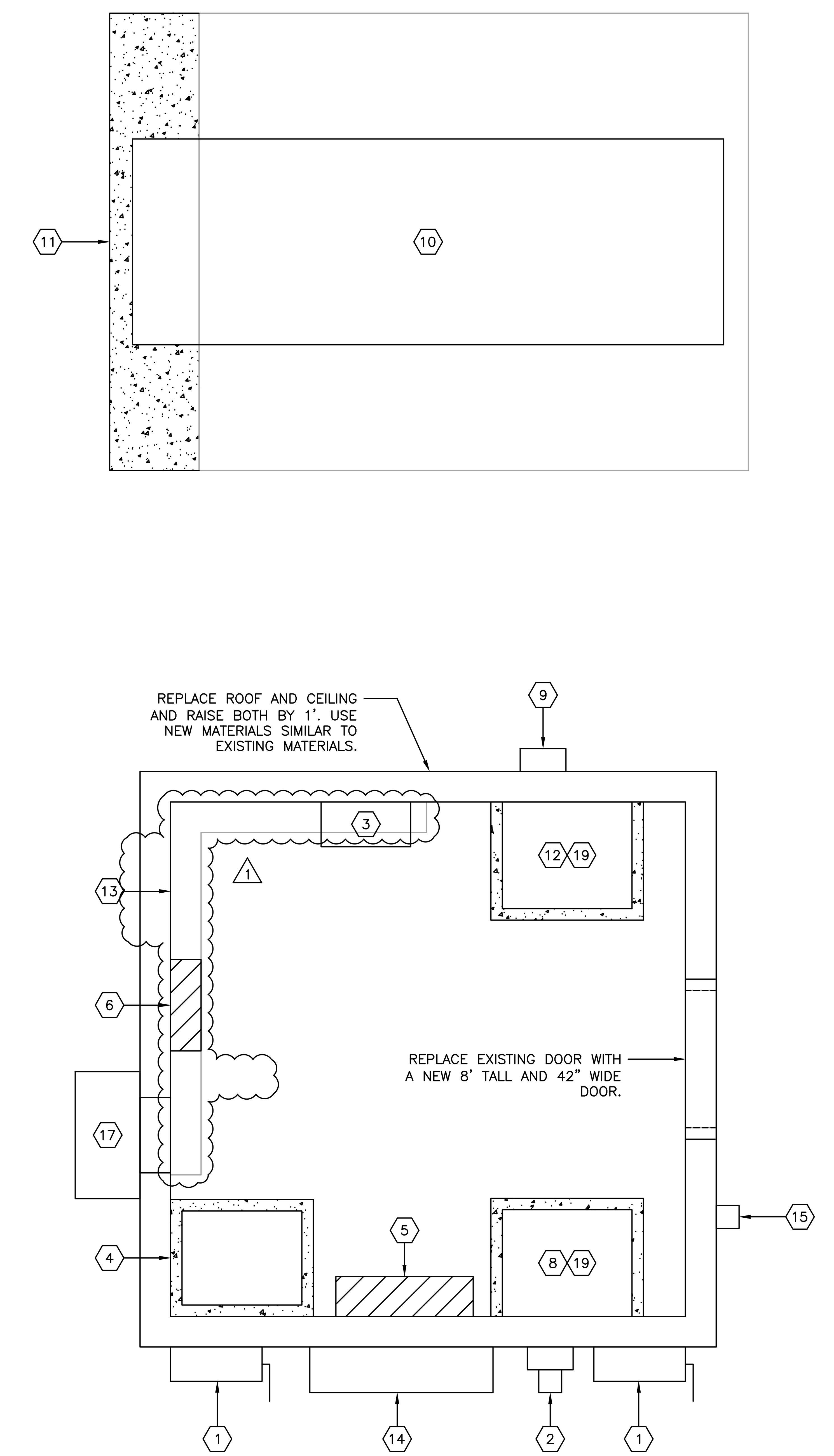
ELECTRIC CONTROL BUILDING
ELECTRICAL PLAN - NEW WORK - BASE BID

SCALE: 1/2"=1'-0"

0 1' 2' 4'



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ELECTRIC CONTROL BUILDING
ELECTRICAL PLAN - NEW WORK - ALTERNATE #3

SCALE: 1/2"=1'-0"

0 1' 2' 4'

ELECTRICAL KEYED NOTES:

1. MAIN UTILITY DISCONNECT.
2. NEW METER AND METER BASE.
3. EXISTING 'BREAKER PANEL' TO BE USED AS A SPLICE BOX.
4. TRANSFORMER, 'T1' WITH 3" CONCRETE HOUSE KEEPING PAD.
5. PANEL, 'MDP'.
6. PANEL, 'L1'.
7. GENERATOR TRANSFER SWITCH, 'GEN MTS'.
8. UTILITY TRANSFER SWITCH, 'UTILITY ATS' WITH 3" CONCRETE HOUSE KEEPING PAD.
9. GENERATOR RECEPTACLE, BASE BID.
10. GENERATOR, ALTERNATE #1.
11. EXTEND EXISTING CONCRETE PAD 6" BEYOND THE GENERATOR AS REQUIRED. COORDINATE WITH FINAL APPROVED GENERATOR SHOP DRAWINGS, ALTERNATE #1.
12. GENERATOR TRANSFER SWITCH, 'GEN ATS'.
13. EXISTING WIREWAY TO REMAIN. 1
14. CT/PT CABINET.
15. GENERATOR E-STOP BUTTON, ALTERNATE #1.
16. NOT USED. 1
17. EXTERIOR WALL MOUNT HVAC UNIT, BARD 1.5 TON PTAC WITH 6KW HEAT AND ALUMINUM EXTERIOR OR APPROVED EQUAL.
18. UTILITY TRANSFER SWITCH, 'UTILITY MTS'.
19. ATS WITH BYPASS ISOLATION SWITCH.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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1	12/09/19	ADDENDUM #1

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153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE: ELECTRIC CONTROL BUILDING ELECTRICAL PLAN - NEW WORK

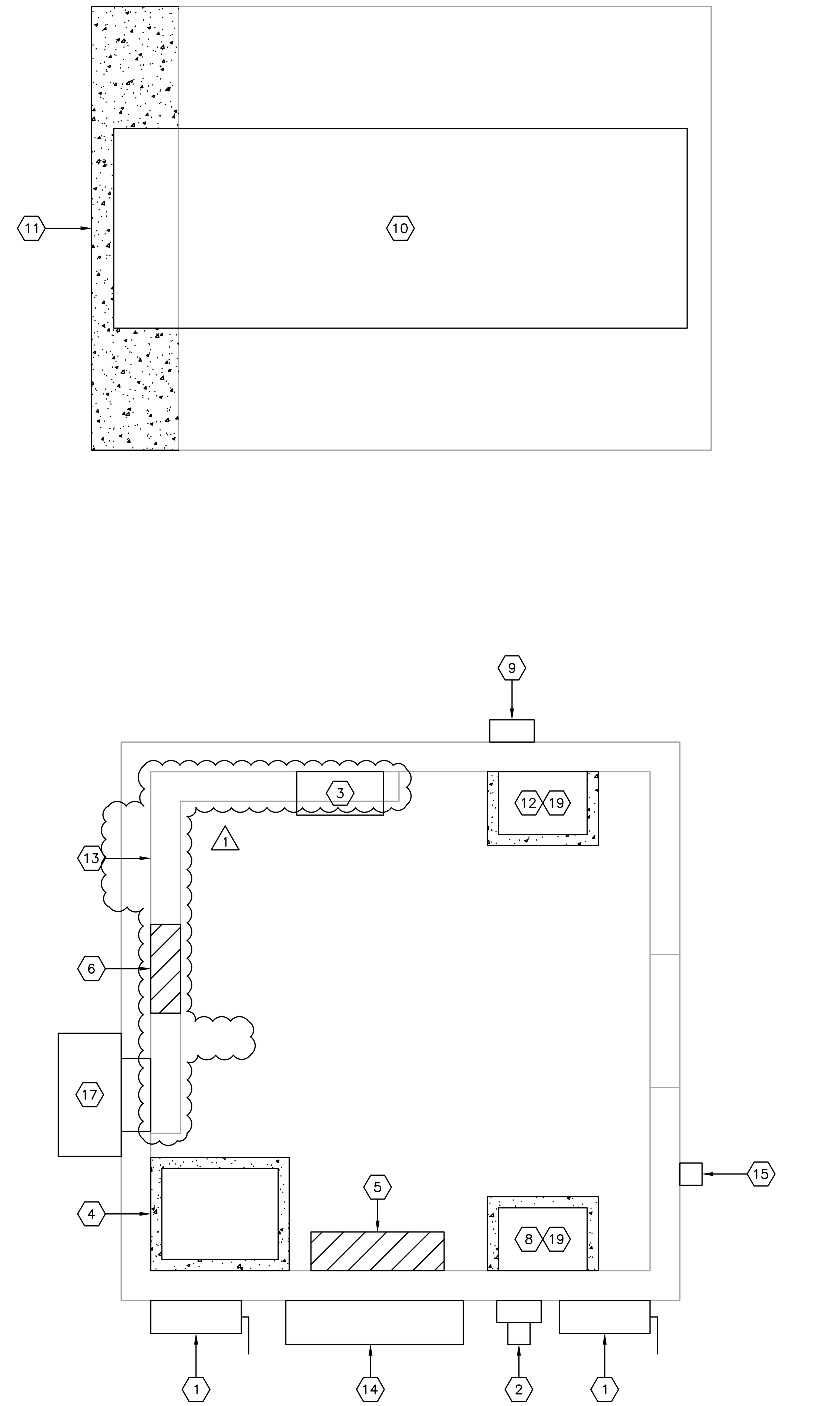
DATE: 11/15/2019

DESIGNED BY: JEF

DRAWN BY: TEAM

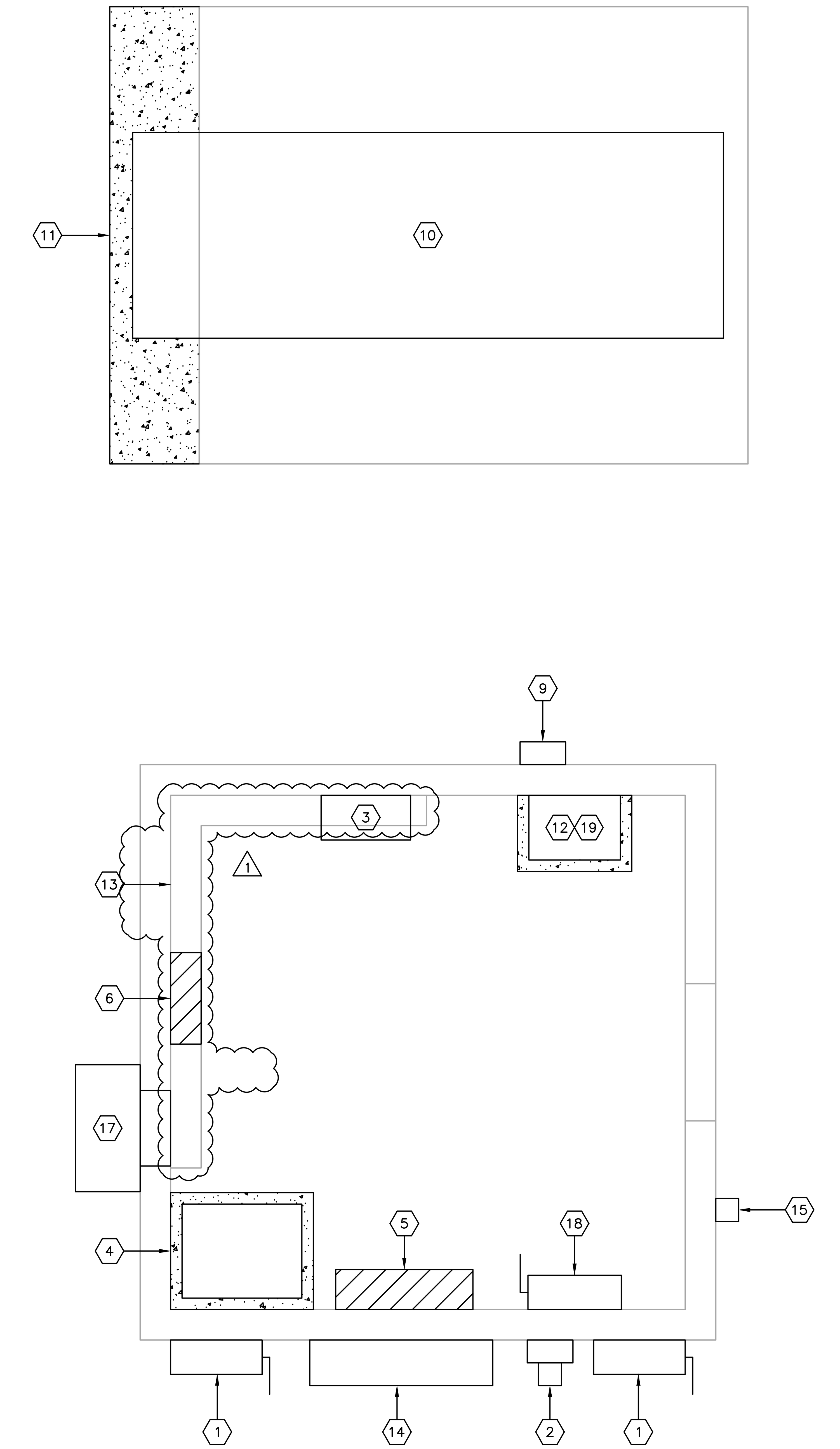
SCALES: AS NOTED

SHEET: E-4A



ELECTRIC CONTROL BUILDING
ELECTRICAL PLAN - NEW WORK - ALTERNATE #4

SCALE: 1/2"=1'-0"



ELECTRIC CONTROL BUILDING
ELECTRICAL PLAN - NEW WORK - ALTERNATE #5

SCALE: 1/2"=1'-0"

ELECTRICAL KEYED NOTES:

