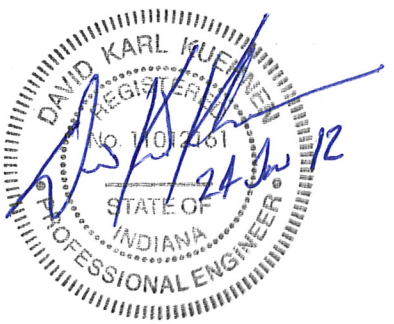
Specifications

South Richland Conservancy District
Old US Highway 31
Water Main Extension

Rochester, Indiana
Fulton County

Prepared for:
Textron Inc.



Prepared by:
AMEC E&I
8901 N. Industrial Road
Peoria, IL 61615

AMEC Project No. 3359092490

November 2011

South Richland Conservancy District
Old US Highway 31
Water Main Extension
AMEC Project No. 3359092490

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SECTION 00020
INVITATION TO BID

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The proposed Work is officially known as the "South Richland Conservancy District Old US Highway 31 Water Main Extension" and consists of the following:

1. Installation of approximately 18,900 LF of 4-inch and 6-inch water main.
2. Installation of approximately 5,890 LF of 1-inch and 2-inch service piping
3. Water service connection to approximately 34 homes
4. Supply and installation of water booster station complete with pumps, chlorine addition equipment, and backup natural gas powered generator
5. Installation of miscellaneous appurtenances.
6. Surface restoration and cleanup.

1.02 TYPE OF BID

A. Bids for the "South Richland Conservancy District Old US Highway 31 Water Main Extension" project will be on a unit price basis.

1.03 PREBID MEETING

A. A pre-bid teleconference meeting will be held prior to the bid opening.

1.04 TIME AND LOCATION FOR OPENING OF BIDS

A. Sealed bids for the installation of the "South Richland Conservancy District Old US Highway 31 Water Main Extension" project will be received at AMEC Environment & Infrastructure, Inc. (AMEC), until 1:00 PM (prevailing time) on XXX Date at 8901 N. Industrial Road, Peoria, Illinois, 61615.

B. All Bids received will be publicly opened and read aloud at the above time and place.

1.05 EXAMINATIONS AND PROCUREMENT OF DOCUMENTS

A. The contract documents may be examined at the following locations:

1. AMEC Environment & Infrastructure, Inc. 8901 N. Industrial Road, Peoria, Illinois 61615

B. Copies of the above documents may be obtained at the office of AMEC Environment & Infrastructure, Inc. located at 8901 N. Industrial Road, Peoria, IL 61615, by paying the non-refundable sum of TWENTY DOLLARS ($20.00) per set with a limit of two (2) sets per prospective Bidder.

1.06 BID SECURITY

A. Bid Security in the amount of ten percent (10%) of the Bid must accompany each Bid in accordance with the Instructions to Bidders.

1.07 PERFORMANCE AND PAYMENT BONDS

A. The successful Bidder will be required to furnish a satisfactory Performance Bond and Payment Bond in the full amount of the Bid. No Bid shall be withdrawn after the opening of the Bids for a period of ninety (90) days after the scheduled time of closing Bids.

1.08 RIGHT TO REJECT BIDS

A. AMEC and Textron reserve the right to waive irregularities and to reject any and all Bids. Unless all Bids are rejected, award shall be made to the low, responsive, responsible Bidder after the Bid evaluation.

– End of Section –

SECTION 00100
INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 DEFINED TERMS

A. The term "Bidder" means one who submits a Bid directly to AMEC Environment & Infrastructure, Inc. (AMEC), as distinct from a sub-bidder, who submits a bid to a Bidder. The term “OWNER” means Textron Inc. The term “ENGINEER” means AMEC. The term "Successful Bidder" means the lowest, qualified, responsible and responsive Bidder to whom AMEC (on the basis of AMEC’S and OWNER'S evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.02 COPIES OF BIDDING DOCUMENTS

A. Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from AMEC.

B. Complete set of Bidding Documents must be used in preparing Bids; neither OWNER nor AMEC assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

C. OWNER and AMEC in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

1.03 QUALIFICATIONS OF BIDDERS

To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days of AMEC'S request written evidence, such as financial data, previous experience, present commitments and other such data as may be called for below. Each Bid must contain evidence of Bidder'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.

1.04 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work, (c) consider federal, state, and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify AMEC of all conflicts, errors, or discrepancies in the Contract Documents.

1.05 INTERPRETATIONS AND ADDENDA

A. All questions about the meaning or intent of the Contract Documents are to be directed to AMEC. Interpretations or clarifications considered necessary by AMEC in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by AMEC as having received the Bidding Documents. Questions received less than five working days prior to the date for opening of Bids 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.

B. Addenda may also be issued to modify the Bidding Documents as deemed advisable by AMEC.

1.06 BID SECURITY

A. Each Bid must be accompanied by Bid security made payable to AMEC in an amount of ten percent (10%) of the Bidder's maximum Bid price and in the form of a certified check or bank check or a Bid Bond issued by a surety.

B. The Bid security of the Successful Bidder will be retained until such Bidder has executed the Construction Services Subcontract Agreement (Agreement) and furnished the required contract security, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within ten days after the Notice of Award, AMEC may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom AMEC believes to have a reasonable chance of receiving the award may be retained by AMEC until the earlier of the seventh day after the Effective Date of the Agreement or the forty-sixth day after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security with Bids which are not competitive will be returned within seven days after the Bid opening.

1.07 COVENANT AGAINST CONTINGENT FEES

The contractor shall warrant that no person or selling agency has been employed or retained to solicit or secure the Agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee. For breach or violation of this warranty, AMEC shall have the right to annul the Agreement without liability or in its discretion to deduct from the Agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

1.08 CONTRACT TIME

The numbers of days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the Contract Time) are set forth in the Bid Form and the Agreement.

1.09 LIQUIDATED DAMAGES

Provisions for liquidated damages, if any, are set forth in the Agreement.

1.10 SUBSTITUTE OR "OR-EQUAL" ITEMS

The Agreement, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Sub-CONTRACTOR if acceptable to AMEC, application for such acceptance will not be considered by AMEC until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by AMEC is set forth in Paragraph 2.17 of the Agreement.

1.11 SUBCONTRACTORS, SUPPLIERS, AND OTHERS

A. The apparent Successful Bidder, and any other Bidder so requested, shall within seven days after the Bid opening submit to AMEC a list of all such Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or person or organization if requested by AMEC. If AMEC after due investigation has reasonable objection to any proposed Subcontractor, Supplier, or other person or organization, either may before the Notice of Award is given request the apparent successful Bidder to submit an acceptable substitute without an increase in Bid price. If apparent Successful Bidder declines to make any such substitution, AMEC may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, or other person or organization listed and to whom AMEC does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to AMEC subject to revocation of such acceptance after the Effective Date of the Agreement.

B. If Agreements where the Contract Price is on the basis of Cost-of-the-Work Plus a Fee, the apparent Successful Bidder, prior to the Notice of Award, shall identify in writing to AMEC those portions of the Work that such Bidder proposes to subcontract and after the Notice of Award may only subcontract other portions of the Work with AMEC'S written consent.

C. No CONTRACTOR shall be required to employ any Subcontractor, Supplier, other person, or organization against whom Subcontractor has reasonable objection.

1.12 BID FORM

A. The Bid Form is included with the Bidding Documents; additional copies may be obtained from AMEC.

B. All blanks on the Bid Form must be completed in ink or by typewriter.

C. Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

D. Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

E. All names must be typed or printed below the signature.

F. The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).

G. The address and telephone number for communications regarding the Bid must be shown.

1.13 SUBMISSION OF BIDS

Bids shall be submitted at the time and place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of the Bidder and accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

1.14 MODIFICATION AND WITHDRAWAL OF BIDS

A. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

B. If, within twenty-four hours after Bids are opened, any Bidder who files a duly signed, written notice with AMEC and promptly thereafter demonstrates to the reasonable satisfaction of AMEC that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw it's Bid and the Bid security will be returned. Thereafter, that Bidder will be disqualified from further bidding on the Work to be provided by the Contract Documents.

1.15 OPENING OF BIDS

Bids will be opened and (unless obviously non-responsive) read aloud publicly. A bid tab of the amounts of the base Bids and major alternates (if any) will be made available to Bidders after the opening of Bids.

1.16 BIDS TO REMAIN SUBJECT TO ACCEPTANCE

All bids will remain subject to acceptance for ninety days (90) after the day of the Bid opening, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to that date.

1.17 AWARD OF CONTRACT

A. AMEC reserves the right to reject any and all Bids, to waive any and all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced or conditional Bids. Also, AMEC reserves the right to reject the Bid of any Bidder if AMEC believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by AMEC. AMEC reserves the right to consider as unqualified to do the work of general construction any Bidder who does not habitually perform with his own forces the major portions of the work involved in construction of the Improvements embraced in this Contract. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

B. In evaluating Bids, AMEC will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

C. AMEC may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted. AMEC also may consider 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.

D. AMEC may conduct such investigations as AMEC deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to AMEC'S satisfaction within the prescribed time.

E. If the Agreement is to be awarded, it will be awarded to the lowest, responsive, responsible Bidder whose evaluation by AMEC indicates to AMEC that the award will be in the best interests of the Project.

F. If the Agreement is to be awarded, AMEC will give the Successful Bidder a Notice of Award within ninety (90) days after the day of the Bid opening.

1.18 CONTRACT SECURITY

When the Successful Bidder delivers the executed Agreement to AMEC, it must be accompanied by the required Performance and Payment Bonds.

1.19 SIGNING OF AGREEMENT

When AMEC gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten days thereafter, CONTRACTOR shall sign and deliver the

required number of counterparts of the Agreement and attached documents to AMEC with the required Bonds. Within ten days thereafter, AMEC shall deliver one fully signed counterpart to Subcontractor.

– End of Section –

SECTION 00410
BID FORM

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

AMEC Environment & Infrastructure, Inc.
8901 N Industrial Road
Peoria, IL 61615
(herein after called "AMEC")

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with AMEC in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of AMEC. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within ten days after the date of AMEC's Notice of Award.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work.

D. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

E. Bidder is aware of the general nature of work to be performed by AMEC and others at the Site that relates to the Work as indicated in the Bidding Documents.

F. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents,

and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

G. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

H. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

I. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. This Bid 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 agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over AMEC.

ARTICLE 5 – BASIS OF BID

5.01 Bidder understands the following: Bidder will complete the Work for the following price(s):

BASE BID – BID SCHEDULE

No.	Item	Unit	Unit Price	Quantity	Total Amount
1.	4" watermain	LF		4,280	
2.	4" watermain (directionally drilled)	LF		465	
3.	6" watermain	LF		12,529	
4.	6" watermain (directionally drilled)	LF		914	
5.	6" watermain (directionally drilled) River Crossing	LF		738	
6.	6" Gate Valve and Valve Box	EA		27	
7.	4" Gate Valve and Valve Box	EA		12	
8.	6x6x4" tee	EA		4	
9.	6x6x6" tee	EA		2	
10.	12x6" reducer	EA		1	
11.	6" Air Release Valve	EA		4	
12.	Automatic Flushing System, Complete w/ Valve and Valve Box	EA		2	

No.	Item	Unit	Unit Price	Quantity	Total Amount
13.	4" Flushing Hydrant, w/ Valve and Valve Box Complete with up to 15' of piping	EA		6	
14.	6" Flushing Hydrant, w/ Valve and Valve Box Complete with up to 15' of piping	EA		14	
15.	Master Meter and Vault, Complete	LS		1	
16.	RPZ System and Enclosure, Complete	LS		1	
17.	Booster Pump/Generator/Chlorine Station, Complete	LS		1	
18.	Install Booster/Generator/Chlorine Station, Complete	EA		1	
19.	Saddle, Tap, Corp Stop, Curb Stop and Box	EA		34	
20.	Service Piping, 1", with tracer wire	LF		5,634	
21.	Service Piping, 2", with tracer wire	LF		256	
22.	Water Meter, Installed	EA		34	
23.	Service Connection to Home, Complete including water shutoff valve, disconnection of existing service from well system and connection to new potable service	EA		34	
24.	Internal Re-plumbing of Well System For Outdoor Use, Complete	EA		34	
25.	Select Backfill Compacted In Place	CY		1,077	
26.	Abandon Existing Well	EA		4	
27.	Seeding/Yard Restoration	SY		9,447	
28.	Driveway, Bituminous R&R	SY		245	
29.	Driveway, Gravel R&R	SY		1,031	
30.	Driveway, Concrete R&R	SY		23	
31.	Driveway, Booster Station	SY		205	
32.	Rip Rap	SY		78	
33.	Flared End Section, Installed	EA		1	
34.	Exploration Excavation	CY		500	
35.	Yard Hydrant, Complete	EA		1	
36.	Tie-In to Existing Main	LS		1	
37.	Pre-Construction Videos & Photos	LS		1	
38.	Traffic Control	LS		1	
				Total Bid	

TOTAL BASE BID AMOUNT WRITTEN IN WORDS

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

Any other item of work not covered in the BID, but necessary for the completion of the project shall be included in the Contract Price for the items to which the work pertains. All specified cash allowances are included in the price(s) set forth above and have been computed in accordance with Paragraph 11.02 of the General Conditions.