1. MAIN UTILITY DISCONNECT.
2. NEW METER AND METER BASE.
3. EXISTING 'BREAKER PANEL' TO BE USED AS A SPLICE BOX.
4. TRANSFORMER, 'T1' WITH 3" CONCRETE HOUSE KEEPING PAD.
5. PANEL, 'MDP'.
6. PANEL, 'L1'.
7. NOT USED.
8. UTILITY TRANSFER SWITCH, 'UTILITY ATS' WITH 3" CONCRETE HOUSE KEEPING PAD.
9. GENERATOR RECEPTACLE, BASE BID.
10. GENERATOR, ALTERNATE #1.
11. EXTEND EXISTING CONCRETE PAD 6" BEYOND THE GENERATOR AS REQUIRED. COORDINATE WITH FINAL APPROVED GENERATOR SHOP DRAWINGS, ALTERNATE #1.
12. GENERATOR TRANSFER SWITCH, 'GEN ATS' WITH 3" CONCRETE HOUSE KEEPING PAD.
13. EXISTING WIREWAY TO REMAIN. 1
14. CT/PT CABINET.
15. GENERATOR E-STOP BUTTON, ALTERNATE #1.
16. NOT USED. 1
17. EXTERIOR WALL MOUNT HVAC UNIT, BARD 1.5 TON PTAC WITH 6KW HEAT AND ALUMINUM EXTERIOR OR APPROVED EQUAL.
18. UTILITY TRANSFER SWITCH, 'UTILITY MTS'.
19. ATS WITHOUT BYPASS ISOLATION SWITCH.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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1	12/09/19	ADDENDUM #1

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SDA PROJECT #2019108

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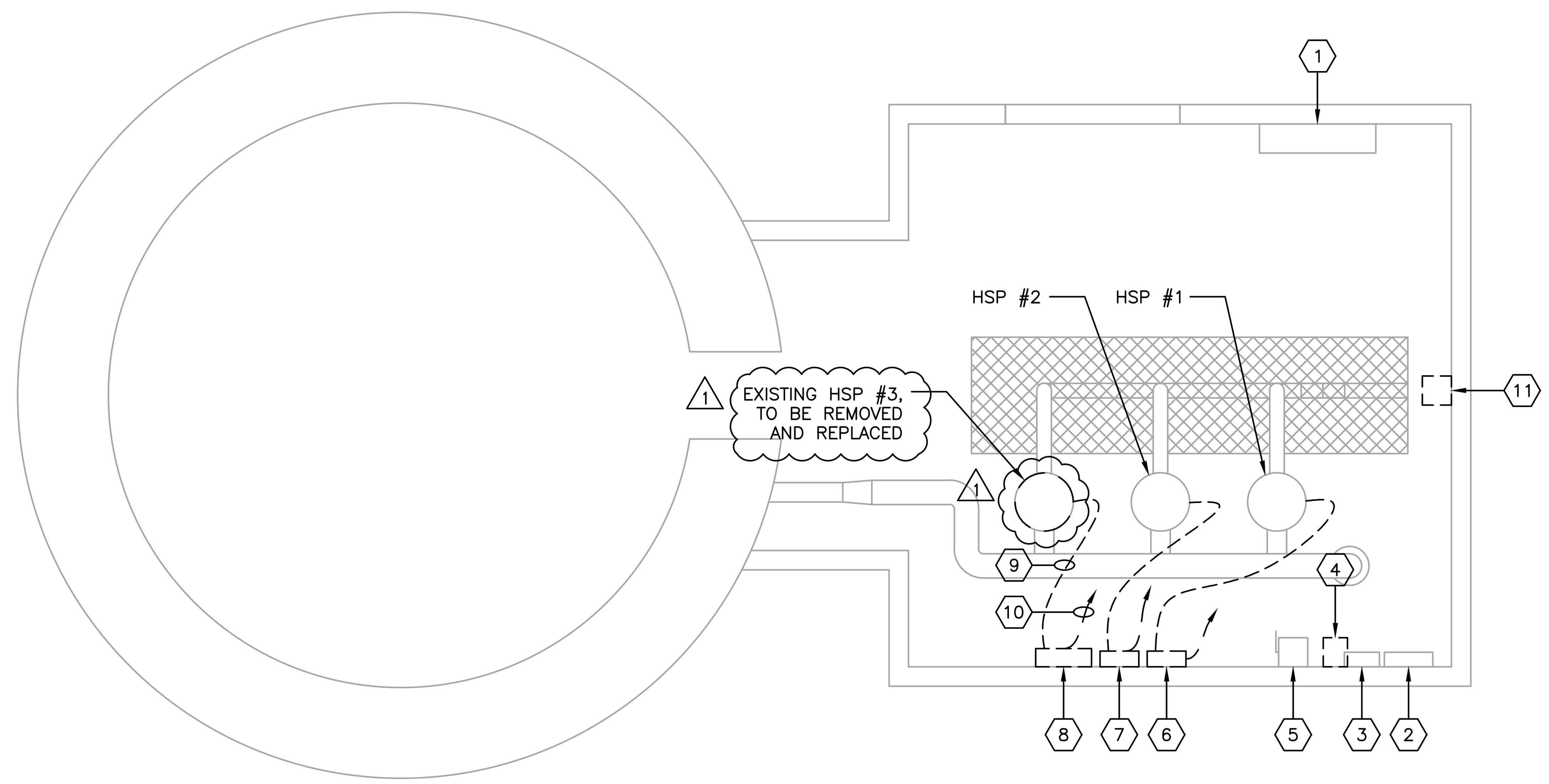
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE
ELECTRIC CONTROL BUILDING
ELECTRICAL PLAN - NEW WORK

DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET E-4B



N

HSP BUILDING ELECTRICAL PLAN - DEMO

SCALE: 1/4"=1'-0"

0 2' 4' 8'

GENERAL ELECTRICAL DEMO NOTES:

A. WHERE POSSIBLE, COMPLETE NEW CONSTRUCTION BEFORE DEMOLITION OF EXISTING EQUIPMENT TO MINIMIZE DOWNTIME. COORDINATE EQUIPMENT OUTAGES WITH OWNER.

B. DISCONNECT AND COMPLETELY REMOVE ALL CONDUIT, WIRE, BOXES, ETC. TO BE RENDERED OBSOLETE BY THIS WORK, UNLESS OTHERWISE NOTED.

C. REMOVE OBSOLETE WIRE BACK TO ITS SOURCE, CUT OFF CONDUIT FLUSH WITH WALL, FLOOR, OR CEILING. WHERE CONDUIT IS CUT OFF IN A VISIBLE LOCATION, PATCH AND PAINT TO MATCH EXISTING SURFACE.

D. REMOVE FROM THE SITE AND DISPOSE OF ALL REMOVED ELECTRICAL AND/OR OTHER MATERIALS UNLESS OTHERWISE NOTED. OWNER HAS FIRST RIGHT OF REFUSAL ON ALL REMOVED EQUIPMENT AND MATERIALS.

E. CONTRACTOR SHALL TAKE NECESSARY MEANS TO PROTECT AND SUPPORT CABLES TO PREVENT DAMAGE DURING CONSTRUCTION. PROTECT EXISTING SYSTEMS AND CABLING DURING CONSTRUCTION.

F. MAINTAIN CONTINUITY OF EXISTING CIRCUITS AFFECTED BY DEMOLITION WORK. VERIFY THAT EQUIPMENT TO REMAIN IS FUNCTIONAL AFTER DEMOLITION.

ELECTRICAL KEYED NOTES:

1. EXISTING PLC CONTROL PANEL.
2. EXISTING 'PANEL 1'. 120/240V, 3PH, 4W.
3. EXISTING 'PANEL 2'. 120/240V, 1PH, 3W.
4. EXISTING 1PH 240V PRIMARY, 1PH 120/240V SECONDARY TRANSFORMER TO BE REMOVED.
5. EXISTING AERATOR MOTOR STARTER DISCONNECT SWITCH.
6. EXISTING 200A DISCONNECT SWITCH FOR HSP #1 TO BE REMOVED.
7. EXISTING 200A DISCONNECT SWITCH FOR HSP #2 TO BE REMOVED.
8. EXISTING 400A DISCONNECT SWITCH FOR HSP #3 TO BE REMOVED.
9. DISCONNECT AND REMOVE CONDUCTORS BETWEEN PUMP AND DISCONNECT SWITCH. TYPICAL FOR EACH PUMP.
10. DISCONNECT AND REMOVE CONDUCTORS BETWEEN DISCONNECT SWITCH AND POWER SOURCE. TYPICAL FOR EACH PUMP DISCONNECT SWITCH.
11. EXISTING UNIT HEATER TO BE DISCONNECTED AND RELOCATED.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

REV. #	DATE	REVISIONS
7		
6		
5		
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3		
2		
1	12/09/19	ADDENDUM #1

JEREMY E. FARRER REGISTERED No. PE11500293 STATE OF INDIANA PROFESSIONAL ENGINEER

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SDA PROJECT #2019108

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE: HSP BUILDING ELECTRICAL PLAN - DEMO

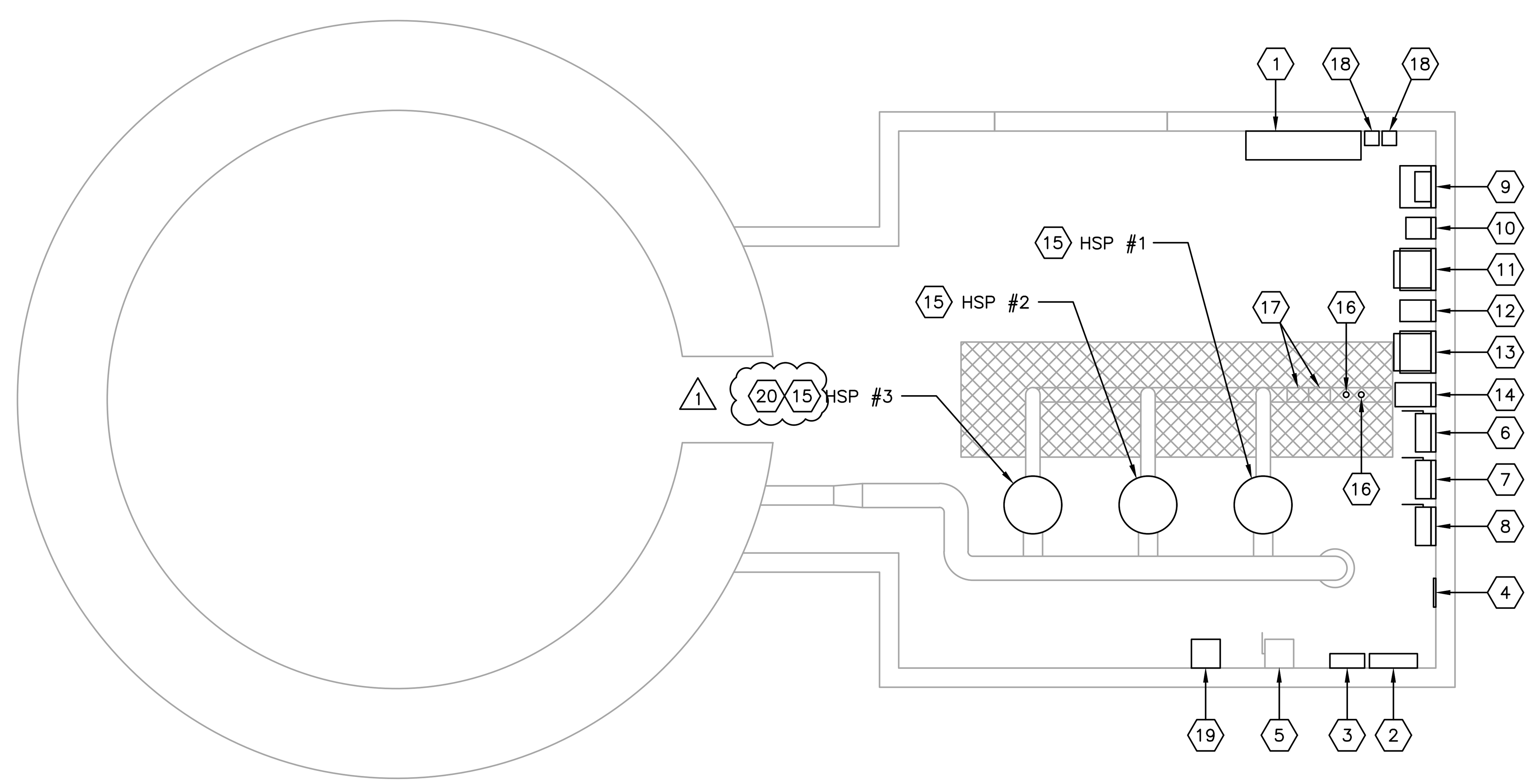
DATE: 11/15/2019

DESIGNED BY: JEF

DRAWN BY: TEAM

SCALES: AS NOTED

SHEET: E-5



N

HSP BUILDING ELECTRICAL PLAN - NEW WORK

SCALE: 1/4"=1'-0"

0 2' 4' 8'

GENERAL ELECTRICAL NOTES:

A. FURNISH AND INSTALL STAINLESS STEEL UNISTRUT FOR MOUNTING NEW ELECTRICAL EQUIPMENT TO WALLS.

ELECTRICAL KEYED NOTES:

1. EXISTING CONTROL PANEL TO BE MODIFIED TO INCORPORATE NEW HSP CONTROL.
2. EXISTING 'PANEL 1'. 120/240V, 3PH, 4W.
3. EXISTING 'PANEL 2'. 120/240V, 1PH, 3W.
4. PROVIDE AND HANG SIGN DOCUMENTING MULTIPLE BUILDING SERVICES AND DISCONNECTION/SWITCHING PROCEDURE. SEE ELECTRICAL DETAILS SHEET FOR MORE INFORMATION.
5. EXISTING AERATOR MOTOR STARTER DISCONNECT SWITCH.
6. NEW DISCONNECT SWITCH FOR HSP #1.
7. NEW DISCONNECT SWITCH FOR HSP #2.
8. NEW DISCONNECT SWITCH FOR HSP #3.
9. NEW LOAD REACTOR AND HARMONIC FILTER FOR HSP #1. STACK HARMONIC FILTER ON BOTTOM AND LOAD REACTOR ON TOP.
10. NEW VFD FOR HSP #1.
11. NEW LOAD REACTOR AND HARMONIC FILTER FOR HSP #2. STACK HARMONIC FILTER ON BOTTOM AND LOAD REACTOR ON TOP.
12. NEW VFD FOR HSP #2.
13. NEW LOAD REACTOR AND HARMONIC FILTER FOR HSP #3. STACK HARMONIC FILTER ON BOTTOM AND LOAD REACTOR ON TOP.
14. NEW VFD FOR HSP #3.
15. CONTRACTOR SHALL FURNISH AND INSTALL AEGIS SHAFT GROUNDING RINGS. CONNECT TO NEAREST BUILDING GROUND WITH #6 CU WIRE.
16. NEW PIPE MOUNTED PRESSURE SENSOR. ONE PRIMARY, ONE BACKUP. PROVIDE SHUT OFF VALVE FOR EACH PIPE MOUNTED PRESSURE SENSOR TO ALLOW FOR PRESSURE SENSOR TO BE REMOVED FOR REPLACEMENT. EXISTING PIPE IS BELOW GRATING.
17. EXISTING FLOW METER AND OTHER PIPE MOUNTED EQUIPMENT.
18. NEW PRESSURE INDICATOR AND TRANSMITTER.
19. EXISTING UNIT HEATER SHALL BE RECONNECTED AND RELOCATED IN THIS LOCATION.
20. CONTRACTOR SHALL INSTALL NEW HIGH SERVICE PUMP. PUMP TO BE FURNISHED BY OWNER.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

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INDIANA AMERICAN WATER
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SHEET TITLE
HSP BUILDING ELECTRICAL PLAN - NEW WORK

DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET E-6

ELECTRICAL KEYED NOTES:

1. NEW PANEL 'L2'. RECONNECT EXISTING LOADS TO THIS LOCATION.
2. EXISTING PANELS LOCATED BEHIND WALL ACCESS PLATE TO BE USED AS A SPLICE BOXES.
3. REPAIR WALL AS NEEDED AFTER WORK.

N

OFFICE BUILDING ELECTRICAL PLAN - DEMO AND NEW WORK - ALTERNATE #2

SCALE: 1/4"=1'-0"

0 2' 4' 8'

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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INDIANA AMERICAN WATER
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153 N. EMERSON AVENUE
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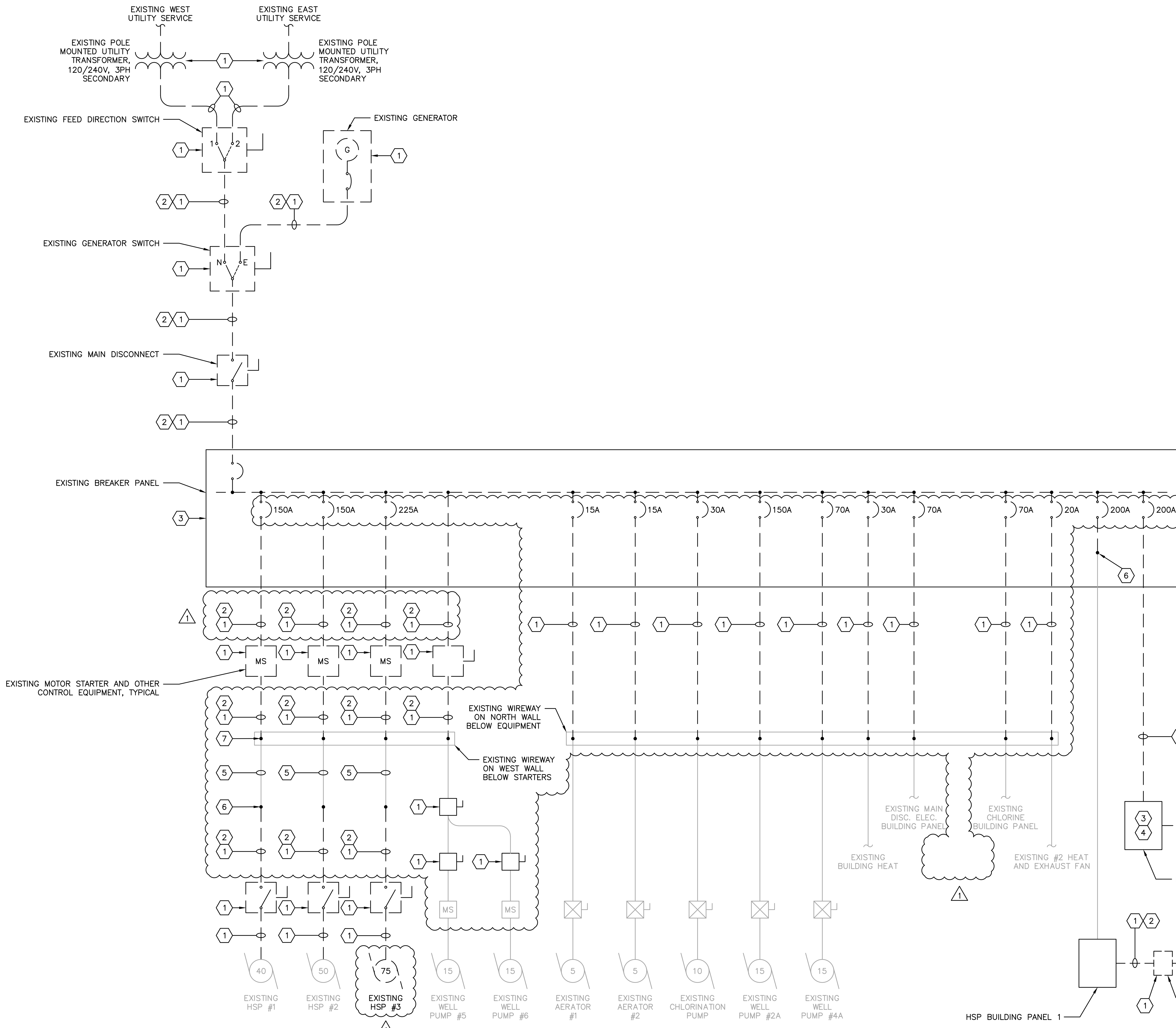
SHEET TITLE: OFFICE BUILDING ELECTRICAL PLAN - ALTERNATE #2
DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET: E-7



ELECTRICAL ONE-LINE DIAGRAM - DEMO

NOT TO SCALE

GENERAL ELECTRICAL DEMO NOTES:

A. WHERE POSSIBLE, COMPLETE NEW CONSTRUCTION BEFORE DEMOLITION OF EXISTING EQUIPMENT TO MINIMIZE DOWNTIME. COORDINATE EQUIPMENT OUTAGES WITH OWNER.

B. DISCONNECT AND COMPLETELY REMOVE ALL CONDUIT, WIRE, BOXES, ETC. TO BE RENDERED OBSOLETE BY THIS WORK, UNLESS OTHERWISE NOTED.

C. REMOVE OBSOLETE WIRE BACK TO ITS SOURCE, CUT OFF CONDUIT FLUSH WITH WALL, FLOOR, OR CEILING. WHERE CONDUIT IS CUT OFF IN A VISIBLE LOCATION, PATCH AND PAINT TO MATCH EXISTING SURFACE.

D. REMOVE FROM THE SITE AND DISPOSE OF ALL REMOVED ELECTRICAL AND/OR OTHER MATERIALS UNLESS OTHERWISE NOTED. OWNER HAS FIRST RIGHT OF REFUSAL ON ALL REMOVED EQUIPMENT AND MATERIALS.

E. CONTRACTOR SHALL TAKE NECESSARY MEANS TO PROTECT AND SUPPORT CABLES TO PREVENT DAMAGE DURING CONSTRUCTION. PROTECT EXISTING SYSTEMS AND CABLING DURING CONSTRUCTION.

F. MAINTAIN CONTINUITY OF EXISTING CIRCUITS AFFECTED BY DEMOLITION WORK. VERIFY THAT EQUIPMENT TO REMAIN IS FUNCTIONAL AFTER DEMOLITION.

G. EQUIPMENT IN GRAY IS EXISTING TO REMAIN.

ELECTRICAL KEYED NOTES:

1. EQUIPMENT/CONDUCTORS TO BE REMOVED.
2. CONDUIT TO BE REMOVED.
3. PANEL TO BE GUTTED AND REUSED AS A SPLICE BOX FOR EXISTING CIRCUITS.
4. ALTERNATE #2. IN BASE BID, SPLICE EXISTING CONDUCTORS WITHIN EXISTING BREAKER PANEL AND EXISTING FEED TO REMAIN. 1
5. EXISTING CONDUCTORS AND CONDUIT BETWEEN ELECTRIC CONTROL BUILDING AND HSP BUILDING TO BE REUSED.
6. SPLICE POINT, TYPICAL.
7. SPLICE POINT IN EXISTING WIREWAY, TYPICAL.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

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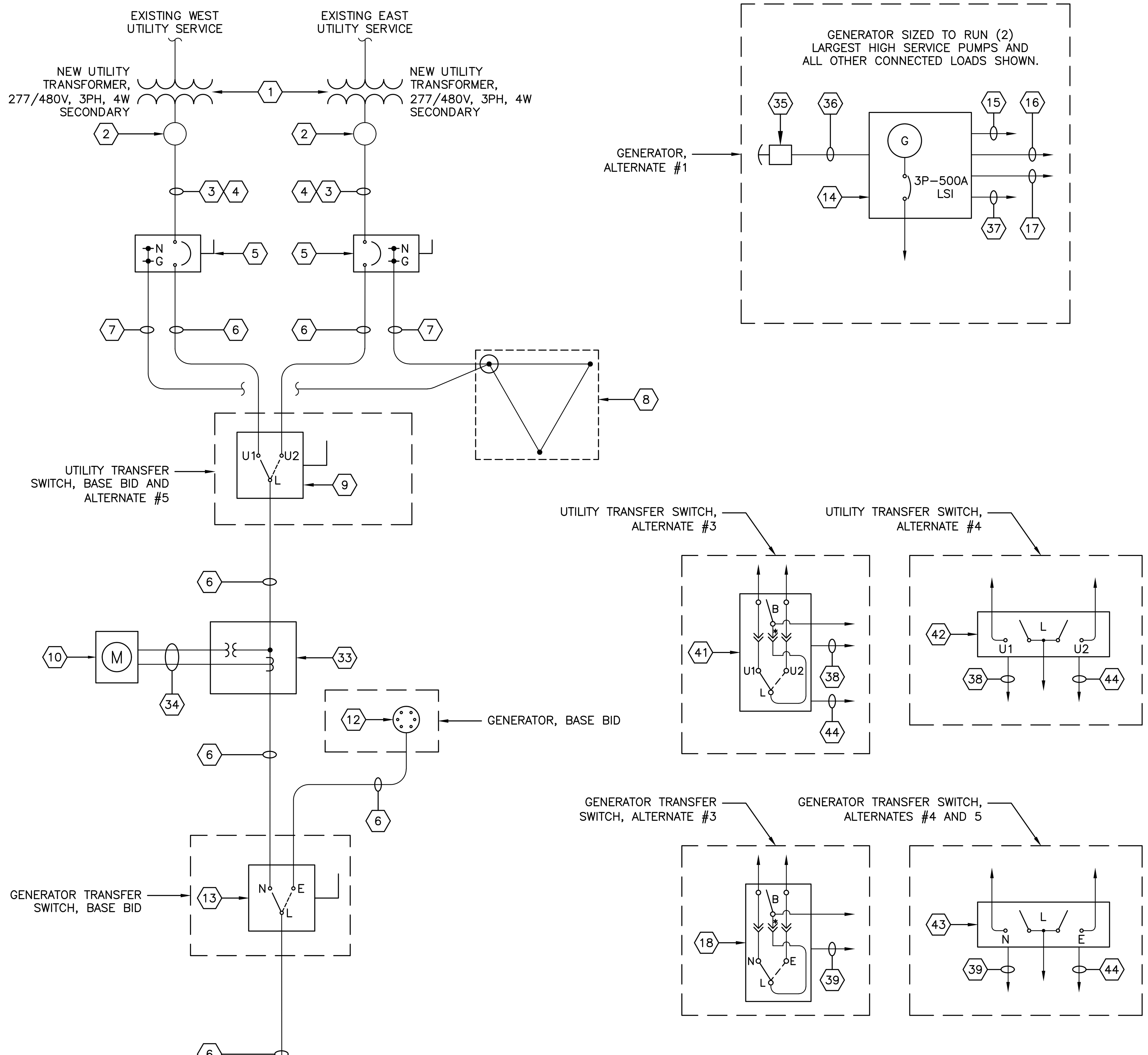
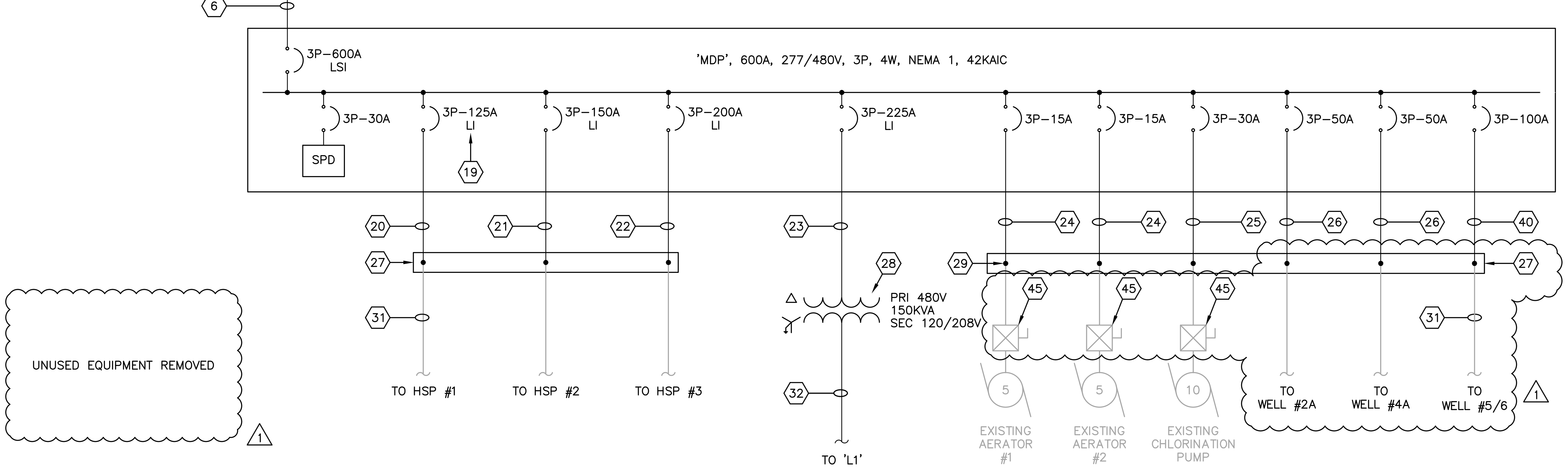
INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE: ELECTRICAL ONE-LINE DIAGRAM - DEMO

DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET: E-8





ELECTRICAL ONE-LINE DIAGRAM - NEW WORK

NOT TO SCALE

GENERAL ELECTRICAL NOTES:

A. SPLICE AND EXTEND EXISTING CIRCUITS TO REMAIN AS NECESSARY TO RECONNECT AS SHOWN.

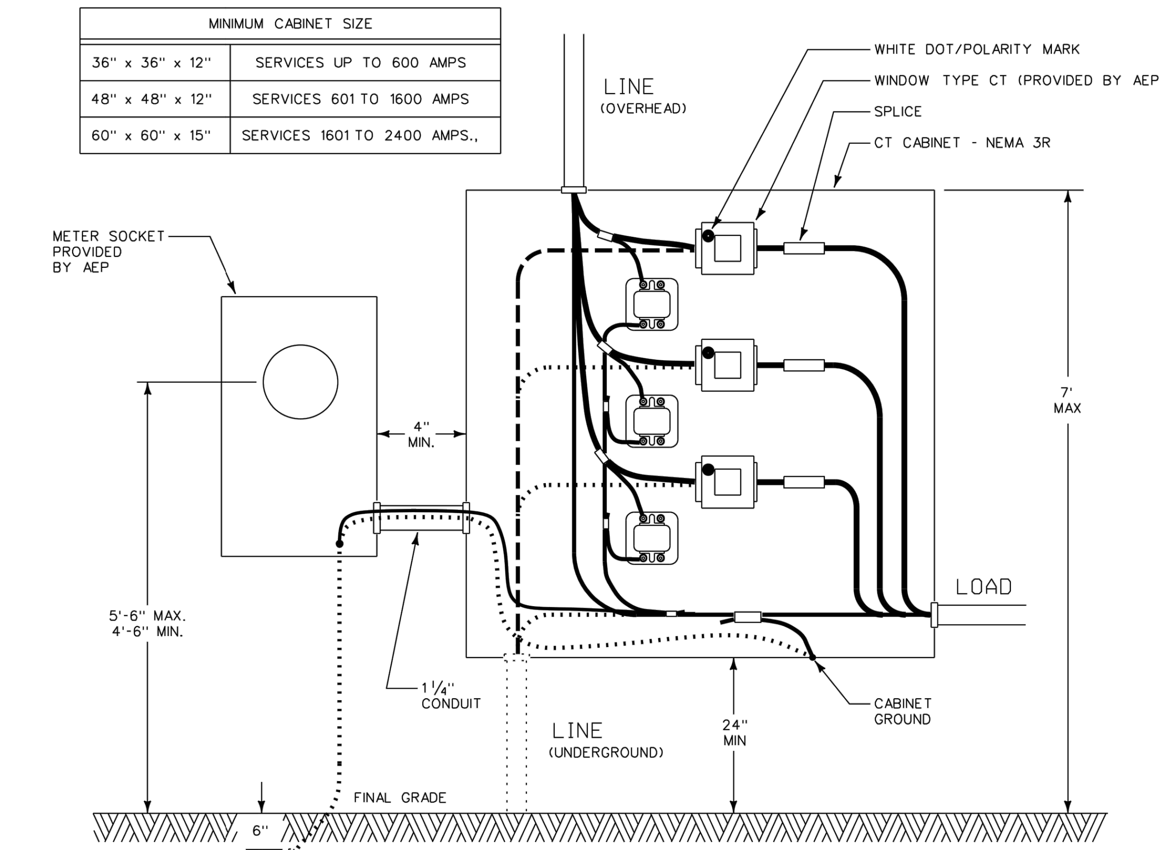
B. RELABEL ALL EQUIPMENT THAT HAS ITS VOLTAGE CHANGED.

C. ALL PUMPS AND MOTORS SHALL BE REWIRIED AND CONVERTED TO 480V. 1

ELECTRICAL KEYED NOTES:

1. FURNISHED AND INSTALLED BY UTILITY COMPANY.
2. EXISTING UTILITY POLE. RISER TO BE REVISED.
3. CONDUIT AND CONDUCTORS FURNISHED AND INSTALLED BY CONTRACTOR. LEAVE PIGTAILS AT TOP OF POLE FOR FINAL TERMINATIONS BY UTILITY COMPANY. CONTRACTOR SHALL FURNISH AND INSTALL RISER AND WEATHERHEAD PER UTILITY REQUIREMENTS.
4. (2) PARALLEL RUNS OF 4-#500 CU, 4" C. EACH RUN.
5. MAIN UTILITY DISCONNECT. 3P-600A LSI ENCLOSED CIRCUIT BREAKER IN NEMA 4X ENCLOSURE WITH EXTERNAL DISCONNECT HANDLE. BOND NEUTRAL TO GROUND IN THIS LOCATION.
6. (2) PARALLEL RUNS OF 4-#350 CU, 1-#1 CU GND, 4" C. EACH RUN.
7. #2/0 BARE CU TO GROUND GRID.
8. GROUND GRID, SEE ELECTRICAL DETAILS.
9. BASE BID AND ALTERNATE #5, 'UTILITY MTS' 600A MANUAL TRANSFER SWITCH, NEMA 1, 42KAIC, SWITCHED NEUTRAL.
10. UTILITY METER BASE FURNISHED BY UTILITY COMPANY, INSTALLED BY CONTRACTOR. UTILITY METER FURNISHED AND INSTALLED BY UTILITY.
11. NOT USED.
12. PORTABLE GENERATOR RECEPTACLE. COORDINATE RECEPTACLE REQUIREMENTS WITH OWNER. FURNISH AND INSTALL IN NEMA 4X STAINLESS STEEL ENCLOSURE.
13. BASE BID, 'GEN MTS', 600A, 3P, 4W, SOLID NEUTRAL MANUAL TRANSFER SWITCH, NEMA 1, 42KAIC.
14. 400KW/500KVA @ .8PF, 277/480V DIESEL GENERATOR WITH 24 HOUR SUBBASE FUEL TANK AND WEATHER RATED ENCLOSURE.
15. 2-#12 CU, 1-#12 CU GND, 3/4" C. FOR BATTERY CHARGER FROM PANELBOARD 'L1'.
16. 2-#10 CU, 1-#10 CU GND, 3/4" C. FOR BLOCK HEATER FROM PANELBOARD 'L1'.
17. 2-#14 CU, 1-#14 CU GND, 3/4" C. FOR GENERATOR START SIGNAL FROM ATS.
18. ALTERNATE #3, 'GEN ATS' 600A AUTOMATIC TRANSFER SWITCH, NEMA 1, 42KAIC, SOLID NEUTRAL, WITH BYPASS ISOLATION, ASCO 7000 OR APPROVED EQUAL. PROVIDE TIME DELAY TO ALLOW UTILITY ATS TO TRY BOTH UTILITY CIRCUITS PRIOR TO SWITCHING TO GENERATOR.
19. INSTANTANEOUS ADJUSTMENT REQUIRED FOR CIRCUIT BREAKER, TYPICAL.
20. 3-#4 CU, 1-#6 CU GND, 1-1/2" C.
21. 3-#3 CU, 1-#6 CU GND, 1-1/2" C.
22. 3-#1 CU, 1-#6 CU GND, 2" C.
23. 3-#4/0 CU, 1-#4 CU GND, 2-1/2" C.
24. 3-#12 CU, 1-#12 CU GND, 3/4" C.
25. 3-#10 CU, 1-#10 CU GND, 3/4" C.
26. 3-#6 CU, 1-#10 CU GND, 1" C.
27. EXISTING WIREWAY TO REMAIN. 1
28. 'T1', TRANSFORMER, NEMA 1.
29. SPLICE NEW CONDUCTORS TO EXISTING CONDUCTORS. PROVIDE POLARIS INSULATED CONNECTORS OR APPROVED EQUAL. TYPICAL FOR EACH SPLICE LOCATION.
30. NOT USED. 1
31. EXISTING CONDUCTORS AND CONDUIT TO BE REUSED, TYPICAL.
32. SEE SHEET E-10 FOR DETAILS.
33. NEW CT/PT CABINET FURNISHED AND INSTALLED BY CONTRACTOR, COORDINATE WITH UTILITY, SEE DETAIL THIS SHEET.
34. NEW INSTRUMENTATION CONDUIT BY CONTRACTOR. SEE DETAIL THIS SHEET.
35. EMERGENCY STOP PUSH BUTTON FOR GENERATOR.
36. 2-#12 CU, GENERATOR E-STOP SIGNAL; 1-#12 CU GND; 3/4" C,
37. 2-#14 CU, GENERATOR RUN STATUS; 2-#14 CU, GENERATOR COMMON FAIL ALARM; 2-#14 CU, GENERATOR WEAK BATTERY ALARM; 2-#14 CU, GENERATOR LOW FUEL ALARM; 2-#14 CU, GENERATOR LOW COOLANT LEVEL ALARM; 2-#14 CU, GENERATOR HIGH COOLANT TEMPERATURE ALARM; 1-#14 CU GND; 1" C. TO EXISTING CONTROL PANEL IN HSP BUILDING.
38. 2-#14 CU, ATS ON UTILITY SOURCE 1; 2-#14 CU, ATS ON UTILITY SOURCE 2; 1-#14 CU GND; 3/4" C. TO EXISTING CONTROL PANEL IN HSP BUILDING.
39. 2-#14 CU, ATS IN EMERGENCY; 1-#14 CU GND; 3/4" C. TO EXISTING CONTROL PANEL IN HSP BUILDING.
40. 3-#1 CU, 1-#8 CU GND, 1-1/2" C.
41. ALTERNATE #3, 'UTILITY ATS' 600A AUTOMATIC TRANSFER SWITCH, NEMA 1, 42KAIC, SWITCHED NEUTRAL, WITH BYPASS ISOLATION, ASCO 7000 SERIES OR APPROVED EQUAL.
42. ALTERNATE #4, 'UTILITY ATS' 600A AUTOMATIC TRANSFER SWITCH, NEMA 1, 42KAIC, SWITCHED NEUTRAL, WITHOUT BYPASS ISOLATION, ASCO 7000 SERIES OR APPROVED EQUAL.
43. ALTERNATE #4 AND 5, 'GEN ATS' 600A AUTOMATIC TRANSFER SWITCH, NEMA 1, 42KAIC, SOLID NEUTRAL, WITHOUT BYPASS ISOLATION, ASCO 7000 OR APPROVED EQUAL. PROVIDE TIME DELAY TO ALLOW OTHER ATS TO TRY BOTH UTILITY CIRCUITS PRIOR TO SWITCHING TO GENERATOR.
44. ALTERNATE #3 AND 4, 2-#14 CU, GEN START/SWITCH DISABLE INTERLOCK; 1-#14 CU GND; 3/4" C. TO GENERATOR ATS.
45. REPLACE EXISTING OVERLOADS WITH NEW OVERLOADS THAT MATCH REQUIREMENTS BASED ON NEW PUMP VOLTAGE. 1

MINIMUM CABINET SIZE	
36" x 36" x 12"	SERVICES UP TO 600 AMPS
48" x 48" x 12"	SERVICES 601 TO 1600 AMPS
60" x 60" x 15"	SERVICES 1601 TO 2400 AMPS



NOTES:

1. CT CABINET, FURNISHED AND INSTALLED BY CUSTOMER, SHALL BE OF SUBSTANTIAL STRENGTH WITH CORROSION PROTECTION, SUCH AS PAINTED GALVANIZED STEEL NEMA 3R. ALUMINUM OR FIBER REINFORCED POLYESTER ENCLOSURES MUST BE USED IN CORROSIVE AREAS. IT SHALL BE FITTED WITH HINGED DOORS(s) AND SHALL HAVE PROVISIONS FOR INSTALLING AN COMPANY PADLOCK AND SEAL THE INSIDE BACK OF THE CABINET SHALL BE ENTIRELY COVERED BY 3/4" TREATED PLYWOOD FOR MOUNTING THE CURRENT TRANSFORMERS OR (AEP TEXAS) SUITABLE MOUNTING BRACKETS MAY BE PROVIDED. A GROUNDING LUG SHALL BE PROVIDED TO GROUND THE CABINET.
2. THE WHITE DOT POLARITY MARK ON THE CT SHALL BE TOWARD THE ENERGY SOURCE OR LINE SIDE.
3. CUSTOMER SHOULD MOUNT THE METER SOCKET OR CABINET NEXT TO THE CT CABINET AND INSTALL 1 1/4" CONDUIT BETWEEN THE TWO. IF THE METER SOCKET CANNOT BE INSTALLED NEXT TO THE CT CABINET, IT MAY BE LOCATED UP TO 20 FEET AWAY WITH COMPANY METER SERVICES APPROVAL. 1 1/4" CONDUIT SHALL CONNECT THE SOCKET AND CT CABINET.
4. THE CT CABINET AND METER SOCKET SHALL BE GROUNDED. THE METER SOCKET AND CT CABINET SHALL BE BONDED THROUGH A SEPARATE EQUIPMENT-GROUNDING CONDUCTOR CONNECTED TO THE GROUNDED SERVICE CONDUCTOR (USUALLY THE NEUTRAL). IF A GROUNDED SERVICE CONDUCTOR DOES NOT EXIST THEN GROUNDING AND BONDING OF METERING EQUIPMENT MUST BE ESTABLISHED THROUGH A GROUNDING ELECTRODE SYSTEM ESTABLISHED AT THE POINT OF SERVICE. IN SOME JURISDICTIONS THE GROUNDING OF THE METER SOCKET AND INSTRUMENT TRANSFORMER ENCLOSURE WILL BE SUPPLEMENTED WITH THE USE OF A DRIVEN GROUND ROD IN ADDITION TO BONDING TO THE GROUNDED SERVICE CONDUCTOR.
5. COMPANY WILL INSTALL THE SECONDARY WIRING BETWEEN THE CT AND THE METER SOCKET.
6. THE CONDUCTOR SPLICE SHALL BE MADE WITH BOLTED CONNECTIONS FURNISHED AND INSTALLED BY CUSTOMER WHERE REQUIRED. IN AEP TEXAS NORTH AND CENTRAL WHERE THE CUSTOMER OWNS AND INSTALLS BOTH THE LINE AND LOAD CONDUCTORS, THE CONDUCTOR SHALL PASS THROUGH THE CT'S WITHOUT SPLICE.

CURRENT TRANSFORMER CABINETS OVERHEAD OR UNDERGROUND SERVICE WINDOW TYPE CT'S AND VT'S 277/480 VOLT

FIGURE 11

OCT 4, 2017

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

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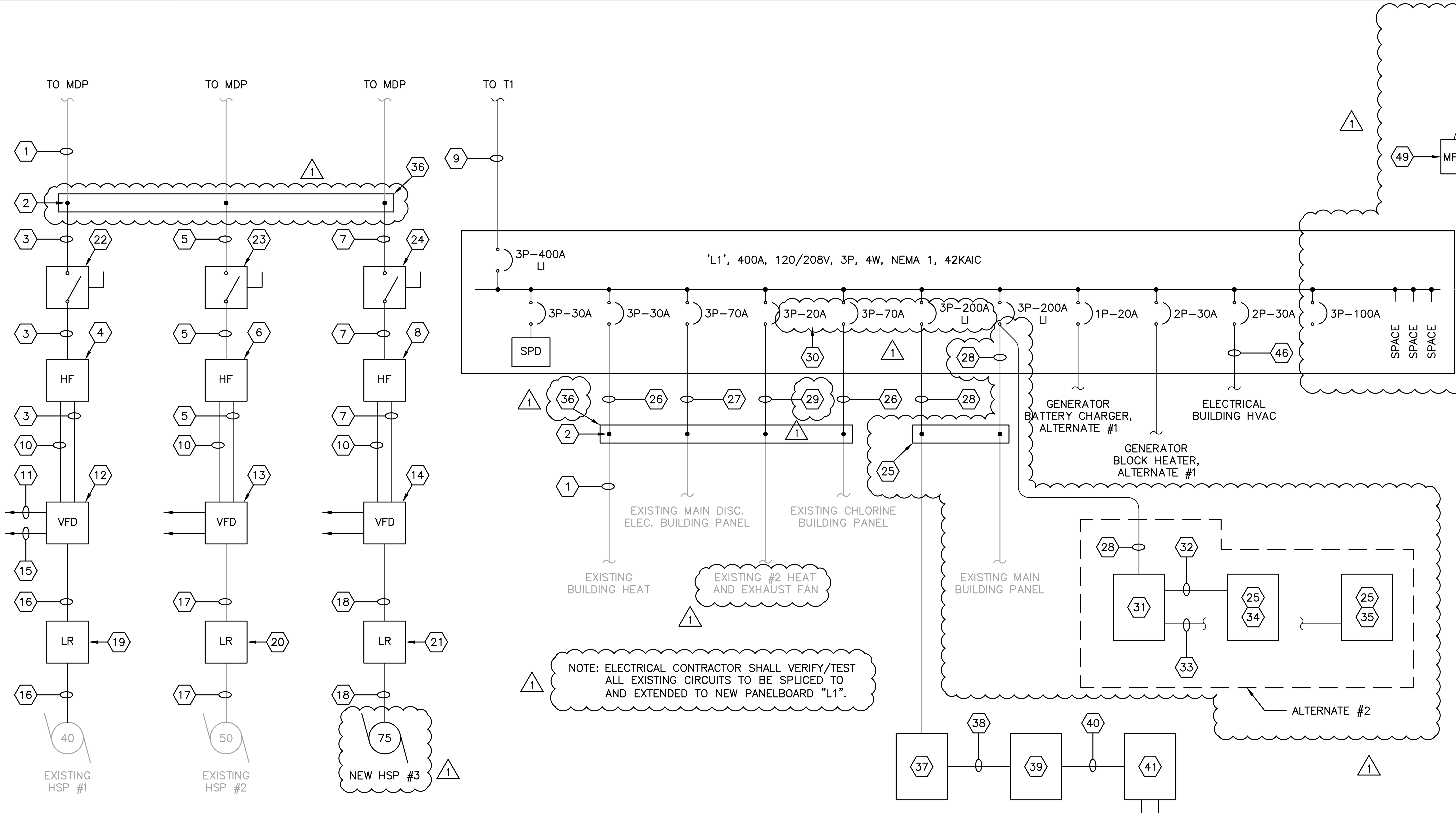
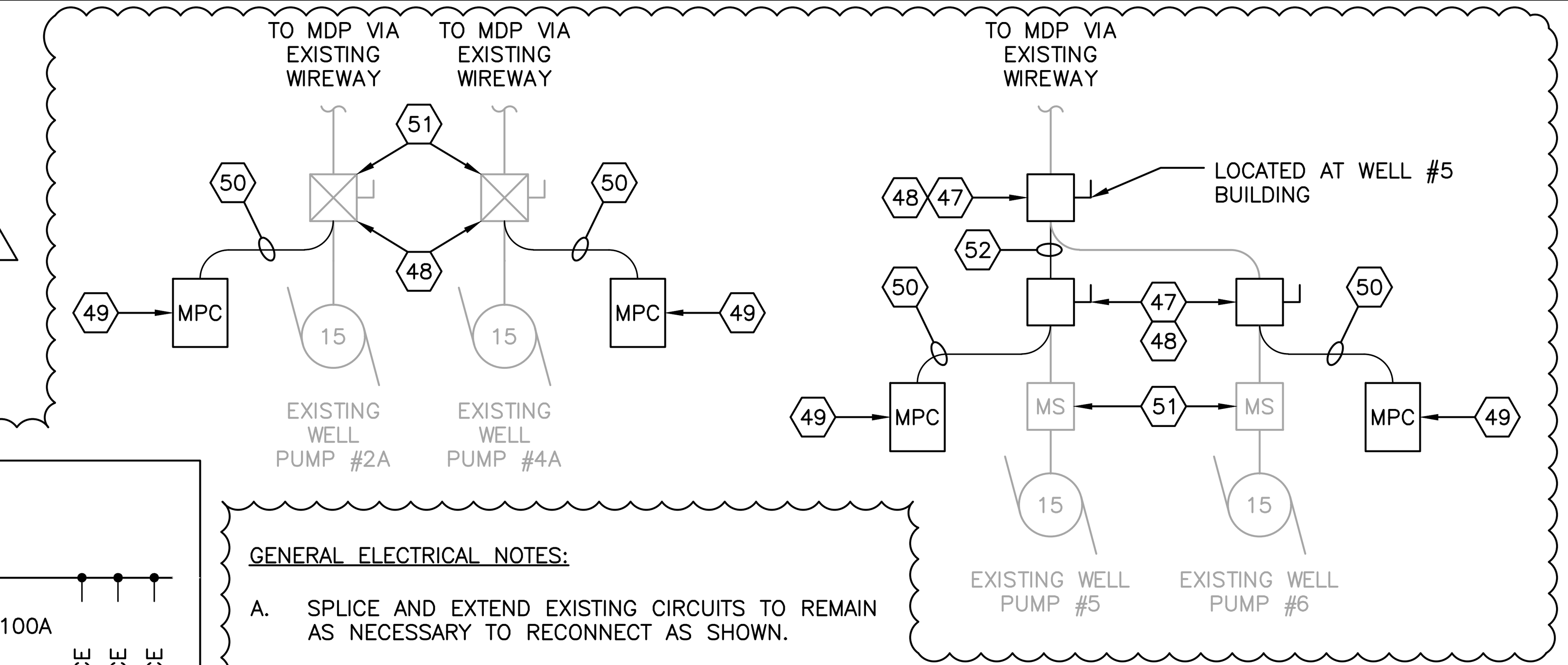




BRANCH CIRCUIT PANELBOARD SCHEDULE									
PANEL : L2	LOCATION: OFFICE BUILDING	MOUNTING: ☐ SURFACE ■ FLUSH		RATING: 200A., 120/208V 3PH., 4W.		MAIN: ■ 200A. M.C.B. ☐ 200A. M.L.O.		REMARKS: PROVIDE OPTIONS MARKED WITH ■	
LOAD DESIGNATION	CKT. BKR.	CKT. NO.	PHASE A	PHASE B	PHASE C	CKT. NO.	CKT. BKR.	LOAD DESIGNATION	
FLUORIDE CL2	1P-20	1				2	3P-30	AIR COMPRESSORS	
PHOSPHATE	1P-20	3				4			
PRE CL2	1P-20	5				6			
POST CL2	1P-20	7				8	1P-20	RECEPTS COMP	
BIG AC UNIT	2P-40	9				10	1P-20	SCADA OFF	
		11				12	1P-20	NIGHT LIGHT	
LITTLE AC UNIT	2P-20	13				14	2P-20	HEAT	
		15				16			
DRYER	2P-30	17				18	1P-20	SCADA COMP	
		19				20	3P-40	FURNACE	
SCALE	1P-20	21				22			
OFFICE FURNACE	1P-20	23				24			
BACK FURNACE	1P-15	25				26	1P-20	GARAGE LIGHTS	
FT	1P-15	27				28	1P-20	TOOL	
SPARE	1P-20	29				30	1P-20	SPARE	
SPARE	1P-20	31				32	1P-20	SPARE	
SPARE	1P-20	33				34	1P-20	SPARE	
SPARE	1P-20	35				36	1P-20	SPARE	
SPARE	1P-20	37				38	1P-20	SPARE	
SPARE	1P-20	39				40	1P-20	SPARE	
SPARE	1P-20	41				42	1P-20	SPARE	
		kVA	0.0	0.0	0.0				
☐ 200% NEUTRAL BUSBAR		■ 10,000 A.I.C.			☐ SWITCH-DUTY C.Bs		■ CU. BUSBARS & LUGS		
■ 100% NEUTRAL BUSBAR		☐ 22,000 A.I.C.			■ BOLT-IN C.Bs		☐ AL. BUSBARS & LUGS		
■ EQUIPMENT GROUND BUSBAR		☐ ISOLATED GROUND BUSBAR			■ NEMA 1		☐ NEMA 3R	☐ NEMA 4X	

ELECTRICAL ONE-LINE DIAGRAM - NEW WORK CONTINUED

NOT TO SCALE

GENERAL ELECTRICAL NOTES:

A. SPLICE AND EXTEND EXISTING CIRCUITS TO REMAIN AS NECESSARY TO RECONNECT AS SHOWN.

B. RELABEL ALL EQUIPMENT THAT HAS ITS VOLTAGE CHANGED.

ELECTRICAL KEYED NOTES:

1. EXISTING CONDUCTORS AND CONDUIT TO BE REUSED, TYPICAL.
2. SPLICE NEW CONDUCTORS TO EXISTING CONDUCTORS. PROVIDE POLARIS INSULATED CONNECTORS OR APPROVED EQUAL. TYPICAL FOR EACH SPLICE LOCATION.
3. 3-#4 CU, 1-#6 CU GND, 1-1/2" C.
4. HARMONIC FILTER FOR HSP #1, 40HP RATED, TRANSCOIL HGP SERIES WITH PQ CONNECT AND CONTACTOR OPTION OR APPROVED EQUAL.
5. 3-#3 CU, 1-#6 CU GND, 1-1/2" C.
6. HARMONIC FILTER FOR HSP #2, 50HP RATED, TRANSCOIL HGP SERIES WITH PQ CONNECT AND CONTACTOR OPTION OR APPROVED EQUAL.
7. 3-#1 CU, 1-#6 CU GND, 2" C.
8. HARMONIC FILTER FOR HSP #3, 75HP RATED, TRANSCOIL HGP SERIES WITH PQ CONNECT AND CONTACTOR OPTION OR APPROVED EQUAL.
9. (2) PARALLEL RUNS OF 4-#300 CU, 1-#1/0 CU GND, 3-1/2" C. EACH RUN.
10. 2-#14 CU, 1-#14 CU GND, 3/4" C. FOR CAPACITOR INTERLOCK SIGNAL.
11. DISCRETE SIGNALS: 2-#14 CU, RUN COMMAND; 2-#14 CU RUN STATUS; 2-#14 CU, FAULT; 1-#14 CU GND; ALL IN 3/4" C. TO EXISTING CONTROL PANEL IN HSP BUILDING. TYPICAL FOR EACH VFD.
12. VFD FOR HSP #1, RATED FOR 59.8A, NEMA 12, ABB ACQ580 SERIES OR APPROVED EQUAL.
13. VFD FOR HSP #2, RATED FOR 74.8A, NEMA 12, ABB ACQ580 SERIES OR APPROVED EQUAL.
14. VFD FOR HSP #3, RATED FOR 110.4A, NEMA 12, ABB ACQ580 SERIES OR APPROVED EQUAL
15. ANALOG SIGNALS: TSP #16, SPEED SET; TSP #16, SPEED FEEDBACK; ALL IN 3/4" C. TO EXISTING CONTROL PANEL IN HSP BUILDING. TYPICAL FOR EACH VFD.
16. 3-#4 XHHW-2 CU, 1-#6 CU THHN-2 GND, 1-1/2" C.
17. 3-#3 XHWW-2 CU, 1-#6 THHN-2 CU GND, 1-1/2" C.
18. 3-#1 XHHW-2 CU, 1-#6 THHN-2 CU GND, 2" C.
19. LOAD REACTOR FOR HSP #1, 40HP RATED, TRANSCOIL KDR SERIES OR APPROVED EQUAL.
20. LOAD REACTOR FOR HSP #2, 50HP RATED, TRANSCOIL KDR SERIES OR APPROVED EQUAL.
21. LOAD REACTOR FOR HSP #3, 75HP RATED, TRANSCOIL KDR SERIES OR APPROVED EQUAL.
22. DISCONNECT SWITCH FOR HSP #1, 100A, 600V, 3PH, NEMA 1.
23. DISCONNECT SWITCH FOR HSP #2, 100A, 600V, 3PH, NEMA 1
24. DISCONNECT SWITCH FOR HSP #3, 200A, 600V, 3PH, NEMA 1
25. EXISTING PANEL TO BE USED AS SPLICE BOX FOR EXISTING CIRCUITS
26. 4-#10 CU, 1-#10 CU GND, 3/4" C.
27. 4-#4 CU, 1-#8 CU GND, 1-1/4" C.
28. 4-#3/0 CU, 1-#6 CU GND, 2-1/2" C.
29. 4-#12 CU, 1-#12 CU GND, 3/4" C.
30. INSTANTANEOUS ADJUSTMENT REQUIRED FOR CIRCUIT BREAKER, TYPICAL.
31. 'L2', PANELBOARD FOR OFFICE BUILDING. SPLICE AND EXTEND EXISTING CIRCUITS TO RECONNECT AS REQUIRED. PROVIDE NEW OR REUSE, IF IN GOOD CONDITION, EXISTING CIRCUIT BREAKERS. SEE PANEL SCHEDULE FOR MORE DETAILS.
32. 18-#12 CU, 1-#12 CU GND, 1-1/4" C. FOR 15A AND 20A CIRCUITS. 2-#10 CU, 2-#8 CU, 1-#10 CU GND, 1" C. FOR 30A AND 40A CIRCUITS.
33. 34-#12 CU, 1-#12 CU GND, 1-1/4" C. FOR 15A AND 20A CIRCUITS. 3-#10 CU, 3-#8 CU, 1-#10 CU GND, 1" C. FOR 30A AND 40A CIRCUITS.
34. EXISTING 'BLDG DIST PANEL HEATING' PANEL.
35. EXISTING 'BLDG LIGHTING PANEL' PANEL.
36. EXISTING WIREWAY TO REMAIN.
37. EXISTING 'PANEL 1' IN THE HSP BUILDING. REUSE EXISTING 2P-50A CIRCUIT BREAKER TO FEED 'PANEL 2' IN THE SAME BUILDING. RELABEL PANEL TO SHOW THAT THE VOLTAGE HAS CHANGED TO 120/208V, 3PH, 4W.
38. 3-#6 CU, 1-#10 CU GND, 1" C.
39. EXISTING 'PANEL 2' IN THE HSP BUILDING. RELABEL THE PANEL TO SHOW THAT THE VOLTAGE HAS CHANGED TO 120/208V, 1PH, 3W.
40. EXISTING WIRING AN CONDUIT TO REMAIN.
41. EXISTING CONTROL PANEL IN HSP BUILDING.
42. TSP #16, PRESSURE; 3/4" C.
43. PRESSURE INDICATOR TRANSMITTER.
44. PRESSURE SENSOR INSTRUMENT CABLE FURNISHED BY MANUFACTURER, INSTALLED BY CONTRACTOR IN 1" C.
45. PIPE MOUNTED PRESSURE SENSOR.
46. 2-#10 CU, 1-#10 CU GND, 3/4" C.
47. NEW FUSIBLE DISCONNECT SWITCH, 100A, 3P, 600V, 10KAIC, NEMA 1.
48. PROVIDE DOUBLE TAP LUGS TO ALLOW FOR ADDITIONAL TERMINATIONS.
49. SINGLE PHASE MINI POWER CENTER, 480V PRIMARY, 120/240V SECONDARY, 5KVA. CONNECT ALL EXISTING LOADS FOR WELL HOUSE, BESIDES PUMPS.
50. 2-#12 CU, 1-#12 CU GND, 3/4" C.
51. REPLACE EXISTING OVERLOADS WITH NEW OVERLOADS THAT MATCH REQUIREMENTS BASED ON NEW PUMP VOLTAGE.
52. 3-#10 CU, 1-#10 CU GND, 3/4" C.

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

REV. #	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1	12/09/19	ADDENDUM #1

JEREMY E. FARRER REGISTERED No. PE11500290 STATE OF INDIANA PROFESSIONAL ENGINEER

SIMS-DURKIN ASSOCIATES ENGINEERING COMPANY
1545 COUNTRY CLUB ROAD
INDIANAPOLIS, INDIANA 46234
PHONE: 317-209-4035
FAX: 317-222-4120
WEB: WWW.SIMS-DURKIN.COM
SDA PROJECT #2019108

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE: ELECTRICAL ONE-LINE - NEW WORK CONTINUED
DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET: E-10

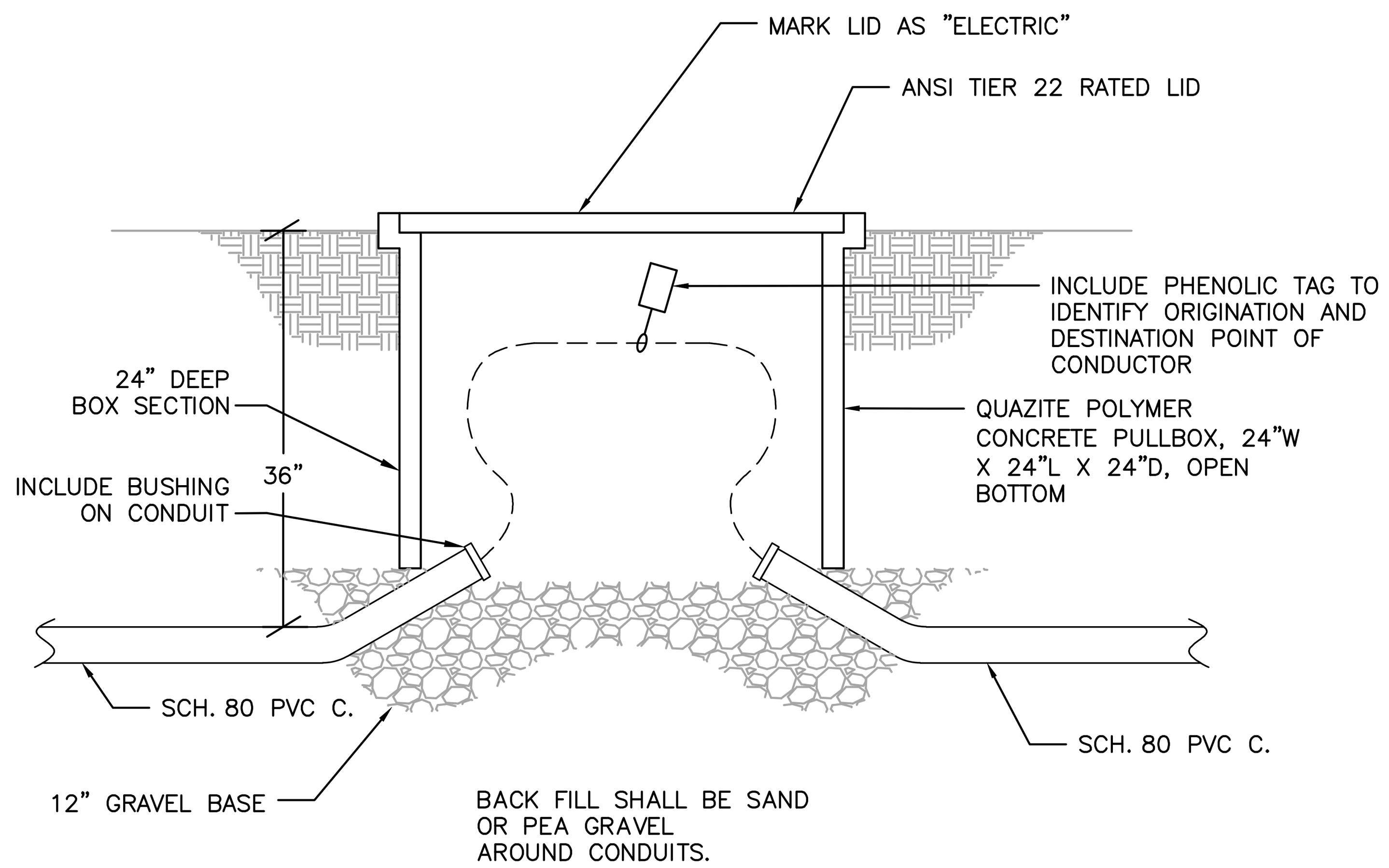
WARNING:

MULTIPLE FEEDS SUPPLY THIS BUILDING. THE FOLLOWING DISCONNECTING DEVICES IN THIS BUILDING SHALL BE OPENED TO SHUT DOWN POWER TO THIS BUILDING.

1. HSP #1 DISCONNECT
2. HSP #2 DISCONNECT
3. HSP #3 DISCONNECT
4. PANEL 1 MAIN CIRCUIT BREAKER
5. AERATOR DISCONNECT SWITCH