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within 150 calendar days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions within 180 calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

Required Bid security in the form of certified check, bank check or a Bid Bond issued by a Surety.

ARTICLE 8 - COMMUNICATIONS CONCERNING BID

8.01 Communications Concerning this Bid shall be addressed to:

AMEC Environment &Infrastructure, Inc.
8901 N. Industrial Road, Peoria, IL 61615
phone: (309) 692-4422
fax: (309) 692-9364

ARTICLE 9 - DEFINED TERMS

9.01 The terms used in this Bid which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents have the meanings assigned to them in the General Conditions.

ARTICLE 10 - BID SUBMITTAL

10.01 This Bid submitted by: _____

SUBMITTED on _____ _____, 2012.

If Bidder is:

An Individual

By _____ *(Seal)*

doing business as _____

Business address: _____

_____ Phone No.: _____

A Partnership

By _____ *(Seal)*
(Firm Name)

_____
(General Partner)

Business Address _____

_____ Phone No.: _____

A Corporation

By _____
(Corporation Name)

_____
(State of Incorporation)

By _____
(Name of Person Authorized to Sign) (Title)

(Corporate Seal)

Attest _____
(Secretary)

Business Address _____

_____ Phone No. _____

A Joint Venture

By _____
(Name)

_____
(Address)

By _____
(Name)

_____
(Address)

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

SECTION 00520
AGREEMENT, BONDS, AND CERTIFICATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contract, bonds, and certificates shall be those assembled by the ENGINEER and shall consist of the following:

Construction Services Subcontract Agreement
Performance Bond
Payment Bond
Notice of Award
Notice to Proceed
Application for Payment
Subcontract Change Order
Closeout Form and Lien Release

B. Copies of the Agreement, bonds, and certificates follow for reference.

Construction Services Subcontract Agreement
{Enter Master or Project Specific here}
AGREEMENT No. {Enter Agreement Number}

This Subcontract Agreement ("Agreement") is made and entered into this {Enter date here} day of {Enter Month, Year here}, by and between **AMEC E&I, Inc.** (hereafter called "AMEC") and {Enter subcontractor name here} ("Subcontractor"), **{ENTER CORPORATION, PARTNERSHIP, SOLE PROPRIETOR OR LLC}**.

WHEREAS, AMEC has been, and in the future may also be, engaged to furnish design and construction services (collectively, "Services") for a client(s) in connection with a project(s) (collectively, "Project"); and

NOW THEREFORE, for good and valuable consideration, including the promises contained herein, the receipt and sufficiency of which is mutually acknowledged, of the foregoing recitals, undertakings and agreements hereinafter set forth, the parties agree as follows:

ARTICLE 1
SCOPE OF WORK

1.1 SUBCONTRACTOR'S WORK.

1.1.1 This Agreement is being entered into for the purpose of retaining Subcontractor to provide, and Subcontractor agrees to provide, all labor, materials and services required by, and reasonably inferable from, this Agreement, all work order(s) issued by AMEC from time-to-time hereunder in the form attached hereto as Exhibit "A" (individually, "Work Order" and, collectively, "Work Orders"), the prime agreement(s) with a client(s) which is identified in Section 1.1.1.1 or 1.1.1.2 below, and all other documents as indicated in Article 13 below (collectively, "Contract Documents"), which are necessary or incidental to complete the obligations of Subcontractor as described in the Work Orders ("Work"). The Client(s) is:

1.1.1.1 ☐ **{ENTER NAME OF CLIENT}**("Client") under that prime agreement between AMEC and Client dated , 20 ("Prime Agreement"), or

1.1.1.2 ☐ various clients (individually and collectively, "Client") under various prime agreements (individually and collectively, "Prime Agreement").

1.1.2 If Section 1.1.1.1 is applicable, a copy of the Prime Agreement, which may be redacted, is attached hereto as Exhibit "B" and incorporated by reference herein and in each Work Order issued hereunder.

1.1.3 If Section 1.1.1.2 is applicable, a copy of each Prime Agreement, which may be redacted, will be attached as Exhibit "A" to the first Work Order issued hereunder with respect to each Prime Agreement and incorporated by reference herein as well as in the first Work Order and each subsequent Work Order issued hereunder with respect to each Prime Agreement.

1.1.4 Each Work Order shall constitute a separate and individual undertaking and will include the scope of Work, schedule of Work, amount of compensation, or method for determining the amount of compensation, that Subcontractor will be paid for performing all Work ("Contract Price"), and any special provisions or conditions specific to the Work, which is a portion of the design and/or construction services required of AMEC by its client under the Prime Agreement ("Client"). Work shall not commence until a Work Order has been approved and signed by an authorized representative of AMEC. Work outside the scope of Work described in the applicable Work Order without a signed Change Order in the form attached hereto as Exhibit "C" (individually, "Change Order" and, collectively, "Change Orders") will be at Subcontractor's risk.

1.1. 5 All Work authorized by Work Orders under this Agreement shall be subject to its terms, except as otherwise modified in writing by mutual consent of AMEC and Subcontractor in a Work Order. AMEC does not guarantee that a minimum amount of Work will be ordered under this Agreement. By signing each Work Order, Subcontractor acknowledges that it has satisfied itself as to the nature and extent of the Work. Any representation(s) made by AMEC, but not expressly included in, a Work Order shall be deemed only for the information of Subcontractor and shall not render AMEC responsible or liable therefore.

1.1.6 Subcontractor hereby agrees to perform the Work in a professional, workman-like and timely manner under the general direction of AMEC and in accordance with the Contract Documents.

1.2 INCORPORATION OF PRIME AGREEMENT.

Subcontractor shall be bound to AMEC to the same extent that AMEC is bound to Client under the Prime Agreement. Subcontractor shall similarly incorporate the Prime Agreement in any further subcontract entered into by Subcontractor with any lower-tier subcontractors. Subcontractor shall make available to its lower-tier subcontractors the Contract Documents that are binding on the lower-tier subcontractors. By signing this Agreement, in the instance of Section 1.1.1.1 above, or by signing the first Work Order, in the instance of Section 1.1.1.2 above, Subcontractor represents that it has received and reviewed a copy of the Prime Agreement and is familiar, or will familiarize itself, with it. To the extent that any provision

contained in this Agreement conflicts with any provision of the Prime Agreement, the document or provision that imposes the more stringent conditions and requirements on Subcontractor shall apply. Once executed, any changes to this Agreement, and any other Contract Documents applicable thereto, must be made by an amendment to this Agreement and/or the applicable Work Order(s) which is signed by both parties. Nothing in this Agreement shall be construed to create a third party beneficiary or contractual relationship between persons or entities other than AMEC and Subcontractor.

1.3 TERM OF AGREEMENT

This Agreement shall commence as of the date first set forth above and shall expire on the last to occur of (i) the date on which Work on the Project concludes, (ii) completion of the Work under all Work Orders has been finally completed, or (iii) until {Enter date here}, unless earlier terminated in accordance with the termination provisions of this Agreement ("Term"). The Term may be extended only by written amendment signed by both Parties. Subcontractor shall perform the Work within the dates specified in each Work Order and in accordance with the applicable schedule of Work.

ARTICLE 2
SUBCONTRACTOR'S RESPONSIBILITIES

2.1 RESPONSIBILITIES.

2.1.1 Subcontractor shall furnish all of the labor, materials, equipment, construction equipment and services, including, but not limited to, competent supervision, shop drawings, samples and tools, as are necessary for the proper performance of each Work Order in strict accordance with this Agreement and the other Contract Documents.

2.1.2 Subcontractor shall provide a list of proposed lower-tier subcontractors and major suppliers to AMEC for approval, and shall be responsible for taking field dimensions, providing tests, obtaining required permits and affidavits, ordering materials and taking all other actions as required to meet the schedule specified in each Work Order. Subcontractor and lower-tier subcontractors shall not employ on the Project any unfit person or anyone not skilled in the tasks assigned to him or her.

2.1.3 Subcontractor shall be solely responsible for determining the means, manner and methods of performing the Work.

2.1.4 Subcontractor will not communicate about the Work with the Client.

2.2 INCONSISTENCIES AND OMISSIONS.

Should inconsistencies and/or omissions appear in the Contract Documents, it shall be the duty of Subcontractor to notify AMEC in writing within three (3) business days, excluding Saturdays, Sundays and federal holidays, ("Business Days") of discovery by Subcontractor. Upon receipt of such notice, AMEC shall instruct Subcontractor in writing as to the measures to be taken with respect to such inconsistencies and/or omissions, and Subcontractor shall comply with AMEC's instructions.

2.3 SUBMITTALS.

Subcontractor shall be responsible to AMEC for the accuracy of and conformity with the Contract Documents of all shop drawings, samples and other submittals that pertain to the Work. Approval of submittals by AMEC shall not be deemed to authorize deviations or substitutions from the requirements of the Contract Documents, nor shall such action by AMEC be construed to relieve or release Subcontractor from any obligations or liabilities pertaining to the Work required by the applicable Work Order(s).

2.4 TEMPORARY SERVICES.

Subcontractor is responsible for temporary services agreed to by AMEC and Subcontractor. Common temporary services include, but are not limited to, hoisting, scaffolding, trash disposal, installation, maintenance and removal of temporary utilities (power, lighting, water, heating and cooling, telephones, toilets), utility charges, temporary offices and storage facilities, and security.

2.5 COORDINATION.

Subcontractor shall:

2.5.1 cooperate with AMEC and all others whose work may interfere with the Work;

2.5.2 specifically note and immediately advise AMEC of any such interference with the Work; and

2.5.3 participate in the preparation of coordination drawings and Work schedules in areas of congestion.

2.6 SUBCONTRACTOR'S REPRESENTATIVE.

Subject to AMEC's approval under Section 12.7 below, Subcontractor shall designate an individual who is authorized to act on Subcontractor's behalf to be Subcontractor's representative ("Subcontractor's Representative"). Subcontractor's Representative shall be the person to whom AMEC shall issue instructions, orders or directions, except in an emergency.

2.7 PROVISIONS FOR INSPECTION.

AMEC shall at all reasonable times have access to the Work wherever it is in preparation or progress. Subcontractor shall at all times furnish AMEC and its representatives with adequate facilities for inspecting materials at the Project site

or any place where materials under this Agreement may be in the course of preparation, process, manufacture or treatment. Subcontractor shall furnish to AMEC, in such detail and as often as requested, full reports of the progress of the Work, irrespective of its location.

2.8 CLEANUP.

Subcontractor shall at all times keep the Project site free from debris and unsafe conditions resulting from the Work, and broom clean each work area prior to discontinuing Work in that area. If Subcontractor fails to commence compliance with cleanup duties within twenty-four (24) hours after written notification from AMEC of non-compliance, AMEC may undertake necessary cleanup measures without further notice and deduct the cost thereof from any amounts due or to become due Subcontractor.

2.9 SAFETY.

2.9.1 Subcontractor shall take reasonable precautions to perform the Services in a safe manner. Subcontractor will be solely responsible for working conditions on those portions of the project site reasonably within Subcontractor's work area and/or where Subcontractor is taking Samples (hereinafter defined) and in its laboratory and facilities, if applicable, including the safety of all persons and property during performance of the Services, in addition to providing any and all safety equipment or articles necessary to protect its employees and agents and to comply with applicable OSHA regulations and requirements of the owner and/or operator of the project site. Any monitoring of Subcontractor's procedures conducted by AMEC will not include a review of the adequacy of Subcontractor's safety measures in, on, adjacent to, or near any project site or in Subcontractor's laboratory and facilities, if applicable. AMEC is not responsible for any laboratory safety, and AMEC's responsibility for project site safety is limited solely to its own employees and the provision of appropriate training, supervision and personal protective equipment for those employees.

2.9.2. If property damage or bodily injury occurs in the course, or as a result, of Subcontractor's performing the Services, Subcontractor shall immediately notify AMEC. The initial written incident report will be prepared by Subcontractor, followed by a detailed written account of the incident within three (3) calendar days after its occurrence in a form acceptable to AMEC and which includes the results of a comprehensive incident investigation identifying root causes and detailing the corrective actions. Subcontractor will implement to prevent the reoccurrence of a similar incident. The final, written incident report shall be submitted to AMEC within five (5) calendar days of the occurrence. A written request for an extension of the submission deadline must be provided by Subcontractor to, and agreed to by, AMEC prior to expiration of the applicable submission deadline.

2.9.3 Subcontractor acknowledges that it is familiar with the Services and will familiarize itself with (i) the known and the inherent hazardous conditions of each project site, prior to commencing performance of the Services, and (ii) the necessity for the use of safety measures by its personnel during performance of the Services. Subcontractor shall comply with all applicable safety laws and regulations (hereinafter defined) including, but not limited to, those under federal and state occupational, safety, and health acts, and in particular the provisions of OSHA 29 CFR 1910 and 1926:120, and shall comply with the more stringent of those or any site specific safety programs and procedures when required by AMEC, or CLIENT, or both.