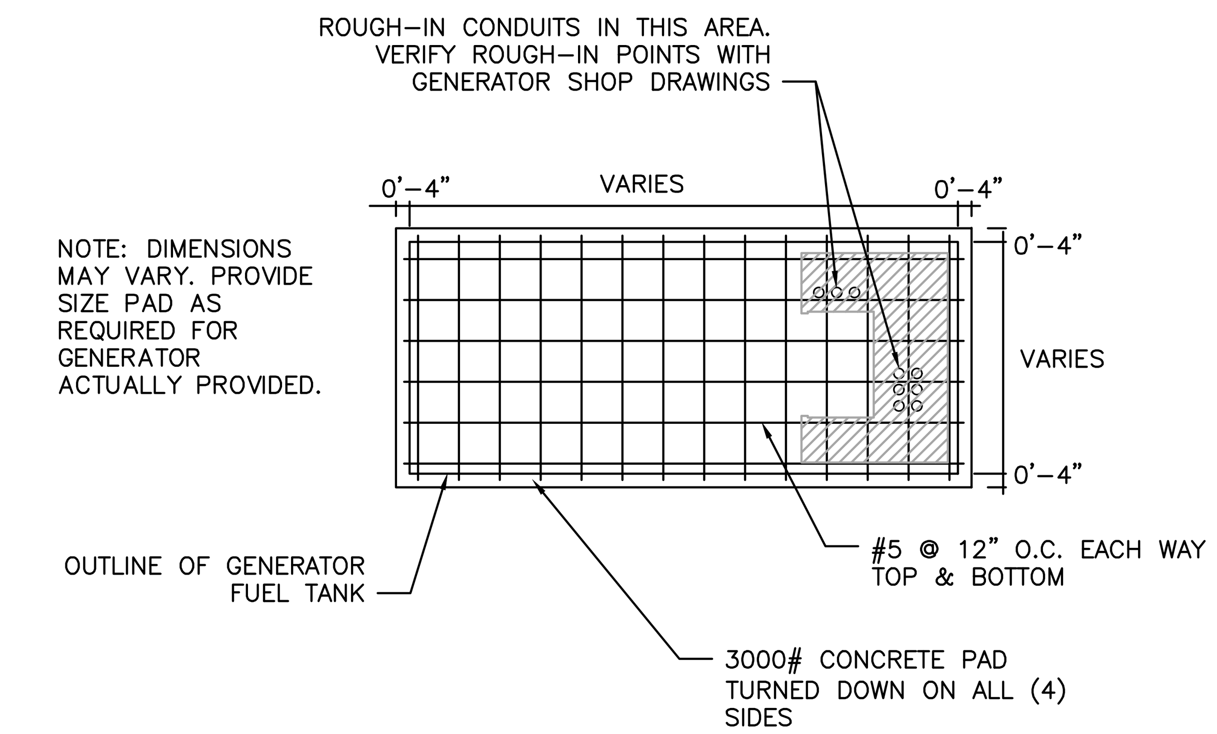
MULTIPLE SERVICE SIGN FOR HSP BUILDING

NOT TO SCALE



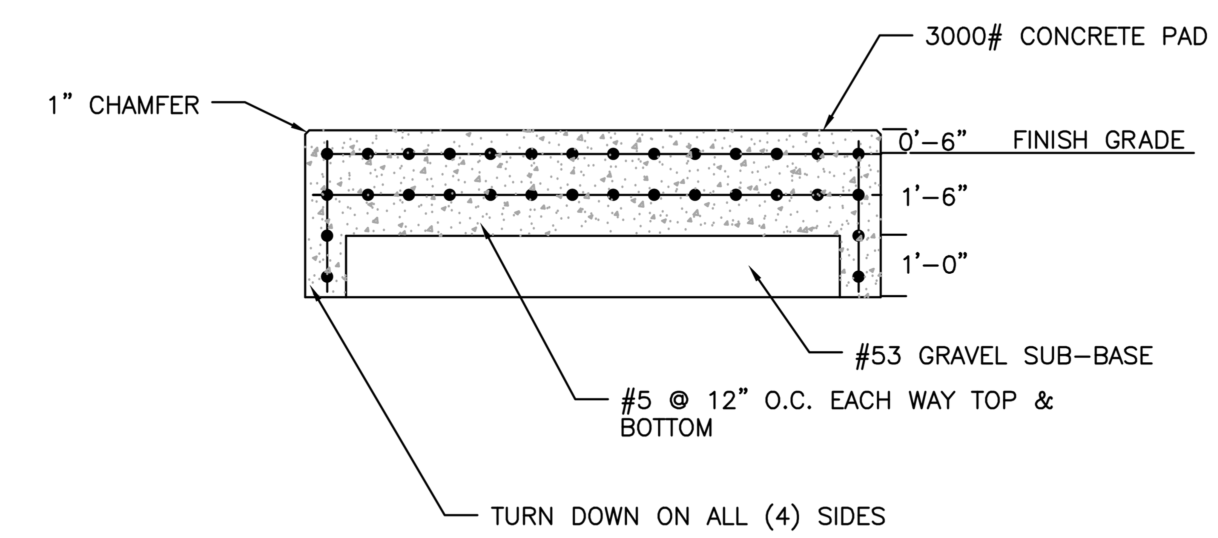
IN GROUND PULL BOX DETAIL

NOT TO SCALE



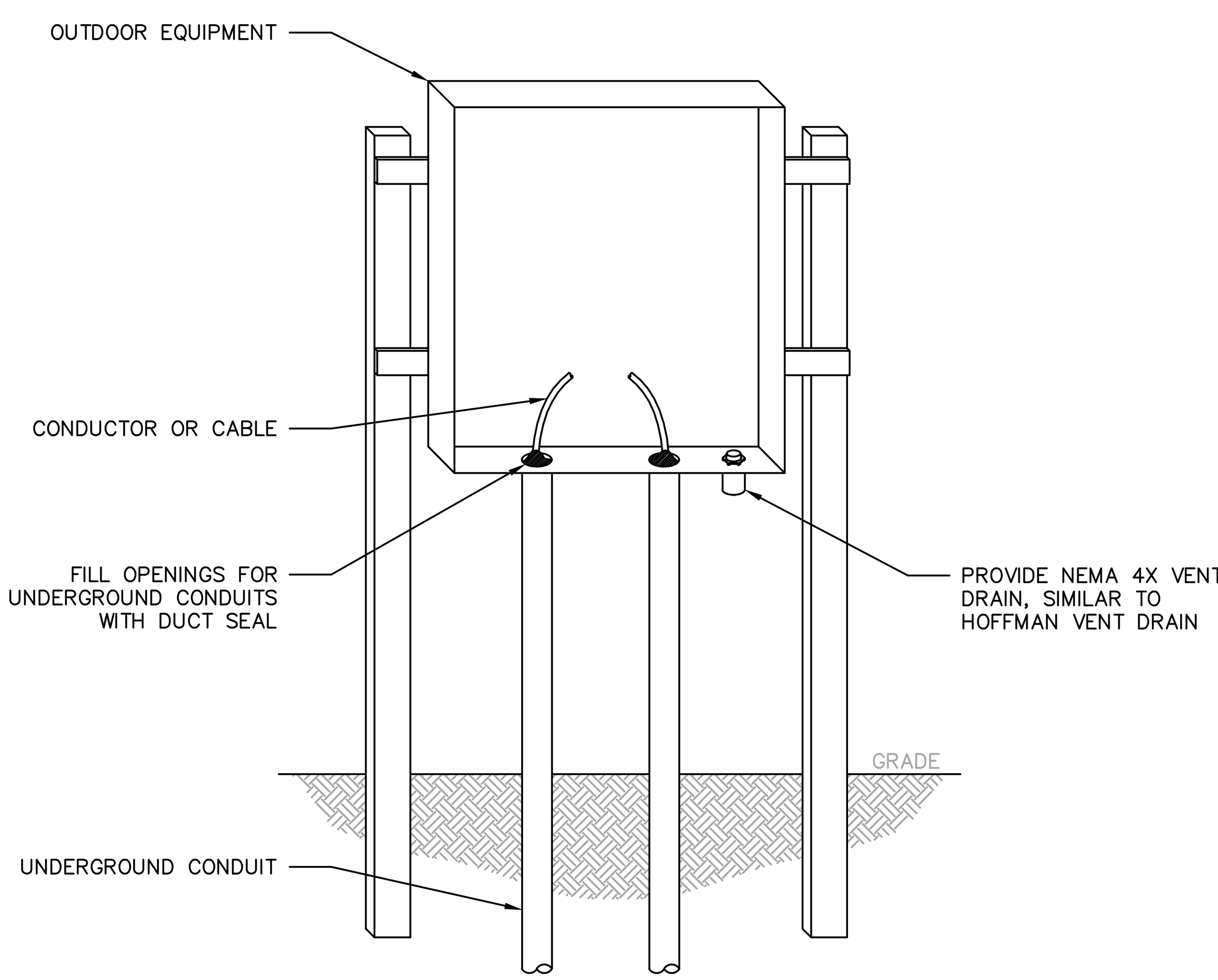
GENERATOR PAD PLAN VIEW DETAIL

NOT TO SCALE



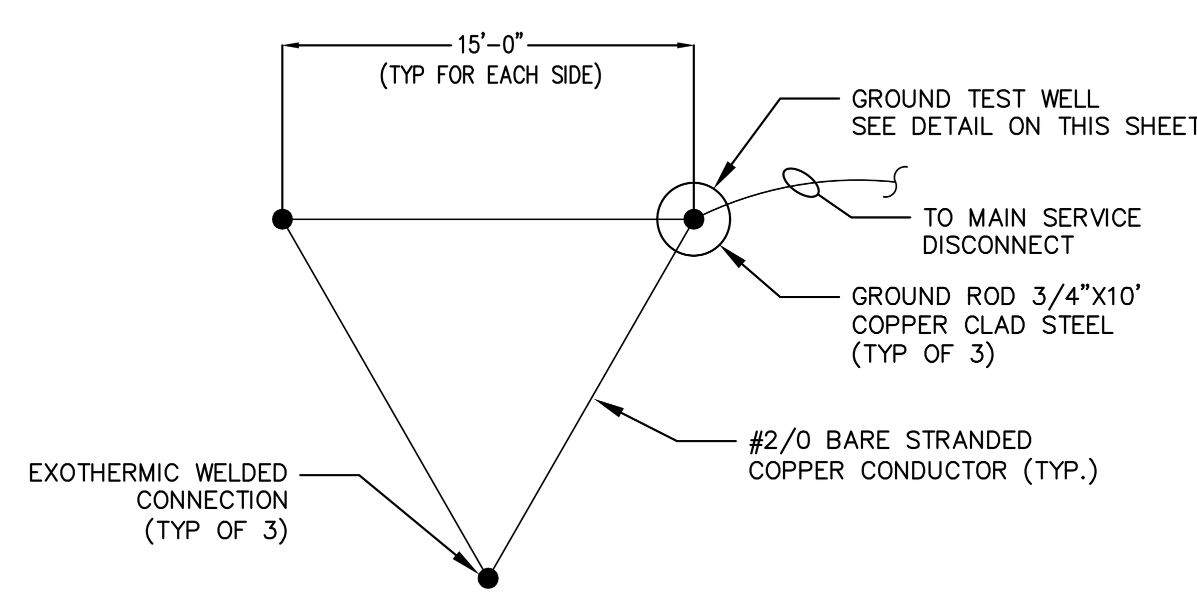
GENERATOR PAD SECTION VIEW DETAIL

NOT TO SCALE



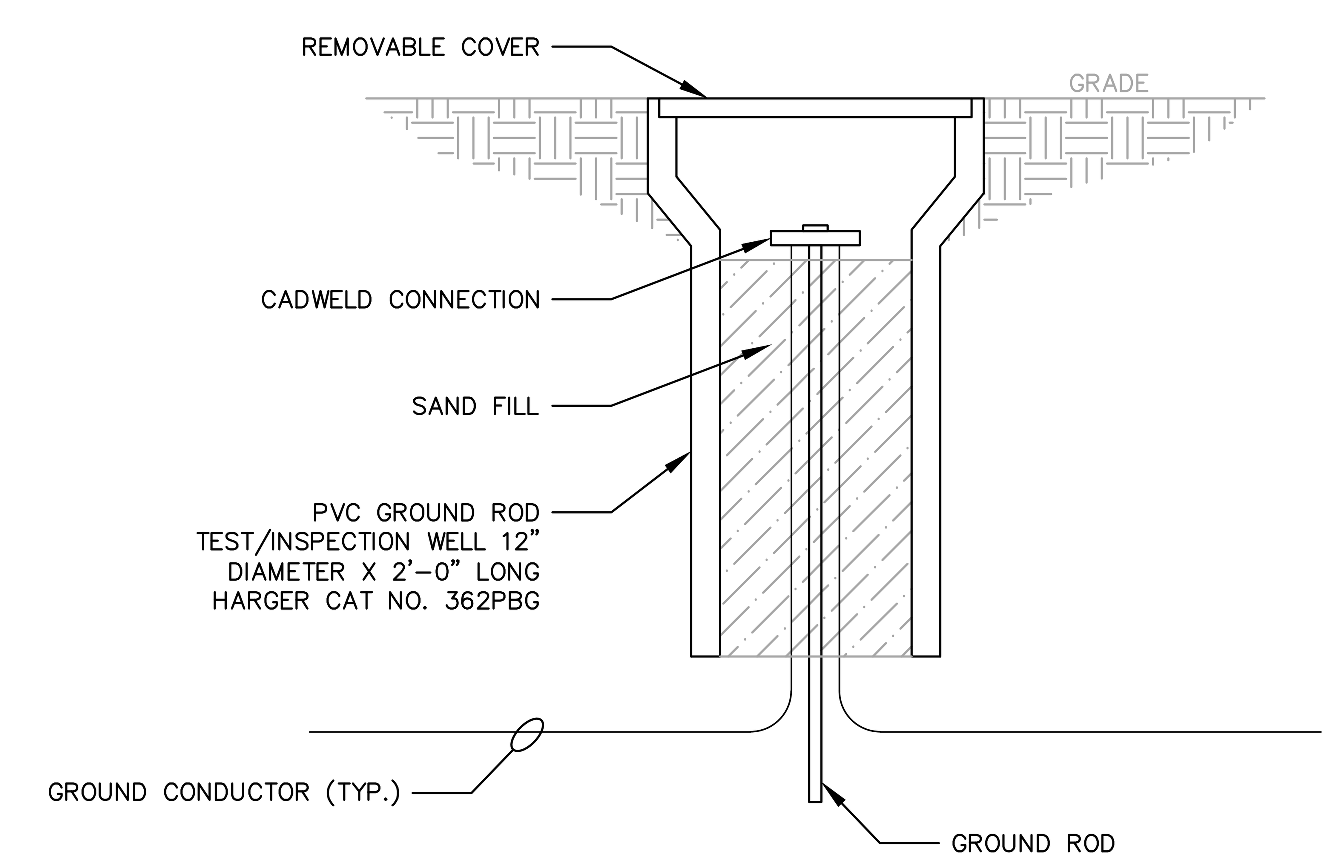
SEALING UNDERGROUND CONDUITS

NOT TO SCALE



GROUND GRID DETAIL

NOT TO SCALE



GROUND TEST WELL DETAIL

NOT TO SCALE

DISTRICT OFFICE: WINCHESTER WATER TREATMENT FACILITY

PROJECT: ELECTRICAL DISTRIBUTION REWORK

REV. #	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

JEREMY E. FARRER REGISTERED No. PE11500293 STATE OF INDIANA PROFESSIONAL ENGINEER

SIMS-DURKIN ASSOCIATES ENGINEERING COMPANY
1545 COUNTRY CLUB ROAD
INDIANAPOLIS, INDIANA 46234
PHONE: 317-209-4035
FAX: 317-222-4120
WEB: WWW.SIMS-DURKIN.COM
SDA PROJECT #2019108

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

SHEET TITLE: ELECTRICAL DETAILS
DATE: 11/15/2019
DESIGNED BY: JEF
DRAWN BY: TEAM
SCALES: AS NOTED
SHEET: E-11

Monthly Report of Operation of Water Treatment Plant
Form 100

Indiana American Water

Winchester-Plant
PWS-ID:5268003

Month: January
Year 2020

Operator Signature: Pamela Sells Date: 2-4-20

Certification # WT3- 031137

I certify, under penalty of law, by this signature that this document was prepared by me, or under my direction, and the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am also aware that there are significant penalties for submitting false information.