2.9.4 If an emergency caused by Subcontractor, its employees or agents, threatens the life or health of any person(s) or property damage, and it is impracticable for AMEC to obtain prior authorization from Subcontractor, AMEC may, but is not obligated to, take such reasonable actions as it deems appropriate to attempt to mitigate or avoid the threatened injury or damage. Subcontractor shall reimburse all of AMEC's costs incurred thereby.

2.9.5 Subcontractor shall prepare and submit to AMEC's project manager an appropriate Health and Safety Plan or a job-specific Job Hazard Analysis, as specified in the applicable Work Order prepared for the performance of the Services.

2.9.6 Should SUBCONTRACTOR or it's subcontractors be involved in any safety related incident which results in an OSHA Recordable incident and or a lost time accident, AMEC may hold SUBCONTRACTOR responsible for any and all costs or damages, including lost profits, overhead or any other lost compensation that AMEC incurs as a result of such incident or accident.

2.9.7 Subcontractor shall provide AMEC with such information as is required under 29 CFR 1910.1200-Hazardous Communication, including Material Safety Data Sheets as appropriate, for any hazardous chemicals (which may include solids, liquids or gases) brought onto any project site by Subcontractor, its employees and agents.

2.9.8 If Subcontractor's personnel will be entering a controlled work area(s) at a project site when performing the Services, a copy of the site-specific Health and Safety Plan prepared by AMEC or CLIENT, or both, if any, will be provided to Subcontractor for its information, and Subcontractor will discuss the same with

its personnel who will sign the Health & Safety Plan to affirm such discussion was held prior to beginning performance of the Services. This sharing of information does not create any rights in parties other than AMEC and Subcontractor, and does not create any duty or obligation of AMEC to the employees, agents and sub-subconsultants of Subcontractor.

2.9.9 All employees of Subcontractor who will enter a controlled work area (s) at any project site which is known or suspected to contain hazardous constituents or materials must demonstrate compliance with all training and personnel health monitoring programs that are required under federal, state or local regulations prior to site entry. Any personnel not able to satisfy this requirement will not be allowed to enter such work area(s), and no delay costs or other compensation will be paid to Subcontractor for failure to begin or continue the performance of Services due to inadequate personnel training.

2.9.10 Upon request, AMEC shall provide Subcontractor with any readings or measurements obtained by monitoring systems utilized for the safety of AMEC's employees with regard to the Services. Subcontractor shall take such additional steps, readings or measurements as are necessary for performing the Services, and will be solely responsible to interpret all information provided by AMEC to determine all appropriate safety measures necessary to protect Subcontractor's employees, agents, and sub-subconsultants. Subcontractor's personnel shall employ at least that level of protection as is utilized by AMEC's employees when within any controlled work area(s). Failure of Subcontractor to comply with this minimum level of protection will be grounds for denial of access to such controlled work area(s) by Subcontractor's employee

2.10 PROTECTION OF THE WORK.

Subcontractor shall take necessary precautions to properly protect the Work and the work of others from damage caused by Subcontractor's operations. Should Subcontractor cause damage to the Work or property of the Client, AMEC or others, Subcontractor shall promptly remedy the damage to the satisfaction of AMEC and such other party or AMEC may remedy the damage and deduct its cost from any amounts due or to become due Subcontractor.

2.11 PERMITS, FEES, LICENSES AND TAXES.

Subcontractor shall give timely notices to authorities pertaining to the Work and shall be responsible for all permits, fees, licenses, assessments, inspections, testing and taxes necessary to complete the Work in accordance with the Contract Documents and all applicable federal, state and local laws and regulations. Subcontractor shall deliver required certificates of inspection, testing or approval to AMEC. To the extent reimbursement is obtained by AMEC from the Client under the Contract Documents, Subcontractor shall be compensated for additional costs resulting from taxes enacted or increased after the date of this Agreement.

2.12 ASSIGNMENT OF WORK.

Subcontractor shall not assign any part of the Work without prior written approval of AMEC, which said approval shall not be unreasonably withheld.

2.13 HAZARDOUS MATERIALS.

A hazardous material is any substance or material identified now or in the future as hazardous under any federal, state or local law or regulation, or any other substances or materials which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal and/or clean-up (collectively, "Hazardous Materials"). To the extent that AMEC has obligations and/or liabilities under the Contract Documents or by law regarding Hazardous Materials within the scope of the Subcontractor's Work, Subcontractor shall have the same obligations and/or liabilities.

2.14 WARRANTIES AND COMPLETION.

2.14.1 Subcontractor warrants during the Warranty Period that all of the Work required of it under this Agreement shall be performed in accordance with the conditions contained herein and in the other Contract Documents and shall be free from defects and improper workmanship in every particular. If AMEC discovers any defect in the Work within the Warranty Period, Subcontractor shall replace, repair or correct, without cost to AMEC, such Work as may be found to be improper or imperfect, and to make good all damage caused to other work or materials due to such required replacement, repair or correction. This warranty covers a period of one (1) year from the later to occur of AMEC's or Client's acceptance of the final completion of the Work ("Warranty Period").

2.14.2 If, during the Warranty Period, AMEC finds that the Work, or any part thereof, does not conform to the warranty, AMEC shall give written notice to Subcontractor of such nonconformity. Upon receipt of such notice, Subcontractor shall promptly correct such defective components or repair such defective items or re-perform such Work as AMEC may reasonably require in order to verify that the Work conforms to the warranty set forth above. Subcontractor shall bear all costs incurred by it in replacing, repairing or correcting the Work.

2.14.3 In the event that Subcontractor fails to replace, repair or correct such Work, as set forth above, within a reasonable time and to AMEC's reasonable satisfaction, AMEC may correct the Work itself or cause it to be replaced, repaired or corrected by third parties in such manner as AMEC may reasonably consider appropriate. AMEC shall be entitled to recover all costs and expenses incurred thereby from Subcontractor or deduct the same from any amounts due

or to become due to Subcontractor. Subcontractor shall assist AMEC in every way in enforcing its warranties. Nothing contained in this Section 2.14 is intended, or shall be construed, to relieve the obligation, liability under Laws, and/or warranty of the manufacturer and/or supplier of such materials and manufactured items to Subcontractor, AMEC, Client and/or other third parties.

2.14.4 The Warranty Period for the part of the Work which is replaced, repaired or corrected, as set forth above, shall be extended for a period of one (1) year from the date of completion of such replacement, repair or correction, except where a period longer than the Warranty Period has been specified, in which instance, the longer period shall apply.

2.14.5 Neither the final acceptance of the Work, the payment therefor, nor any provision of the Contract Documents shall relieve Subcontractor of its responsibility for neglect or faulty workmanship during the Warranty Period.

2.15 MATERIALS OR EQUIPMENT FURNISHED BY OTHERS.

In the event the scope of the Work includes installation of materials or equipment furnished by others, it shall be the responsibility of Subcontractor to exercise proper care in inspecting, handling, storing and installing such items. Subcontractor shall examine the items provided and report to AMEC in writing any items it may discover that do not conform to requirements of the Contract Documents. Subcontractor shall not proceed to install nonconforming items without further instructions from AMEC. Loss or damage due to the failure of Subcontractor to comply with the foregoing shall be deducted from any amounts due or to become due Subcontractor.

2.16 SUBSTITUTIONS.

No substitutions shall be made in the Work unless permitted in the Contract Documents, and only then upon Subcontractor first receiving all approvals required under the Contract Documents for substitutions. Subcontractor shall defend, indemnify and hold harmless AMEC as a result of any and all substitutions for which Subcontractor has not obtained approval.

2.17 USE OF AMEC'S EQUIPMENT.

Subcontractor, its agents, employees, lower-tier subcontractors and suppliers shall not use AMEC's equipment without the express written permission of AMEC's Representative. If Subcontractor or any of its agents, employees, lower-tier subcontractors or suppliers utilize any of AMEC's equipment, including machinery, tools, scaffolding, hoists, lifts or similar items owned, leased or under the control of AMEC, Subcontractor shall defend, indemnify and be liable to AMEC, as provided in Article 8 below, for any and all loss or damage (including, but not limited to, personal injury or death) which may arise from such use, except where the loss or damage shall be found to have been due to the negligence of AMEC's employees in operating AMEC's equipment.

2.18 WORK FOR OTHERS.

Until final completion of the Project, Subcontractor agrees not to perform any Work or other work directly for the Client or deal directly with the Client's representatives in connection with the Project, unless otherwise directed in writing by AMEC.

2.19 AMEC'S RIGHT TO PERFORM.

If AMEC's Representative provides written notice to the Subcontractor that, in its reasonable opinion, Subcontractor is failing, neglecting or refusing to perform the Work in certain specified particulars or the Work is unduly delayed, except for delays caused by Force Majeure Events under Section 4.5 below, Subcontractor shall commence to cure such failure, neglect, refusal or delay ("Cure") within a reasonable time, not to exceed three (3) Business Days after receipt of written notice from AMEC, and shall diligently complete the Cure within a reasonable time. If AMEC's Representative is not reasonably satisfied with the pace and the quality of the Cure, AMEC, without any prejudice to any of its other rights or remedies and at Subcontractor's expense, shall have the right to exercise any or all of the following remedies: (i) supply or contract with others to supply, in AMEC's sole discretion, such number of workers or quantities of materials, equipment, and other facilities as AMEC deems necessary to complete the Cure, or any portion thereof, which Subcontractor has failed to satisfactorily perform or complete after such notice; (ii) withhold payment of any monies otherwise due Subcontractor pending the satisfactory completion of remedial efforts by Subcontractor; (iii) take any other action AMEC deems necessary to complete the Cure or (iv) terminate this Agreement, in whole or in part, and all applicable Work Orders, upon notice to Subcontractor. For purposes of this paragraph, strikes, lockouts or other labor difficulties shall not be considered to be Force Majeure Events.

2.20 SYSTEMS AND EQUIPMENT STARTUP.

With the assistance of the Client's maintenance personnel and AMEC, Subcontractor shall, if required by AMEC, direct the check out and operation of systems and equipment for readiness, and assist in their initial startup and testing.

2.21 COMPLIANCE WITH LAWS.

Subcontractor agrees to be bound by, and at its own cost comply with, all federal, state and local laws, ordinances and regulations (collectively, "Laws") which are applicable to the Subcontractor, the Work, the Project and the Project site, including but not limited to, equal employment opportunity, minority business enterprise, women's business enterprise, disadvantaged business enterprise, safety, environment, and

all other Laws with which AMEC must comply. Subcontractor shall be liable to AMEC and Client for all losses, costs and expenses attributable to any acts of commission or omission by Subcontractor, its employees and agents, resulting from the failure to comply with any Laws, including, but not limited to, any fines, penalties or corrective measures.

2.22 ROYALTIES, PATENTS AND COPYRIGHTS.

2.22.1 Subcontractor shall pay all royalties and license fees that may be due on the inclusion of any patented or copyrighted materials, methods or systems selected by Subcontractor and incorporated in the Work. Subcontractor shall defend, indemnify and hold AMEC and Client harmless from all suits or claims for infringement of any patent rights or copyrights arising out of such selection. Subcontractor shall pay any judgment and all court-awarded costs against AMEC or Client in such suit or proceeding, together with all compensation and expenses of its own counsel and experts in connection with such suit or proceeding. AMEC may be represented by counsel of its own selection and at its own expense and agrees to cooperate fully in the defense of such suit or proceedings to the extent of furnishing, at Subcontractor's expense, all evidence within AMEC's control.

Subcontractor shall, at its option and at its own expense, either procure for AMEC and Client the fully paid-up right to continue using any designs and/or processes referred to above or have the same replaced with non-infringing designs and/or processes, provided that such replacement or modification shall not diminish the performance or interfere with the operation of the facilities that are involved in the Project.

2.23 COSTS AND EXPENSES.

Should AMEC incur costs as a result of Subcontractor's failure to fulfill its duties and obligations pursuant to this Agreement, or any other agreement or contract between AMEC and Subcontractor, AMEC shall be entitled to offset such costs, including, without limitation, reasonable overhead, profit and reasonable attorney's fees, against any sums otherwise due or to become due to Subcontractor under this Agreement or any other agreement or contract between AMEC and Subcontractor on the Project or any other project. Subcontractor shall remain liable for, and shall promptly pay, AMEC, any amount by which such costs exceed such sums which otherwise are due to or are to become due to AMEC. Upon final completion and acceptance of the Work hereunder, whether completed by Subcontractor, AMEC or others at AMEC's election, Subcontractor shall be entitled to the lesser of: (i) the reasonable value of any Work performed by Subcontractor within the scope of this Agreement for which AMEC has received payment or (ii) any unpaid balance of the compensation due to Subcontractor for Work after AMEC shall have fully exercised its right of offset as provided herein. Should AMEC be required to institute or defend a lawsuit or arbitration to enforce any of the provisions of this Agreement or protect AMEC's interests arising hereunder, or to collect damages for the breach of this Agreement, or to recover on a surety bond given by Subcontractor under this Agreement, AMEC shall be entitled to recover reasonable attorney's fees, consultant's costs and expert's fees, and/or any other costs, charges, and expenses in the event AMEC prevails in such lawsuit or arbitration.

ARTICLE 3
AMEC'S RESPONSIBILITIES

3.1 AMEC'S REPRESENTATIVE.

AMEC shall designate a person under Section 12.7 below who shall be AMEC's authorized representative ("AMEC's Representative"). AMEC's Representative shall be the only person the Subcontractor shall look to for instructions, orders and/or directions, except in an emergency.

3.2 STORAGE AREAS.

AMEC shall designate storage areas, if available, for Subcontractor's materials and equipment during the course of the Work.

3.3 TIMELY COMMUNICATIONS.

AMEC shall transmit to Subcontractor, with reasonable promptness, all submittals, transmittals, and written approvals relative to the Work.

ARTICLE 4
SCHEDULE OF WORK

4.1 TIME IS OF THE ESSENCE.

Time is of the essence for both parties, and they mutually agree to see to the performance of their respective Services and Work and the work of their lower-tier subcontractors so that the entire Project may be completed in accordance with the Contract Documents and the schedule of Work.

4.2 SCHEDULE OBLIGATIONS.

Both AMEC and Subcontractor shall be bound by the schedule of Work. Subcontractor shall provide AMEC with any requested scheduling information for the Work. Subcontractor recognizes that changes may be made in the schedule of Work and agrees to comply with such changes. The Schedule of Work and all subsequent changes shall be submitted to Subcontractor in advance of the required performance.

4.3 PRIORITY OF WORK.

AMEC shall have the right to decide the time, order and priority in which the various portions of the Work shall be performed and all other matters relative to the timely and orderly conduct of the Work. Subcontractor shall commence Work within five (5) calendar days of notice to proceed from

AMEC, and, if interrupted for any reason, Subcontractor shall resume Work within two (2) Business Days from AMEC's notice to do so.

4.4 DELAY.

If the progress of the Work is substantially delayed without the fault or responsibility of the Subcontractor, then, in the event Subcontractor provides written notice of the delay to AMEC and requests an extension of time within three (3) Business Days of the commencement of such delay, the time for Subcontractor to perform the Work shall be extended by Change Order to the extent that a corresponding extension is obtained by AMEC from Client under the Prime Agreement, and the schedule of Work shall be revised accordingly. Failure to provide the requisite written notice shall constitute a waiver by Subcontractor of any and all claims relating to such delay. Subcontractor's sole and exclusive remedy for any and all impact, delay, disruption, hindrance, interference, inefficiencies, damages, or any other adverse effects upon the performance of the Work shall be by a time extension to the applicable schedule of Work, and Subcontractor shall not be entitled to any compensation or remuneration for any costs, expenses, or damages related to, or resulting from, any such impact, delay, disruption, hindrance, inefficiencies, damages, or other adverse effects upon the performance of the Work.

4.5 FORCE MAJEURE.

Where Subcontractor is prevented from completing any part of the Work in accordance with the schedule of Work due to delay beyond the control of both AMEC and Subcontractor, an extension of the contract time in an amount equal to the time lost due to such delay shall be Subcontractor's sole and exclusive remedy for such delay. In no event shall AMEC be liable to Subcontractor, or any lower-tier subcontractor, supplier or other person or organization, or to any surety for, or employee or agent of, any of them, for damages arising out of or resulting from (i) delays beyond the control of both parties, including, but not limited to, fires, floods, epidemics, abnormal weather conditions, acts of God, or acts of regulatory agencies ("Force Majeure Events") or (ii) delays caused by or within the control of Subcontractor.

4.6 LIQUIDATED DAMAGES.

If the Contract Documents provide for liquidated or other damages for delay beyond the completion date set forth in the Contract Documents, and such damages are assessed, then AMEC shall have the right to assess all or a share of the damages against Subcontractor to the extent that Subcontractor is responsible for the delay. Notwithstanding the foregoing, the Subcontractor shall be liable for any actual costs and damages incurred by AMEC as a result of delays caused by Subcontractor, including, without limitation, liquidated damages payable by AMEC to Client. Liquidated damages payable from AMEC to Client as a result of Subcontractor's delay shall be only a part of AMEC's actual damages that result from Subcontractor's delay, and Subcontractor is liable to AMEC for AMEC's actual damages caused by Subcontractor's failure to meet milestones set forth in the applicable Work Order.

ARTICLE 5
CONTRACT PRICE

AMEC agrees to pay Subcontractor for the satisfactory performance of the Work the amount specified under each Work Order, subject to additions or deductions as provided in Article 6 below ("Contract Price").

ARTICLE 6
CHANGES IN THE WORK

6.1 CHANGES.

Changes in the Work may be accomplished after execution of this Agreement without voiding this Agreement or any applicable Work Order should circumstances arise which reasonably require such change. Such changes shall be made by Change Order, as provided in Section 6.2 below, or by Change Directive, as provided in Section 6.3 below.

6.2 CHANGE ORDERS.

In the event it becomes necessary to change, delete from or add to the Work in a manner that causes a material increase or decrease in the time or cost, or both, required for Subcontractor to perform the Work, such change, deletion or addition shall be evidenced by a written change order signed by both parties ("Change Order"). To the extent that a Change Order materially changes the cost or time, or both, to perform the Work, an equitable adjustment, either upward or downward, will be made in the contract time for performance or compensation, or both, as applicable. Subcontractor shall not proceed with any such change or additional Work until mutual execution of a Change Order.

6.3 CHANGE DIRECTIVES.

Notwithstanding Section 6.2 above, AMEC reserves the right, in its discretion, to change, delete or add to the Work, including corresponding immaterial additions to or reductions in Subcontractor's time for performance or compensation, or both, and to issue a written directive, ("Change Directive") which directs Subcontractor to perform such additional and/or modified Work prior to agreement by Subcontractor on an adjustment, if any, in compensation or schedule, or both. To the extent that a Change Directive modifies the Work, Subcontractor may be entitled to an equitable adjustment in the contract time for performance or the Contract Price, or both. In the event that Subcontractor is given a Change Directive by AMEC, Subcontractor shall promptly give written notice of its intent to seek such an adjustment to the office of AMEC which issued the applicable Change Directive within three (3) Business Days after receipt of the Change Directive from AMEC. Failure to timely give this notice shall constitute an

irrevocable waiver by Subcontractor of all rights to seek such an adjustment. Subcontractor shall promptly proceed to perform the change(s) in Work, notwithstanding its disagreement with the Change Directive.

6.4 UNKNOWN CONDITIONS.

If, in the performance of the Work, Subcontractor finds latent, concealed or subsurface physical conditions which differ materially from the conditions Subcontractor reasonably anticipated, or if physical conditions are materially different from those normally encountered and generally recognized as inherent in the Work, then the scope of Work with respect to the price, schedule, or other terms and conditions may be equitably adjusted by a Change Order within a reasonable time after the conditions are first observed. Any adjustments that Subcontractor may receive shall be limited to the adjustment that AMEC receives from the Client on behalf of Subcontractor. Subcontractor shall assume the entire responsibility for examining the Project site and for acquainting itself with conditions that may exist or develop during the Work. Subcontractor further certifies that consideration of all such conditions, with the exception of unknown and unforeseen subsurface conditions, have been included in the Contract Price.

6.5 CLAIMS RELATING TO CLIENT.

Subcontractor agrees to make all claims for which the Client is or may be liable in the manner and within the time limits provided in the Contract Documents for AMEC to pursue like claims against Client and in sufficient time for AMEC to make such claims against the Client in accordance with the Contract Documents. AMEC agrees to permit Subcontractor to prosecute a claim in the name of AMEC for the use and benefit of Subcontractor in the manner provided in the Contract Documents for like claims pursued by AMEC against the Client. However, nothing contained in this Agreement shall create any rights, remedies, or benefits in favor of Subcontractor that do not exist pursuant to the terms of this Agreement.

6.6 CLAIMS RELATING TO AMEC.

Subcontractor shall give AMEC written notice of all claims not included in Section 6.5 above within three (3) Business Days of the occurrence of the event(s) for which claim is made; otherwise, such claims shall be deemed waived. All unresolved claims, disputes and other matters in question between AMEC and Subcontractor not relating to claims included in Section 6.5 above shall be resolved in the manner provided in Article 10 below.

6.7 ADJUSTMENTS IN CONTRACT PRICE.

If a Change Order requires an adjustment in the Contract Price, the adjustment shall be established by one of the following methods:

6.7.1 Mutual agreement on a lump sum with sufficient information to substantiate the amount;

6.7.2 Unit prices already established in the Work Order or, if not established in the Work Order, then established by mutual agreement for the applicable adjustment; or

6.7.3 A mutually determined cost plus an acceptable allowance for overhead and profit.

6.8 SUBSTANTIATION OF ADJUSTMENT.

If Subcontractor does not respond promptly or disputes the method of adjustment, the method and the adjustment shall be determined by AMEC on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Price, an allowance for overhead and profit at a rate to be negotiated. Subcontractor shall maintain for AMEC's review and approval an appropriately itemized and substantiated accounting of the following items attributable to the Change Order:

6.8.1 costs of labor, including Social Security, health, welfare, retirement and other fringe benefits as normally required, and state workers' compensation insurance;

6.8.2 costs of materials, supplies and equipment, whether incorporated in the Work or consumed, including transportation costs;

6.8.3 costs of renting machinery and equipment other than hand tools;

6.8.4 costs of bond and insurance premiums, permit fees and taxes attributable to the change; and

6.8.5 costs of additional supervision and field office personnel services necessitated by the change.

6.9 EMERGENCIES.

In an emergency affecting the safety of persons and/or property, Subcontractor shall act, at its discretion, to prevent threatened damage, injury or loss. Any change in the Contract Price and/or the schedule of Work on account of emergency Work shall be determined as provided in this Article 6.

ARTICLE 7
PAYMENT

7.1 SCHEDULE OF VALUES.

As a condition to payment, the Subcontractor shall, upon request of AMEC, provide a schedule of values satisfactory to AMEC no more than five (5) calendar days from the date of execution of the applicable Work Order.

7.2 PROGRESS PAYMENTS.

7.2.1 Subcontractor's application for payment shall include the Purchase Order Number, AMEC's Project Number (if given), a description of Work provided, and be supported by substantiating data as required by AMEC. Subcontractor's application shall be notarized if required. Subcontractor's progress payment application for the Work performed in the preceding payment period shall be submitted to AMEC in accordance with the schedule of values, if required, and Sections 7.2.2, 7.2.3, and 7.2.4 below, either electronically to VendorElectronicInvoices@amec.com or by hardcopy to the following address:

AMEC
Attention: Accounts Payable
1105 Lakewood Parkway, Suite 300
Alpharetta, GA 30009

7.2.2 In making progress payments to Subcontractor, ten percent (10%) of the estimated amount shall be retained until final completion and acceptance of the Work by AMEC and Client. However, if AMEC, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, the retainage may, in AMEC's sole discretion, be reduced on subsequent invoices if requested by Subcontractor in writing. Following completion and acceptance of all Work, the retainage shall be paid upon the presentation of a properly prepared payment application and signed release of liens in a form acceptable to AMEC.

7.2.3 Subcontractor shall promptly submit progress payment applications to AMEC which indicate Work completed and, to the extent allowed under Subparagraph 7.2.4 below, materials suitably stored during the preceding payment period.

7.2.4 Unless otherwise provided in the Contract Documents, and if approved in advance by the Client, applications for payment may include materials and equipment not incorporated in the Work, but delivered to and suitably stored at the Project site or at some other location agreed upon in writing. Approval of payment applications for such stored items on or off the Project site shall be conditioned upon submission by Subcontractor of bills of sale and applicable insurance or such other procedures satisfactory to the Client and AMEC to establish the Client's title to such materials and equipment, and otherwise to protect the interests of the Client and AMEC, including transportation to the Project site.

7.2.5 Progress payments to Subcontractor for satisfactory performance of the Work shall be made no later than thirty (30) calendar days after receipt by AMEC of payment from the Client for the applicable Work.

7.2.6 Subcontractor acknowledges and recognizes that the Work is a portion of the Services to be performed by AMEC, and payment for the Work by AMEC is conditioned upon payment for the Work by the Client to AMEC. Subcontractor warrants and represents that it relies for payment for the Work on the credit and ability to pay of Client, and not the credit and ability of AMEC, and that Subcontractor undertakes the risk that it shall not be paid for the Work performed by Subcontractor in the event AMEC is not paid by Client for such Work. Notwithstanding any contrary provision of the Contract Documents, Subcontractor expressly acknowledges and agrees that receipt by AMEC of payment from Client for the Work shall be a condition precedent to any payment obligation of AMEC (or its surety) to Subcontractor under this Agreement. Furthermore, Subcontractor agrees that it will not, under any circumstances, file claims against AMEC or its surety for payment of amounts not due to Subcontractor under this Agreement.

7.2.7 Should Subcontractor, its lower-tier subcontractors or agents cause damage to the Project or fail to perform or otherwise be in default under the terms of this Agreement, AMEC shall have the right to withhold from any payment, and/or otherwise be reimbursed for, an amount sufficient to protect the Client and AMEC, or both, from any loss that may result. When the grounds for withholding payment have been removed, payment shall be made for amounts withheld because of those grounds.