IDEM Field Rep: Carolyn Chappell

	Water Treated	Filters						Chemicals (LBS/MG)			Chemicals (lbs)			Physical and Chemical Data (mg/L)								
Date	Treated Water (MGD)	Filter Run (hours)_ TOTAL	Wash Water (MGD) Total	Wash Water (MGD) Filter 1	Wash Water (MGD) Filter 2	Wash Water (MGD) Filter 3	Wash Water (MGD) Filter 4	Hypoch-lorite (Bleach)	HFS (Fluoride)	Orthophosphate (PO4)	Hypoch-lorite (Bleach)	HFS (Fluoride)	Orthophosphate (PO4)	Raw Alk	Eff Alk	Raw pH	Eff pH	Raw Hard	Eff Hard	Raw Iron	Eff Iron	Raw Mn
1/1/2020	0.420	8.8	0.0	0.006	0.006			309.52	23.81	21.43	130	10	9.00								0.01	
1/2/2020	0.500	9.1	0.0			0.006	0.006	232.00	18.00	16.00	116	9	8.00								0.02	
1/3/2020	0.470	12.2	0.0	0.006	0.006			193.62	19.15	14.89	91	9	7.00								0.01	
1/4/2020	0.430	11.0	0.0			0.006	0.006	220.93	23.26	13.95	95	10	6.00									
1/5/2020	0.640	15.9	0.0	0.006	0.006			196.88	15.63	15.63	126	10	10.00									
1/6/2020	0.460	12.3	0.0			0.006	0.006	191.30	15.22	15.22	88	7	7.00	320	320	7.30	7.40	398	394	0.82	0.02	0.13
1/7/2020	0.500	13.0	0.0	0.006	0.006			200.00	18.00	16.00	100	9	8.00								0.01	
1/8/2020	0.500	12.8	0.0			0.006	0.006	192.00	18.00	14.00	96	9	7.00								0.01	
1/9/2020	0.490	13.7	0.0	0.006	0.006			181.63	14.29	14.29	89	7	7.00								0.01	
1/10/2020	0.480	12.7	0.0			0.006	0.006	181.25	18.75	16.67	87	9	8.00								0.02	
1/11/2020	0.480	12.1	0.0	0.006	0.006			191.67	20.83	14.58	92	10	7.00									
1/12/2020	0.485	12.6	0.0			0.006	0.006	191.75	20.62	14.43	93	10	7.00									
1/13/2020	0.455	11.6	0.0	0.006	0.006			191.21	19.78	15.38	87	9	7.00	320	314	7.20	7.40	396	388	0.70	0.02	0.13
1/14/2020	0.470	12.2	0.0			0.006	0.006	180.85	14.89	14.89	85	7	7.00								0.02	
1/15/2020	0.520	13.5	0.0	0.006	0.006			186.54	17.31	15.38	97	9	8.00								0.01	
1/16/2020	0.490	12.8	0.0			0.006	0.006	181.63	18.37	16.33	89	9	8.00								0.02	
1/17/2020	0.480	12.4	0.0	0.006	0.006			189.58	14.58	14.58	91	7	7.00								0.01	
1/18/2020	0.480	12.3	0.0			0.006	0.006	185.42	16.67	14.58	89	8	7.00									
1/19/2020	0.510	13.1	0.0	0.006	0.006			190.20	15.69	15.69	97	8	8.00									
1/20/2020	0.500	12.9	0.0			0.006	0.006	188.00	14.00	16.00	94	7	8.00								0.02	
1/21/2020	0.520	13.3	0.0	0.006	0.006			188.46	13.46	15.38	98	7	8.00								0.01	
1/22/2020	0.530	13.8	'0.0			0.006	0.006	179.25	16.98	16.98	95	9	9.00	320	310	7.20	7.40	390	396	0.67	0.01	0.13
1/23/2020	0.530	14.5	0.0	0.006	0.006			183.02	16.98	15.09	97	9	8.00								0.01	
1/24/2020	0.480	13.4	0.0			0.006	0.006	187.50	16.67	16.67	90	8	8.00								0.01	
1/25/2020	0.490	12.7	0.0	0.006	0.006			191.84	20.41	16.33	94	10	8.00									
1/26/2020	0.510	13.1	0.0			0.006	0.006	188.24	17.65	15.69	96	9	8.00									
1/27/2020	0.550	13.9	0.0	0.006	0.006			187.27	16.36	14.55	103	9	8.00	320	314	7.20	7.40	404	392	0.37	0.02	0.12
1/28/2020	0.500	12.9	0.0			0.006	0.006	128.00	16.00	16.00	64	8	8.00								0.01	
1/29/2020	0.450	11.6	0.0	0.006	0.006			191.11	22.22	15.56	86	10	7.00								0.02	
1/30/2020	0.520	13.3	0.0			0.006	0.006	180.77	17.31	17.31	94	9	9.00								0.02	
1/31/2020	0.520	13.2	0.0	0.006	0.006			173.08	17.31	13.46	90	9	7.00								0.02	
Total	15.360	392.7	0.4	0.096	0.096	0.090	0.090	5954.51	548.18	482.94	2939	270	239.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average	0.50	12.7	0.0	0.01	0.01	0.01	0.01	192.08	17.68	15.58	95	9	7.71	320	315	7.23	7.40	397	393	0.64	0.01	0.13
Min	0.42	8.8	0.0	0.01	0.01	0.01	0.01	128.00	13.46	13.46	64	7	6.00	320	310	7.20	7.40	390	388	0.37	0.01	0.12
Max	0.64	15.9	0.0	0.01	0.01	0.01	0.01	309.52	23.81	21.43	130	10	10.00	320	320	7.30	7.40	404	396	0.82	0.02	0.13

Comments: Chemicals are measured in wet lbs unless otherwise noted

Monthly Report of
Operation of Water
Treatment Plant
Form 100

Indiana American Water

Winchester-Plant
PWS-ID:5268003

Month: January
Year 2020

								Distribution System									
	Chlorine Residual (mg/L)							(W-E) Elevated Tank			(W-G) 191 N Middle Rd			(W-J) 115 E Fourth			
Date	Eff Mn	Eff PO4	Eff Fluoride	Eff CL2 Free	Eff CL2 Total	Dist CL2 Free	Dist CL2 Total	pH	Alk.	Phos.	pH	Alk.	Phos.	pH	Alk.	Phos.	Remarks
1/1/2020	0.02	1.36	0.80	0.80	0.94	0.60	0.68										
1/2/2020	0.01	1.45	0.81	0.96	1.03	0.70	0.82										
1/3/2020	0.01	1.53	0.74	1.04	1.09	0.71	0.79										
1/4/2020		1.54	0.83	1.19	1.24	0.79											
1/5/2020		1.47	0.80	1.01	1.09	0.86											
1/6/2020	0.02	1.56	0.79	1.05	1.09	0.75	0.82	7.40	320.00	1.43	7.40	330.00	1.47	7.50	324.00	1.41	
1/7/2020	0.01	1.73	0.76	1.16	1.36	0.84	0.91										
1/8/2020	0.01	1.58	0.83	1.06	1.09	0.53	0.63										
1/9/2020	0.01	1.46	0.70	0.99	1.07	1.16	1.25										
1/10/2020	0.01	1.47	0.70	1.06	1.16	0.68	0.77										
1/11/2020		1.67	0.77	1.16	1.26	1.00											
1/12/2020		1.53	0.83	1.12	1.17	0.91											
1/13/2020	0.02	1.60	0.86	1.00	1.03	0.80	0.86				7.50	322.00	1.73	7.50	322.00	1.58	
1/14/2020	0.01	1.35	0.85	1.04	1.13	0.92	1.01	7.40	318.00	1.47							
1/15/2020	0.01	1.25	0.72	1.13	1.20	0.78	0.88										
1/16/2020	0.01	1.34	0.74	1.12	1.17	0.69	0.78										
1/17/2020	0.01	1.65	0.80	0.97	1.07	0.66	0.74										
1/18/2020		1.55	0.70	1.05	1.19	1.04											
1/19/2020		1.51	0.80	1.07	1.19	0.95											
1/20/2020	0.01	1.64	0.70	1.10	1.18	0.74	0.86										
1/21/2020	0.01	1.46	0.74	1.10	1.14	1.11	1.16										
1/22/2020	0.02	1.64	0.80	1.02	1.08	0.70	0.83										
1/23/2020	0.01	1.70	0.80	1.28	1.35	0.70	0.79										
1/24/2020	0.01	1.61	0.74	1.14	1.22	0.63	0.76										
1/25/2020		1.69	0.70	1.43	1.51	1.21											
1/26/2020		1.53	0.74	1.12	1.20	0.78											
1/27/2020	0.02	1.53	0.73	1.20	1.22	1.10	1.21										
1/28/2020	0.01	1.56	0.73	1.04	1.13	0.73	0.86										
1/29/2020	0.02	1.58	0.70	1.06	1.10	1.00	1.08										
1/30/2020	0.02	1.20	0.74	1.20	1.27	0.70	0.84										
1/31/2020	0.01	1.40	0.80	1.28	1.36	0.75	0.87										
Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14.80	638.00	2.90	14.90	652.00	3.20	15.00	646.00	2.99	
Average	0.01	1.52	0.77	1.10	1.17	0.82	0.88	7.40	319.00	1.45	7.45	326.00	1.60	7.50	323.00	1.50	
Min	0.01	1.20	0.70	0.80	0.94	0.53	0.63	7.40	318.00	1.43	7.40	322.00	1.47	7.50	322.00	1.41	
Max	0.02	1.73	0.86	1.43	1.51	1.21	1.25	7.40	320.00	1.47	7.50	330.00	1.73	7.50	324.00	1.58	

Monthly Report of Operation of Water Treatment Plant
Form 100

Indiana American Water

Winchester-Plant
PWS-ID:5268003

Operator Signature: Pamela Sells Date: 3-3-20

Certification # WT3- 031137

I certify, under penalty of law, by this signature that this document was prepared by me, or under my direction, and the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am also aware that there are significant penalties for submitting false information.

IDEM Field Rep: Carolyn Chappell

Month:	February
Year	2020

	Water Treated	Filters						Chemicals (LBS/MG)		
Date	Treated Water (MGD)	Filter Run (hours)_ TOTAL	Wash Water (MGD) Total	Wash Water (MGD) Filter 1	Wash Water (MGD) Filter 2	Wash Water (MGD) Filter 3	Wash Water (MGD) Filter 4	Hypoch-lorite (Bleach)	HFS (Fluoride)	Orthophosphate (PO4)
2/1/2020	0.520	13.5	0.0			0.006	0.006	203.85	34.62	17.31
2/2/2020	0.540	13.8	0.0	0.006	0.006			175.93	20.37	14.81
2/3/2020	0.520	13.3	0.0			0.006	0.006	165.38	21.15	15.38
2/4/2020	0.390	10.2	0.0	0.006	0.006			184.62	25.64	17.95
2/5/2020	0.430	11.0	0.0			0.006	0.006	167.44	20.93	13.95
2/6/2020	0.540	14.9	0.0	0.006	0.006			175.93	22.22	16.67
2/7/2020	0.460	12.4	0.0			0.006	0.006	171.74	21.74	17.39
2/8/2020	0.430	11.2	0.0	0.006	0.006			181.40	20.93	13.95
2/9/2020	0.410	11.3	0.0			0.006	0.006	170.73	21.95	17.07
2/10/2020	0.650	16.3	0.0	0.006	0.006			170.77	23.08	15.38
2/11/2020	0.540	13.8	0.0			0.006	0.006	166.67	24.07	16.67
2/12/2020	0.390	8.4	0.0	0.006	0.006			223.08	17.95	15.38
2/13/2020	0.480	9.2	0.0			0.006	0.006	327.08	20.83	16.67
2/14/2020	0.730	13.5	0.0	0.006	0.006			219.18	10.96	16.44
2/15/2020	0.460	8.7	0.0			0.006	0.006	223.91	13.04	15.22
2/16/2020	0.560	11.0	0.0	0.006	0.006			223.21	14.29	17.86
2/17/2020	0.410	7.9	0.0			0.006	0.006	224.39	9.76	17.07
2/18/2020	0.690	13.3	0.0	0.006	0.006			221.74	14.49	15.94
2/19/2020	0.480	9.4	0.0			0.006	0.006	137.50	14.58	16.67
2/20/2020	0.540	11.2	0.0	0.006	0.006			211.11	12.96	14.81
2/21/2020	0.470	10.1	0.0			0.006	0.006	217.02	14.89	17.02
2/22/2020	0.610	11.9	0.0	0.006	0.006			213.11	13.11	16.39
2/23/2020	0.370	7.3	0.0			0.006	0.006	218.92	10.81	18.92
2/24/2020	0.660	12.8	0.0	0.006	0.006			207.58	13.64	15.15
2/25/2020	0.420	8.3	0.0			0.006	0.006	207.14	14.29	16.67
2/26/2020	0.680	12.9	0.0	0.006	0.006			213.24	14.71	16.18
2/27/2020	0.360	6.9	0.0			0.006	0.006	213.89	5.56	16.67
2/28/2020	0.570	11.3	0.0	0.006	0.006			135.09	10.53	10.53
2/29/2020	0.350	6.9	0.0			0.006	0.006	220.00	17.14	17.14
Total	14.660	322.7	0.3	0.084	0.084	0.090	0.090	5791.63	500.24	467.27
Average	0.51	11.1	0.0	0.01	0.01	0.01	0.01	199.71	17.25	16.11
Min	0.35	6.9	0.0	0.01	0.01	0.01	0.01	135.09	5.56	10.53
Max	0.73	16.3	0.0	0.01	0.01	0.01	0.01	327.08	34.62	18.92

	Chemicals (lbs)			Physical and Chemical Data (mg/L)								
Date	Hypoch-lorite (Bleach)	HFS (Fluoride)	Orthophosphate (PO4)	Raw Alk	Eff Alk	Raw pH	Eff pH	Raw Hard	Eff Hard	Raw Iron	Eff Iron	Raw Mn
2/1/2020	106	18	9.00									
2/2/2020	95	11	8.00									
2/3/2020	86	11	8.00	320	320	7.20	7.40	396	398	0.62	0.02	0.12
2/4/2020	72	10	7.00								0.01	
2/5/2020	72	9	6.00								0.01	
2/6/2020	95	12	9.00								0.01	
2/7/2020	79	10	8.00								0.02	
2/8/2020	78	9	6.00									
2/9/2020	70	9	7.00									
2/10/2020	111	15	10.00	328	314	7.20	7.40	382	380	0.65	0.02	0.12
2/11/2020	90	13	9.00								0.01	
2/12/2020	87	7	6.00								0.02	
2/13/2020	157	10	8.00								0.02	
2/14/2020	160	8	12.00								0.02	
2/15/2020	103	6	7.00									
2/16/2020	125	8	10.00									
2/17/2020	92	4	7.00								0.01	
2/18/2020	153	10	11.00								0.03	
2/19/2020	66	7	8.00	328	318	7.10	7.30	404	416	1.10	0.03	0.16
2/20/2020	114	7	8.00								0.02	
2/21/2020	102	7	8.00								0.02	
2/22/2020	130	8	10.00									
2/23/2020	81	4	7.00									
2/24/2020	137	9	10.00	322	322	7.10	7.30	404	408	1.13	0.03	0.16
2/25/2020	87	6	7.00								0.02	
2/26/2020	145	10	11.00								0.02	
2/27/2020	77	2	6.00								0.02	
2/28/2020	77	6	6.00								0.01	
2/29/2020	77	6	6.00									
Total	2924	252	235.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average	101	9	8.10	325	319	7.15	7.35	397	401	0.88	0.02	0.14
Min	66	2	6.00	320	314	7.10	7.30	382	380	0.62	0.01	0.12
Max	160	18	12.00	328	322	7.20	7.40	404	416	1.13	0.03	0.16

Comments: Chemicals are measured in wet lbs unless otherwise noted