7.3 FINAL PAYMENT.

7.3.1 Upon acceptance of all Work by the Client and AMEC and receipt from Subcontractor of evidence of fulfillment of Subcontractor's obligations in accordance with the Contract Documents, including, without limitation, Section 7.3.2 below, AMEC shall promptly invoice the Client for final payment.

7.3.2 Subcontractor's final invoice must be accompanied by a properly completed and executed Subcontract Work Order Closeout From and Lien Release, attached hereto as Exhibit D.. In addition, Subcontractor's application for final payment also shall include:

7.3.2.1 Consent of surety to final payment, if required;

7.3.2.2 Satisfaction of required closeout procedures;

7.3.2.3 Certification that insurance required by the Contract Documents to remain in effect beyond final payment pursuant to Section 8.2.3 below is in effect and will not be canceled or allowed to expire without at least thirty (30) calendar days written notice to AMEC, unless a longer period is stipulated in this Agreement;

7.3.2.4 Other data, if required by AMEC or Client, such as receipts, releases, and waivers of liens to the extent and in such form as may be designated by AMEC or Client;

7.3.2.5 Written warranties and equipment manuals; and

7.3.2.6 As-built drawings, if required by the Contract Documents.

7.3.2.7 Final payment of the unpaid balance of the Contract Price shall be made to Subcontractor:

7.3.2.8 Upon receipt by AMEC of the Client's waiver of all claims related to the Work, except for unsettled liens, unknown defective Work, and non-compliance with the Contact Documents or warranties if permitted by Client; and

7.3.2.9 Within thirty (30) calendar days after receipt by AMEC of final payment from the Client for all Work.

7.3.3 If the Client or its designated agent does not issue a certificate for final payment or AMEC does not receive such payment for any cause that is the fault of Subcontractor, AMEC shall promptly inform Subcontractor of that fact in writing. AMEC shall also diligently pursue, with the assistance of Subcontractor, the prompt release by the Client of the final payment due for all Work. At Subcontractor's request and expense, to the extent agreed upon in writing, AMEC shall institute reasonable legal remedies to mitigate the damages and pursue payment of Subcontractor's final payment, including interest.

7.3.4 Final payment shall constitute a waiver of all claims by Subcontractor relating to the Work, but in no way shall relieve Subcontractor of liability for the obligations assumed by it under Section 8.1 below, or for faulty or defective Work discovered after final payment.

7.4 **CONTINUING OBLIGATIONS.**

Subcontractor shall reimburse AMEC for all costs and expenses for any claim, obligation or lien asserted before or after final payment is made that arises from the performance of the Work. Subcontractor shall reimburse AMEC for all costs and expenses, including attorney's fees and all other costs and expenses, incurred by AMEC in satisfying, discharging or defending against any such claims, obligation or lien, including any action brought or judgment recovered.

7.5 **PAYMENT USE RESTRICTION.**

Payment received by Subcontractor shall be used to satisfy the indebtedness owed by Subcontractor to any person furnishing labor or materials for use in performing the Work before it is used in any other manner.

7.6 **PAYMENT USE VERIFICATION.**

AMEC shall have the right at all times to contact Subcontractor's lower-tier subcontractors and suppliers to ensure that they are being paid promptly by Subcontractor for labor or materials furnished for use in performing the Work.

7.7 **PARTIAL LIEN WAIVERS AND AFFIDAVITS.**

As a prerequisite for payment, Subcontractor shall provide, in a form satisfactory to the Client and AMEC, partial lien or claim waivers and affidavits from the Subcontractor and its lower-tier subcontractors and suppliers for the completed Work.

7.8 **SUBCONTRACTOR PAYMENT FAILURE.**

Upon payment by AMEC, Subcontractor shall promptly pay its lower-tier subcontractors and suppliers the amounts to which they are entitled. In the event AMEC has reason to believe that labor, material and other obligations incurred in the performance of the Work are not being paid, AMEC may give written notice of a potential claim or lien to Subcontractor and may take any steps deemed necessary to assure that progress payments are utilized to pay such obligations, including but not limited to, the issuance of joint checks. If, upon receipt of notice, Subcontractor does not (a) supply evidence to the satisfaction of AMEC that the monies owing have been paid; or (b) post a bond indemnifying the Client, AMEC, AMEC's surety, if any, and protecting the premises on which the Work was performed from a claim or lien, then AMEC shall have the right to withhold a reasonable amount from any payments due or to become due to Subcontractor to protect AMEC from any and all loss, damage or expense, including attorney's fees, that may arise out of or relate to any such claim or lien.

7.9 **SUBCONTRACTOR ASSIGNMENT OF PAYMENTS.**

Subcontractor shall not assign any monies due or to become due under this Agreement, without the written consent of AMEC, unless the assignment is intended to create a new security interest within the scope of Article 9 of the Uniform Commercial Code of the state in which the Project is located. Should Subcontractor assign all or any part of any monies due or to become due under this Agreement to create a new security interest or for any other purpose, the instrument of assignment shall contain a clause to the effect that the assignee's right in and to any money due or to become due to Subcontractor shall be subject to the claims of all persons, firms and corporations for Work performed or materials supplied for the performance of the Work.

7.10 **PAYMENT NOT ACCEPTANCE.**

Payment to Subcontractor does not constitute or imply acceptance of all or any portion of the Work by AMEC or Client.

ARTICLE 8
INDEMNITY, INSURANCE AND WAIVER OF SUBROGATION

8.1 INDEMNITY

8.1.1 To the fullest extent permitted by law, Subcontractor shall defend, indemnify and hold harmless AMEC, AMEC's other subcontractors, Client and their respective parents, subsidiaries, and affiliates and their respective officers, employees, agents and consultants (collectively, "Indemnities") from and against all claims, damages, loss and expenses, including, but not limited to, attorney's fees, costs and expenses, arising out of or resulting from the performance of the Work, provided that:

8.1.1.1 Any such claim, damage, loss, or expense is caused in whole or in part by any breach of this Agreement or by the negligent act or omission of Subcontractor, or anyone directly or indirectly employed by Subcontractor or anyone for whose acts the Subcontractor may be liable, regardless or whether it is caused in part by any of the Indemnitees; and

8.1.1.2 To the extent the Prime Agreement contains provisions which legally require AMEC to assume a greater obligation to indemnify the Client against certain consequences arising out of performance of the Work, then the terms of the Prime Agreement shall control and require Subcontractor to indemnify AMEC to the same extent AMEC is required to indemnify the Client; and

8.1.1.3 Such obligations shall not require Subcontractor to indemnify AMEC for its own sole negligence if, under the applicable state law, such a provision would be deemed contrary to public policy.

8.1.2 In any and all claims against the Indemnities by any employee of Subcontractor, anyone directly or indirectly employed by Subcontractor or anyone for whose acts Subcontractor may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Subcontractor under any workers' compensation acts, disability benefits acts or other employee benefit statutes.

8.2 INSURANCE.

8.2.1 Subcontractor shall, at its own expense, purchase and maintain insurance with insurance companies reasonably satisfactory to AMEC as follows:

8.2.2

(i.) Worker's Compensation & Employer's Liability	Statutory
–Each Accident	$500,000
–Disease - Policy Limits	$500,000
–Disease - Each Employee	$500,000
(ii.) Commercial General Liability (Including Contractual Liability Insurance)	
–Per Occurrence	$1,000,000
–Aggregate	$2,000,000
(iii.) Commercial Automobile Liability – Combined Single Limit for bodily injury & property damage on owned, non-owned and hired vehicles.	$1,000,000
(iv.) Umbrella Coverage excess of (i.), (ii.) and (iii.) - Per Occurrence Combined Single Limit	$1,000,000
(v.) Contractor's Pollution Liability Insurance –Each Occurrence	$1,000,000

(vi.) If Subcontractor's scope of work includes "design/build" Work, Subcontractor shall be required to provide evidence of Professional Liability insurance with limits of $1,000,000 per claim and in the aggregate.

8.2.2.1 Prior to performing any Work, Subcontractor shall furnish AMEC with certificates of insurance certifying that all insurance required under this Agreement is in full force and effect, citing the expiration date of each policy and stating that the insurance will not be canceled or non-renewed during the term of this Agreement without thirty (30) calendar days prior written notice to AMEC; provided, that ten (10) Business Days notice is acceptable for cancellation due to nonpayment of premiums.

8.2.2.2 The policies described in 8.2.2 (i.), (ii.), (iv.) and (v.) shall provide for a waiver of subrogation rights in favor of AMEC and Client. The certificate of insurance shall name AMEC and Client as "additional insureds" on the policies described in 8.2.2 (ii.), (iv.), and (v.). The policies described in 8.2.2 (i.), (ii.), (iii.), (iv.), (v.) and (vi.), if required, shall be endorsed to be primary and non-contributing with policies of AMEC. Receipt by AMEC of the certificates of insurance required herein shall be a prerequisite to commencement of, and payment for, the Work.

8.2.2.3 Subcontractor shall bear all risk of loss, theft, damage or destruction to the (i) Work, (ii) property in its care, custody or control that is provided to Subcontractor by AMEC under any Work Order and (iii) Subcontractor's equipment, appliances, tools, facilities, and materials necessary to perform the Work. At all times and at Subcontractor's expense, Subcontractor shall maintain insurance against such loss, theft, damage or destruction in an amount not less than the replacement value of all such items. Subcontractor waives subrogation rights against AMEC for damage to, or destruction of, Subcontractor's property, materials, vehicles and equipment.

8.2.2.4 AMEC may require additional coverages or higher limits of liability for a particular scope of Work or as required by Client. Such additional coverage or higher limits, if any, will be identified in the particular Work Order.

8.2.2.5 Each of Subcontractor's insurance providers shall have an A.M. Best's Key Rating of A:VII and be authorized to conduct business at the place of performance of the Work.

8.2.2.6 Failure by Subcontractor to maintain the required insurance or to provide evidence thereof which is reasonably acceptable to AMEC shall constitute a material breach of this Agreement, upon which AMEC may immediately terminate this Agreement or suspend performance pursuant to this Agreement in accordance with Article 9. Alternatively, AMEC may purchase such required insurance coverage and offset the cost thereof against any compensation due to Subcontractor.

8.2.2.7 The provision of insurance by Subcontractor pursuant to this Article 8 does not limit Subcontractor's responsibility or liability to AMEC, nor does a decision by AMEC to ignore Subcontract's failure to meet these Article 8 requirements constitute a waiver of the requirements.

8.2.2.8 Subcontractor may be required to provide one hundred percent (100%) performance and payment bonds in connection with a particular Work Order. If such bonds are required by AMEC or Client, the surety company providing the bonds must be a "treasury listed" company. In the event Subcontractor fails to provide the bonds prior to the commencement of the Work or provides bonds not in conformance with AMEC's requirements, AMEC may terminate this Agreement.

8.2.3 Subcontractor shall continue to carry Completed Operations liability insurance for at least one year after either (i) ninety (90) calendar days following substantial completion of all Work or (ii) final payment to AMEC, whichever is earlier. The Subcontractor shall furnish AMEC evidence of such insurance at final payment and one (1) year thereafter.

ARTICLE 9
TERMINATION OF AGREEMENT

9.1 FAILURE OF PERFORMANCE.

9.1.1 If Subcontractor fails to commence to cure a default(s) hereunder within three (3) Business Days, after AMEC gives written notice to Subcontractor under this Section 9.1.1 and satisfactorily continue correction of such default(s), then AMEC may, in lieu of or in addition to its other rights and remedies set forth below in this Section 9.1.1 or elsewhere in this Agreement, issue a second notice to Subcontractor and its surety, if any. Such second notice shall state that, if Subcontractor fails to complete the cure of the default(s) within five (5) Business Days of receipt of the second written notice, this Agreement will be deemed to be terminated without further notice. AMEC also may furnish those materials, equipment and/or employ such workers or subcontractors as AMEC deems necessary to maintain the orderly progress of the Work, and Subcontractor shall not be entitled to receive any further payments under this Agreement until AMEC has completed the Work. All costs incurred by AMEC in performing all Work, including, without limitation, reasonable overhead, profit and attorney's fees, costs and expenses, shall be deducted from any monies due or to become due Subcontractor. Subcontractor shall be liable for the payment of any amount by which such expense may exceed the unpaid balance of the Contract Price.

9.1.2 If AMEC performs Work under this Article 9, either directly or through other subcontractors, AMEC and such other subcontractors shall have the right to take and use any materials, implements, equipment, appliances or tools furnished by, or belonging to, Subcontractor which are located at the Project site.

9.2 BANKRUPTCY.

9.2.1 If Subcontractor files a petition under the Bankruptcy Code, this Agreement shall terminate 1) if Subcontractor or Subcontractor's trustee rejects this Agreement or, 2) if there has been a default and Subcontractor is unable to give adequate assurance that it will perform as required by this Agreement or otherwise is unable to comply with the requirements for assuming this Agreement under the applicable provisions of the Bankruptcy Code.

9.2.2 If Subcontractor is not performing in accordance with the schedule of Work at the time a petition for bankruptcy is filed, or at any subsequent time, AMEC, while awaiting the decision of Subcontractor or its trustee to reject or to assume this Agreement and provide adequate assurance of its ability to perform, may avail itself of such remedies under this Article 9 as are reasonably necessary to maintain the schedule of Work. AMEC may offset against any sums due or to become due to Subcontractor hereunder all costs incurred in pursuing any of such remedies including, without limitation, reasonable overhead, profit and attorney's fees. Subcontractor shall be liable for the payment of any amount by which costs incurred may exceed the unpaid balance of the Contract Price.

9.3 SUSPENSION BY CLIENT.

Should the Client suspend all or any part of the Prime Agreement which includes the Work, AMEC shall notify Subcontractor in writing, and, upon receiving notification, Subcontractor shall immediately suspend the Work. In the event Client suspends the Prime Agreement, AMEC's liability to Subcontractor shall be limited to the extent of AMEC's recovery on Subcontractor's behalf under the Contract Documents. AMEC agrees to cooperate with Subcontractor, at Subcontractor's expense, in the prosecution of any Subcontractor claim arising out of the Client's suspension and

to permit Subcontractor to prosecute the claim, in the name of AMEC, for the use and benefit of Subcontractor.

9.4 TERMINATION BY CLIENT.

Should the Client terminate all or any part of the Prime Agreement which includes the Work, AMEC shall notify Subcontractor in writing and, upon written notification, this Agreement shall be terminated and Subcontractor shall immediately stop the Work, follow all of AMEC's instructions, and mitigate all of its costs, expenses and damages of whatsoever nature. In the event of Client termination, AMEC's liability to Subcontractor shall be limited to the extent of AMEC's recovery on Subcontractor's behalf under the Contract Documents. AMEC agrees to cooperate with Subcontractor, at Subcontractor's expense, in the prosecution of any Subcontractor claim arising out of the Client's termination and to permit Subcontractor to either prosecute the claim, in the name of AMEC, for the use and benefit of Subcontractor, or assign the claim to Subcontractor.

9.5 CONTINGENT ASSIGNMENT OF AGREEMENT.

AMEC's contingent assignment of this Agreement to Client, if and as provided in the Prime Agreement, is effective when the Client has terminated the Prime Agreement for cause and has accepted the assignment by notifying Subcontractor of such acceptance in writing. This contingent assignment is subject to the prior rights of the surety that may be obligated under AMEC's bond, if any. Subcontractor hereby consents to such assignment and agrees to be bound to the assignee by the terms of this Agreement.

9.6 SUSPENSION BY AMEC.

AMEC may order Subcontractor in writing to interrupt the performance of all or any part of the Work for such period of time as may be determined to be appropriate for the convenience of AMEC. Such interruptions of the Work for short periods of time shall not be considered a suspension. Subcontractor shall notify AMEC in writing within ten (10) Business Days after receipt of notice of such interruption as to its effect upon the Work to the extent allowed AMEC under the Prime Agreement. The Contract Price or schedule of Work shall be adjusted by Change Order for any increase in the time or cost, or both, of performing the Work which is caused by such interruption. No claim under this Article 9 shall be allowed for any costs incurred more than ten (10) Business Days prior to Subcontractor's aforesaid notice to AMEC. Neither the Contract Price nor the schedule of Work shall be adjusted for any such interruption, to the extent that performance would have been suspended, due, in whole or in part, to the fault or negligence of Subcontractor or by a cause for which Subcontractor otherwise would have been responsible. The Contract Price shall not be adjusted for any such interruption to the extent that performance would have been suspended by a cause for which Subcontractor would have been entitled only to a time extension under this Agreement.

9.7 TERMINATION FOR CONVENIENCE BY AMEC.

In the event a Work Order is terminated for the sole convenience of AMEC, AMEC shall compensate Subcontractor for the costs of actual Work performed and accepted through the date of termination in accordance with Article 7 above. AMEC shall not be obligated hereunder nor otherwise liable to pay Subcontractor any other costs, losses, damages or expenses arising out of or related to the termination of any Work Order.

9.8 WRONGFUL EXERCISE.

If AMEC wrongfully exercises any option under this Article 9, AMEC shall be liable to Subcontractor solely for the actual costs of the Work performed, in accordance with the schedule of values for the Work, prior to AMEC's wrongful action, less prior payments made.

ARTICLE 10
DISPUTE RESOLUTION

10.1 DISPUTE RESOLUTION.

10.1.1 The parties shall undertake in good faith to settle or compromise all disputes, controversies, or differences that may arise between them out of the performance of a party and which arise out of or relate to this Agreement (individually, "Dispute" and, collectively, "Disputes") by means of amicable discussions. Except as otherwise expressly required by the Prime Agreement, all Disputes shall be dealt with as follows:

(i) Any time there is a Dispute, either party may send a written notice to the other party setting forth a description of the Dispute ("Notice of Dispute"). If the Dispute is not resolved during the first fourteen (14) days following receipt of the Notice of Dispute, either party may seek to have the Dispute resolved by non-binding mediation pursuant to the construction industry rules of the American Arbitration Association. Promptly upon selection of a mediator, the parties shall provide the mediator with copies of the Notice of Dispute, all related, relevant documents and a statement of their respective positions and shall request that the mediator meet with the parties within twenty (20) days of such selection to consider and propose a resolution or a procedure for reaching a resolution.

(ii) If the parties have not resolved the Dispute or have not agreed in a writing signed by an officer of both parties to resolve the Dispute by binding arbitration, either party, after sixty (60) days following receipt of the Notice of Dispute (regardless of whether any mediation process has occurred or is ongoing or concluded), may seek a resolution in any state or federal court that has jurisdiction over the parties and the subject matter of the Dispute ("Court"). Either party may apply to a Court for an order, if necessary, granting preliminary relief to maintain the status

quo, to avoid irreparable injury, or to obtain other emergency relief at any time during the process described above. Despite such application, the parties will continue to participate in good faith in the procedures specified in this Section 10.1.1.

10.1.2 The procedures specified in this Article 10 shall be the sole and exclusive procedures for the resolution of Disputes. THE PARTIES HEREBY WAIVE TRIAL BY JURY WITH RESPECT TO ANY ACTION OR PROCEEDING BROUGHT IN CONNECTION WITH THIS AGREEMENT.

ARTICLE 11
INDEPENDENT CONTRACTOR

11.1 MEANS, MANNER AND METHOD.

Subcontractor shall not be deemed an employee or agent of AMEC for any purpose. As an independent contractor, neither Subcontractor nor its employees shall be entitled to receive any employee benefits provided by AMEC to its employees, and Subcontractor shall be solely responsible for compliance with all laws and regulations pertaining to employment of its employees, agents and sub-subcontractors including, without limitation, withholding and remitting payment of FICA and federal and state unemployment compensation taxes and any federal, state and/or local income taxes and filing all tax returns with respect to all such taxes.

11.2 NO AUTHORITY TO CONTRACT.

Subcontractor shall have no authority whatsoever to submit proposals for the performance of services by AMEC, or to bind AMEC to the terms or conditions of any agreement, contract or arrangement, or to commit AMEC in any manner whatsoever; nor shall Subcontractor represent to any person that it has any such authority.

11.3 COORDINATION AND INSPECTION.

AMEC retains the right to coordinate, inspect and approve the Work. Such retained rights shall not affect the obligations of Subcontractor to comply with all aspects of the Contract Documents.

ARTICLE 12
MISCELLANEOUS PROVISIONS

12.1 GOVERNING LAW.

The validity, performance, and enforcement of this Agreement shall be governed by the laws of the state which is so specified in the Prime Agreement. In the event such governing law is not defined in the Prime Agreement, the terms of the Agreement shall be interpreted and enforced by the laws of the State in which the Project site is located.

12.2 SEVERABILITY.

The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other provision.

12.3 NO WAIVER OF PERFORMANCE.

The failure of either party to insist, in any one or more instances, upon the performance of any of the terms, covenants or conditions of this Agreement, or to exercise any of its rights hereunder, shall not be construed as a waiver or relinquishment of those terms, covenants, conditions or rights with respect to further performance.

12.4 TITLES.

The titles given to the Articles and Sections of this Agreement are for ease of reference only and shall not be relied upon or cited for any other purpose.

12.5 OTHER PROVISIONS AND DOCUMENTS.

Other provisions and documents applicable to the Work, if any, are set forth in the Exhibits attached hereto.

12.6 NON-DISCRIMINATION IN EMPLOYMENT.

Subcontractor agrees and hereby certifies that in providing the Work hereunder, it shall not discriminate against any employee or applicant because of race, color, religion, age, sex, or national origin. Subcontractor shall abide by provisions of all applicable governmental regulations pertaining to non-discrimination, including Executive Orders 11246 and 11141 (Equal Employment Opportunity); 41 CFR 60-741.4 (Employment of the Handicapped; 41 CFR 60-250.4 (Employment of Disabled Veterans and Veterans of the Vietnam era); regulations regarding Utilization of Small business Concerns and Small Disadvantaged Business Concerns; regulations regarding utilization of Labor Surplus Area Concerns; and regulations regarding Women-Owned Business Concerns.

12.7 NOTICES.

Any notice to be given under this Agreement shall be in writing and shall be deemed given and received five (5) calendar days after deposit in the United States mail, certified mail, with postage prepaid, return receipt requested, or upon actual delivery to the other party at the following address:

TO: (AMEC)
Attn: Becky McMurray
9725 Cogdill Road
Knoxville, TN 37932

TO: (Subcontractor)
Attn:
{Enter address here}

{Enter city, state & zip here}

12.8 SOLICITATION.

It is expressly agreed and understood that Subcontractor will not hire or directly or indirectly solicit personnel of AMEC for the purpose of inducing them to join Subcontractor's employ during the Term and for one (1) year thereafter.

12.9 BRIBERY AND CORRUPTION PROHIBITED.

12.9.1 Subcontractor will undertake to protect the standards of business practice of AMEC at all times and to act in such a way as to uphold AMEC's good name and reputation and not to do or attempt to do any act or thing which is intended and/or which in fact causes any damage to or brings discredit upon AMEC. In particular, Subcontractor shall not, directly or indirectly:

(i) Offer or give or agree to give to any director, officer, employee, or agent of AMEC or Client any gift or consideration of any kind as an inducement or reward for doing or for forbearing to do or for having done or forborne to do any action in relation to the obtaining or execution of this Agreement, the Prime Agreement, or any other agreement with AMEC or Client or for showing or forbearing to show any favor or disfavor to any person in relation to this Agreement, the Prime Agreement, or any other agreement with AMEC or Client.

(ii) Induce or attempt to induce any officer, servant, employee, or agent of any private or public body to depart from his or her duties to his or her employer nor be involved with any such arrangement.

12.9.2 Subcontractor agrees to review and comply with AMEC's Supplier Code of Business Conduct at http://www.amec.com/supply-chain-cobc.htm. Subcontractor shall report any potential, suspected or actual breaches of the law or AMEC's Supplier Code of Business Conduct via the website.

12.10 SURVIVAL.

All of Subcontractor's obligations and liabilities hereunder, including, but not limited to, its warranty and indemnification obligations and AMEC's rights and remedies with respect thereto, shall survive the expiration or termination of this Agreement and the Work Orders.

12.11 ENTIRE AGREEMENT.

This Agreement and the other Contract Documents set forth herein constitute the entire and integrated agreement between AMEC and Subcontractor with respect to the subject matter hereof, and supersede all prior negotiations, agreements, understandings, restrictions, warranties, or representations, either written or oral between AMEC and Subcontractor.

ARTICLE 13
EXISTING CONTRACT DOCUMENTS

The following Exhibits, if checked, are attached and made a part of this Agreement.

13.1	☒	**EXHIBIT A**	Work Order.
13.2	☒	**EXHIBIT B**	Prime Agreement, if applicable
13.3	☒	**EXHIBIT C**	Change Order
13.4	☒	**EXHIBIT D**	Work Order Closeout Form and Lien Release

IN WITNESS WHEREOF, the parties hereto have executed this Agreement by duly authorized agents as of the day and year stated at the beginning of this Agreement.

AMEC: AMEC E&I, Inc.

BY:_____

PRINT NAME:

PRINT TITLE: Subcontract Administrator

DATE:_____

SUBCONTRACTOR: {Enter Name of Subcontractor Here}

BY:_____

PRINT NAME:_____

PRINT TITLE:_____

DATE:_____

SUBCONTRACT PURCHASE/WORK ORDER

TO: {ENTER NAME HERE} {ENTER ADDRESS HERE} {ENTER ADDRESS HERE} {ENTER ADDRESS HERE}	AMEC WORK ORDER & PO NO.: {ENTER NUMBER HERE} AMEC PROJECT NAME: {ENTER NAME HERE} AMEC PROJECT NO.: {ENTER NUMBER HERE} DATE ISSUED:{ENTER MONTH, DATE & YEAR HERE}

INSTRUCTIONS TO SUBCONTRACTOR/SUBCONSULTANT:

All invoices and correspondence must identify the name of the SUBCONTRACTOR/SUBCONSULTANT and contain the name of the AMEC office requesting the Work/Services as well as AMEC's Project Name, Project No. and Work Order & PO No. Invoices must be received by AMEC within thirty (30) days of performing the Work/Services and sent to AMEC either electronically to VendorElectronicInvoices@amec.com or by hardcopy to the following address:

1105 Lakewood Parkway, Suite 300
Alpharetta, GA 30009
Attn: Accounts Payable Department

SUBCONTRACTOR/SUBCONSULTANT shall perform the work/services described in this Work Order ("Work/Services") for the benefit of AMEC and {Insert legal name of Client} ("Client") in accordance with the terms and conditions contained in that certain Subcontract Agreement {Insert Agreement Number} between AMEC and SUBCONTRACTOR/SUBCONSULTANT dated {Enter date of Agreement}, and any amendments thereto (collectively, "Agreement"), including, without limitation, the Prime Agreement between AMEC and Client which is either attached to the Agreement as Exhibit "B" or to the first Subcontract Work Order issued under the Agreement as Exhibit "A" and incorporated herein and therein by reference.

The Work Order directly or indirectly supports Federal Government Contract: ☐ Yes ☐ No. If Yes, Contract No. _____, DPAS No. _____.

SCOPE OF WORK/SERVICES:

SUBCONTRACTOR/SUBCONSULTANT shall perform the Work/Services which, if not set forth immediately below, is set forth on Attachment "1" hereto in accordance with the Drawings and Specifications provided by AMEC, as set forth on Attachment "2" hereto, as applicable, both of which are incorporated herein. Among other things, the Work/Services will address coordination and other areas relevant to, and appropriate for, the proper performance of the Services.

{Insert Scope}

SCHEDULE:

SUBCONTRACTOR/SUBCONSULTANT shall perform the Work/Services and deliver the work product in accordance with the Performance Schedule which, if not set forth immediately below, is set forth on Attachment "3" hereto and incorporated herein.

{Insert Schedule}

PRICE:

Upon satisfactory completion of the Work/Services, AMEC shall pay and SUBCONTRACTOR/SUBCONSULTANT shall accept the following as full compensation for the Work/Services:

☐ The Not-to-Exceed Cost Reimbursement for the Work/Services, which is {Enter written amount here} (${Enter figure here}).
☐ The Not-to-Exceed Firm Fixed Price for the Work/Services, which is {Enter written amount here} (${Enter figure here}).
☐ The Not-to-Exceed Time & Materials Price for the Work/Services, which is {Enter written amount here} (${Enter figure here}).
☐ The Not-to-Exceed Fixed Unit Price for the Work/Services, which is {Enter written amount here} (${Enter figure here}).

If the compensation is based upon a Fee Schedule, applicable billing rates are set forth in Attachment "4" hereto and incorporated herein.

Any deviation from the above price must be authorized by an executed Change Order.

INSURANCE:

SUBCONTRACTOR/SUBCONSULTANT will not commence Work/Services until it provides AMEC with a certificate evidencing all insurance coverages required of it. The insurance requirements in the Agreement are modified as follows: {If applicable and following the prior approval of the Director of Risk Management, insert modifications here}.

BONDS:

SUBCONTRACTOR/SUBCONSULTANT shall secure and maintain the following surety bonds before commencing Work/Services: {Enter description here}.

Exhibit "A"

OTHER: _____

By their signatures below, the parties acknowledge that they shall be bound by the terms of this Work Order, including the attachments hereto, and that the undersigned are authorized to enter into this Work Order.

SUBCONTRACTOR/SUBCONSULTANT	{ENTER APPROPRIATE AMEC ENTITY HERE}
By _____	By _____
Print Name _____	Print Name _____
Title _____	Title _____
Date _____	Date _____

Scope of Work / Services
(Attachment "1")

The Work / Services to be performed pursuant to this Work Order include:

Drawings and Specifications

(Attachment "2")

The Work / Services to be performed pursuant to this Worker Order shall be performed in accordance with the following drawings and specifications, as applicable:

Performance Schedule

(Attachment #3)

Fee Schedule

(Attachment #4)

See attached.

Exhibit “B”

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of CONTRACTOR)

_____
(Address of CONTRACTOR)

a _____ , hereinafter called Principal, and_____
(Name of Surety)

_____
(Address of Surety)

hereinafter call Surety, are held and firmly bound unto _____
(Name of OWNER)

_____
(Address of OWNER)

hereinafter called OWNER, in the penal sum of _____
(Written Bid Amount) (Dollars)

in lawful money of the United States, for the payment of which sum will and truly be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2012, a copy of which is hereto attached and made a part hereof for the construction of: South Richland Conservancy District Old US Highway 31 Water Main Extension

NOW, THEREFORE, if the Principal shall, willingly, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term, thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the ____ day of _____, 2012.

ATTEST:

_____
Principal

_____ By _____

(SEAL)

_____ _____
Witness as to Principal Surety

_____ _____
Address Address

_____ _____

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____ _____
Witness as to Surety Attorney-in-fact

_____ _____
Address Address

_____ _____

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

_____
(Name of CONTRACTOR)

_____
(Address of CONTRACTOR)

a _____ , hereinafter called Principal, and_____
(Name of Surety)

_____
(Address of Surety)

hereinafter call Surety, are held and firmly bound unto _____
(Name of OWNER)

_____
(Address of OWNER)

hereinafter called OWNER, in the penal sum of _____
(Written Bid Amount) (Dollars)

in lawful money of the United States, for the payment of which sum will and truly be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2012, a copy of which is hereto attached and made a part hereof for the construction of: South Richland Conservancy District Old US Highway 31 Water Main Extension

NOW, THEREFORE, if the Principal shall, willingly, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term, thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this the ____ day of _____, 2012.

ATTEST:

_____
Principal

_____ By _____

(SEAL)

_____ _____
Witness as to Principal Surety

_____ _____
Address Address

_____ _____

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____ _____
Witness as to Surety Attorney-in-fact

_____ _____
Address Address

_____ _____

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

NOTICE OF AWARD

TO _____
_____
_____

PROJECT DESCRIPTION: South Richland Conservancy District Old US Highway 31 Water Main Extension

---

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 2012 and Instructions to Bidders.

You are hereby notified that your BID has been accepted for Base Bid in the amount of $_____.

You are required by the Instructions to Bidders to execute the Agreement and furnish the required CONTRACTOR's Performance Bond, Payment Bond and Certificates of Insurance within 10 (ten) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your Bid Bond. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____ ____, 2012.

_____
OWNER

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By _____ this the _____ day of _____ ___, 2012.

By _____ Title _____

NOTICE TO PROCEED

To: _____ Date: _____

_____ Project: South Richland Conservancy District

_____ Old US Highway 31Water Main Extension

_____ _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____ _____, 2012, on or before _____ __, 2012, and you are to complete the WORK within _____ consecutive calendar days thereafter.

The date of completion of all WORK is therefore _____ __, 2012.

_____
OWNER

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED
is hereby acknowledged by _____

_____

this the _____ day of _____, 2012.

By: _____

Title: _____

Contractor's Application For Payment No. _____

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer)
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

APPLICATION FOR PAYMENT

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	$	
2. Net change by Change Orders	$	
3. CURRENT CONTRACT PRICE (Line 1 ± 2)	$	
4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)	$	
5. RETAINAGE:		
a. _____ % x $_____ Work Completed	$	
b. _____ % x $_____ Stored Material	$	
c. Total Retainage (Line 5a + Line 5b)	$	
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)	$	
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	$	
8. AMOUNT DUE THIS APPLICATION	$	
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)	$	

CONTRACTOR'S CERTIFICATION

The undersigned CONTRACTOR certifies that: (1) all previous progress payments received from OWNER on account of Work done under the Contract have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of: $_____
(Line 8 or other - attach explanation of other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $_____
(Line 8 or other - attach explanation of other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____
Funding Agency (if applicable) (Date)

Progress Estimate

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A		B	Work Completed		E	F		G
Item			C	D		Total Completed and Stored to Date (C + D + E)	% (F) B	Balance to Finish (B - F)
Specification Section No.	Description	Scheduled Value	From Previous Application (C + D)	This Period	Materials Presently Stored (not in C or D)			
	Totals							

Progress Estimate

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A				B	C	D	E	F		G
Item		Bid Quantity	Unit Price	Bid Value	Estimated Quantity Installed	Value	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F) B	Balance to Finish (B - F)
Bid Item No.	Description									
	Totals									

Stored Material Summary

Contractor's Application

For (contract):							Application Number:		
Application Period:							Application Date:		
A	B	C	D		E		F		G
Invoice No.	Shop Drawing Transmittal No.	Materials Description	Stored Previously		Stored this Month		Incorporated in Work		Materials Remaining in Storage ($) (D + E - F)
			Date (Month/Year)	Amount ($)	Amount ($)	Subtotal	Date (Month/Year)	Amount ($)	
		Totals							

SUBCONTRACT CHANGE ORDER

TO: {ENTER NAME HERE}
{ENTER ADDRESS HERE}
{ENTER ADDRESS HERE}
{ENTER ADDRESS HERE}

AMEC WORK ORDER & PO NO.: {ENTER NUMBER HERE}
AMEC PROJECT NAME: {ENTER NAME HERE}
AMEC PROJECT NO.: {ENTER NUMBER HERE}
DATE ISSUED: {ENTER MONTH, DATE & YEAR HERE}
CHANGE NO: {ENTER NUMBER HERE}

In accordance with the terms and conditions contained in that certain Subcontract Agreement {Insert Agreement Number}between AMEC and Subcontractor/Subconsultant dated {Enter date of Agreement}, and any amended thereto (collectively, "Agreement"), the above-referenced Work Order ("Work Order") issued pursuant to the Agreement is hereby changed only as follows:

CHANGE(S) IN WORK/SERVICES:

☐ No change in Subcontractor's/Subconsultant's Work/Services.

☐ Subcontractor's/Subconsultant's Work/Services have been changed as follows: {Insert description of changes. As needed, reference and attach any applicable documents, including a revised Attachment "1" or "2" (or both) to the Work Order, as applicable.}

CHANGE IN SCHEDULE:

☐ No change in Subcontractor's/Subconsultant's time for completion of the Work/Services.

☐ Subcontractor's/Subconsultant's time for completion of the Work/Services has been changed as follows: {Insert description of changes. As needed, reference and attach applicable documents, including a revised Attachment "3" to the Work Order, as applicable.}

CHANGE IN COMPENSATION:

☐ No change in the amount of Subcontractor's/Subconsultant's compensation for the Work/Services.

☐ The compensation of Subcontractor/Subconsultant for the Work/Services is hereby adjusted as follows: {Insert amount and/or basis upon which compensation will be adjusted. As needed, reference and attach any applicable documents, including a revised Attachment "4" to the Work Order, as applicable.}

Original Agreement/ceiling amount:	$_____
Current Agreement amount, as adjusted by previous Change Orders:	$_____
Increase or decrease resulting from this Change Order:	$_____
Revised Agreement/ceiling amount:	$_____

OTHER CHANGES:

☐ No other changes.

☐ {Insert description of other changes}

This Subcontract Change Order shall become an amendment to the above-referenced Work Order, and all Work/Services covered by this Subcontract Change Order will be performed under the terms of the Agreement.

SUBCONTRACTOR/SUBCONSULTANT	{ENTER APPROPRIATE CONTRACTING ENTITY HERE}
By _____	By _____
Print Name _____	Print Name _____
Title _____	Title _____
Date _____	Date _____

Attachments: {List any attachments}

Exhibit "C"

Subcontract Work Order
Closeout Form and Lien Release

Agreement #: {Insert Number}	Client: {Insert Name}
Subcontract Work Order & PO # : {Insert Number}	AMEC Project Name: {Insert Name}
Subcontract Change Order #: {Insert Number}	AMEC Project #: {Insert Number}

INSTRUCTIONS: This document must be completed and submitted together with the SUBCONTRACTOR's/SUBCONSULTANT's final invoice. Failure to properly comply with this requirement shall delay processing of the SUBCONTRACTOR's/SUBCONSULTANT's final payment. Final invoices not submitted within thirty (30) days of completion of the applicable work and/or services shall be subject to rejection.

In accordance with and pursuant to the terms and conditions of the above-referenced Subcontract, Subcontract Work Order and Subcontract Change Order, as applicable, (collectively, "Subcontract Documents"), by submission of this document, the SUBCONTRACTOR/SUBCONSULTANT herewith acknowledges and agrees that:

All work and/or services pertaining to the above-referenced Subcontract Work Order and applicable Change Order, if any, has been completed in a satisfactory manner as required by the Subcontract Documents.

Any property furnished to the SUBCONTRACTOR/SUBCONSULTANT by the AMEC company designated in the Subcontract Documents ("AMEC") and/or its Client has been returned and/or dispositioned as directed by AMEC.

All work and/or services performed by the SUBCONTRACTOR/SUBCONSULTANT, or any of its officers, agents, employees or subcontractors, is free from any claim(s) of patent, copyright, and/or trademark and service mark infringement.

All previous payments and SUBCONTRACTOR's/SUBCONSULTANT's final invoice, when paid, fully satisfy AMEC's obligations to the SUBCONTRACTOR/SUBCONSULTANT with regard to compensation due it under the terms of the Subcontract Documents for the performance of work and/or services on the above-referenced Project, and the SUBCONTRACTOR/SUBCONSULTANT has paid or will pay in a timely manner all of its obligations arising out of such performance.

Upon payment of the final invoice, the SUBCONTRACTOR/SUBCONSULTANT thereby remises, releases, discharges and holds harmless AMEC, its parent, subsidiaries and affiliates, including their respective officers, agents and employees, from any and all claims, demands, liens and lien rights against AMEC and its Client, and their respective properties, on account of goods or services arising out of the performance of work and/or services on, and the provision of materials and equipment for, the above-referenced Project by the SUBCONTRACTOR/SUBCONSULTANT and any of its officers, agents, employees, subcontractors, sub-subcontractors, subconsultants, sub-subconsultants and materialmen under the Subcontract Documents.

Upon payment of the final invoice, the SUBCONTRACTOR/SUBCONSULTANT thereby assigns, transfers, sets over and releases to AMEC all right, title and interest to all refunds, rebates, credits, or other amounts (including any interest thereon) arising out of the former's performance under the Subcontract Documents with respect to the above-referenced Project, together with all rights of action accrued, or which may hereafter accrue, thereunder and with respect thereto.

Receipt of the final payment shall not relieve or release the SUBCONTRACTOR/SUBCONSULTANT from any surviving obligations or liabilities arising out of or resulting from the terms of the Subcontract Documents.

IN WITNESS WHEREOF, this Subcontract Work Order Closeout Form and Lien Release has been executed this day of , 20 . By my signature, I certify that I am authorized and empowered to sign for and on behalf of the SUBCONTRACTOR/SUBCONSULTANT by all necessary authority and within the scope of my authority on behalf of such entity.

SUBCONTRACTOR/SUBCONSULTANT: {Insert Name}	WITNESSES:
By: _____ (Signature)	Signature/Title: _____
Name: _____ (Printed Name)	_____ Signature/Title: _____
Title: _____	_____

Exhibit "D"

SECTION 01010
SUMMARY OF WORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Work to be performed under this Contract consists of the following items:

1. Installation of approximately 18,900 LF of 4-inch and 6-inch water main.
2. Installation of approximately 5,890 LF of 1-inch and 2-inch service piping
3. Water service connection to approximately 34 homes
4. Supply and installation of water booster station complete with pumps, chlorine addition equipment, and backup natural gas powered generator
5. Installation of miscellaneous appurtenances.
6. Surface restoration and cleanup.

B. Perform all Work in accordance with the Contract Documents of which the Specifications are a part. Furnish all materials, equipment, and labor necessary for the proper completion of the Work.

C. Repair, replace, or otherwise settle with the OWNER if damage occurs to property or existing facilities during the construction of the Work.

1.02 CONTRACT

A. Construct the Work under a single unit price contract.

1.03 CONTRACTOR'S USE OF PREMISES

A. Operations at the construction site shall be confined to areas permitted by law, ordinances, permits, contract, or ENGINEER.

B. The CONTRACTOR shall confer with the ENGINEER at the Project and obtain full knowledge of all site rules and regulations affecting the Work. The CONTRACTOR shall conform to site rules and regulations while engaged in the project construction. Site rules and regulations take precedence over others that may exist outside the jurisdiction.

C. The CONTRACTOR shall rigidly enforce the following vehicle use rules:

1. Keep all vehicles, mechanized, or motorized equipment locked at all times, when parked or unattended on the OWNER's premises.

2. Do not, under any circumstances, leave any vehicle unattended with the motor or engine running, or with the ignition in place.

3. Parking will be permitted only in areas designated by the ENGINEER.

4. All traffic control is subject to the ENGINEER's approval.

D. Required Coordination

1. The CONTRACTOR shall coordinate all Work with the OWNER and ENGINEER.

1.04 REFERENCED STANDARDS

A. Any reference to published specifications or standards of any organization or association shall comply with the requirements of the specifications or standard which is current on the date of advertisement for bids. In case of a conflict between the referenced specifications or standards, the one having the more stringent requirements shall apply.

B. In case of conflict between the referenced specifications, standards, and the Contract Documents, the Contract Documents shall govern.

1.05 ABBREVIATIONS

A. The following abbreviations have been used throughout these specifications:

AASHTO	American Association of State Highway & Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
FS	Federal Specifications
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration

1.06 QUALITY ASSURANCE

A. In the installation of this Work the CONTRACTOR shall comply with the laws, ordinances, and rules of the OWNER and the State of Indiana in every way.

B. All equipment and materials shall be new and shall be installed and completed in a conscientious manner. The ENGINEER shall have the authority to reject any item which, in his opinion, does not present an orderly and reasonably neat appearance, provided that such item can be properly installed in such orderly way by usual methods.

C. The Specifications are intended to include all details of a complete installation for the purposes specified; however, the CONTRACTOR shall be responsible for all details which may be necessary to properly install, adjust, and place in operation the complete installation. The CONTRACTOR shall assume full responsibility for additional costs which may result from unauthorized deviations from Specifications.

1.07 COMPLETION AND EXCESS COST OF FIELD INSPECTION

A. The attention of CONTRACTORS is directed to the following provision covering payment of field inspection costs on this Project. The proposal form and Contract form on this Contract provides for a stated number of calendar days to be allowed from the date of the Contract to the date of final completion and acceptance of all Work covered in the Contract. Inspectors will be supplied during this period by the OWNER at no cost to the CONTRACTOR. However, for each day that the Work remains uncompleted and unaccepted beyond the number of days allowed in the Contract, the cost of resident inspectors regularly assigned on this Contract will be deducted from final amounts due the CONTRACTOR. The cost of resident inspectors deducted from any monies due the CONTRACTOR is for liquidated damages for the loss to the OWNER or on account of the expenses due to the employment of engineers and their assistants and to other expenses after the expiration of completion time.

1.08 VERIFICATION OF DRAWINGS

A. The CONTRACTOR shall field verify all dimensions shown on the Drawings to the extent that such conditions may affect the Work.

B. All locations of utilities are approximate. CONTRACTOR is responsible for locating all utilities during construction.

1.09 ADDITIONAL FINAL INSPECTIONS

A. The attention of the CONTRACTOR is directed to the following provisions covering cost of additional final inspection. If, upon written notice from CONTRACTOR that the Work is complete, the ENGINEER finds that the Work is defective or incomplete, the CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies. These remedies shall be subject to additional final inspection. The cost of additional final inspections will be computed on the basis of One Hundred Ten Dollars ($110.00) per 1-hour period with such amounts to cover actual costs to the OWNER. The time for payment of additional final inspections shall include time of travel to and from the job site, in addition to time for inspection on the job site. The cost of additional final inspections deducted from any monies due to CONTRACTOR is for liquidated damages for losses to the OWNER.

1.10 "OR EQUAL" CLAUSE

A. Whenever a material or article required is specified or shown on the Drawings by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will perform adequately the duties imposed by the general design will be considered equal and satisfactory providing the material or article so proposed is of equal substance and function in the ENGINEER's opinion. It shall not be purchased or installed without his written concurrence.

1.11 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

1.12 ACCESS TO AND USE OF FACILITIES

A. The OWNER and ENGINEER shall be granted access to the work site at any time during working hours. Any monitoring or testing equipment shall be open to inspection by the ENGINEER and OWNER during the Work.

B. All Work which requires interruption of existing operations shall be coordinated in advance with the OWNER and OPERATOR.

1.13 AS-BUILT DRAWINGS

A. Submit two (2) copies of "as-built" drawings showing any changes in location and installation of the Work.

-End of Section-

SECTION 01150
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section pertains to the measurement, description, and limits of each respective contract item of work for which payment will be made. Measurement of work for each contract item will be computed either as a Lump Sum (L.S.) or as unit quantities, i.e., per lineal foot (L.F.), per vertical foot (V.F.), per cubic foot (C.F.), per cubic yard (C.Y.), per square foot (S.F.), per square yard (S.Y.), per each (EA.), etc., all as set forth in the Bid Schedule.

1.02 TRENCHING, BACKFILLING, AND COMPACTION

A. Trenching and Structural Excavation

1. Trenching and structural excavation in common soil shall be included in the cost per lineal foot of water main or the cost of the structure.

2. Excavation and removal of rock (if any is encountered) shall be an additional cost. ENGINEER shall determine if material qualifies as rock excavation.

3. Exploratory excavations shall be paid for at the unit cost per cubic yard and shall include all items necessary to perform the exploratory excavation including, but not limited to, pavement cutting, excavation, sheet piling (where required), backfilling, compaction, and hauling of any waste material.

B. Bedding

1. Bedding for pipe including granular cradle and concrete cradle shall be considered incidental to the price per lineal foot of installed water or sewer main.

2. Measurement of B-borrow for payment purposes shall be as specified in the Contract Documents.

3. Any material meeting the requirements of Section 02221, 2.01, "Pipe Bedding," which has been excavated from the trenches may be used for backfilling the excavated trenches. However, no compensation will be allowed as trench backfill for the portion of the trench backfilled with the excavated material.

C. Stabilization Material and Limestone Screenings

1. A maximum of ten (10) cubic yards of bottom stabilization material and ten (10) cubic yards of limestone screenings shall be supplied at no additional cost to the OWNER if the materials are needed.

D. Selected Granular Backfill for Trenches

1. Measurement of selected granular backfill shall assume vertical trench walls with a width as specified in the Contract Documents. The depth shall be taken from the ground surface to the top of cover.

2. Any flare of excavation beyond the above limit will be backfilled with selected granular backfill at the expense of the CONTRACTOR.

3. Any material meeting the requirements of Section 02221, 2.03, "Backfill Materials" which has been excavated from the trenches may be used for backfilling the trenches. However, no compensation will be allowed as select backfill for the portion of the trench backfilled with excavated material.

E. Backfill for Trenches and Structures

1. All compaction and handling for backfill material shall be included in the cost per cubic yard for backfill or granular cradle, if applicable. If water jetting is used to compact backfill, all costs associated with water usage shall be included in the cost per cubic yard for select granular backfill.

1.03 SEEDING - SECTION 02485

A. Seeding of areas disturbed by construction shall assume a width of repair as specified in the Drawings. Payment will be made at the contract price per square foot of installed water main and will include all necessary work to complete the installation.

1.04 WATER SERVICE CONNECTION TO HOUSE

A. The water service connection to house bid item shall include all labor and material necessary, such as water shutoff valve, all piping and fittings required to complete the connection of the new water service to the house's existing potable water system, and to disconnect the existing well/pressure tank system from the internal potable plumbing as generally described in Section 02750 of the Specifications.

1.05 RE-PLUMBING OF WELL SYSTEM FOR OUTDOOR USE ONLY

A. The re-plumbing of well system for outdoor use only bid item shall include all labor and material necessary to connect the house's existing well/pressure tank system to external spigots/hydrants as generally described in Section 02750 of the Specifications.

1.06 OTHER WORK

A. Any other item of work shown in the Drawings and not covered in the Bid, but necessary for the completion of the Project shall be included in the contract price for the items to which the work pertains.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01152
APPLICATION FOR PAYMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Submit Applications for Payment to ENGINEER in accordance with the schedule established by Conditions of the Contract and Agreement between OWNER and CONTRACTOR.

B. Related Requirements in Other Parts of the Project Manual

1. Lump Sum and Unit Prices: Agreement between OWNER and CONTRACTOR.

2. Progress Payments, Retainages, and Final Payment: Conditions of the Contract.

C. Related Requirements Specified in Other Sections:

1. Contract Closeout: Section 01700

1.02 FORMAT AND DATA REQUIRED

A. Submit itemized applications typed on the Contractor's Application for Payment.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form

1. Fill in required information, including that for Change Orders executed prior to the date of submittal of Application.

2. Fill in summary of dollar values to agree with the respective totals indicated on the Continuation Sheets.

3. Execute certifications with the signature of a responsible officer of Contract firm.

B. Continuation Sheets

1. Fill in total list of all scheduled component items of Work with item number and the scheduled dollar value for each item.

2. Fill in the order value in each column for each scheduled line item when work has been performed or products stored.

a. Round off values to nearest dollar, or as specified for the Schedule of Prices.

3. List each Change Order executed prior to the date of submission at the end of the Continuation Sheets.

a. List by Change Order Number and description as for an original component item of work.

C. Lien Waiver

1. CONTRACTOR shall furnish lien waivers with applications for payment for amount of work billed as shown on the Application for Payment.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the OWNER or the ENGINEER requires substantiating data, CONTRACTOR shall submit suitable information with a cover letter identifying:

1. Project

2. Application number and date

3. Detailed list of enclosures

4. For stored products:

a. Item number and identification as shown on Application
b. Description of specific material

B. Submit one copy of data and cover letter for each copy of Application.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Use Continuation Sheet for presenting for final statement of accounting as required in Section 01700, Contract Closeout.

1.06 SUBMITTAL PROCEDURE

A. Submit Application for Payment for ENGINEER at the time stipulated in the Agreement.

B. Number: Three copies of each Application.

C. When ENGINEER finds the Application properly completed and correct, ENGINEER will transmit a Certificate for Payment to OWNER with a copy to CONTRACTOR.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01200
PROJECT MEETINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall schedule and administer preconstruction meetings, periodic progress meetings, and specially called meetings throughout the progress of the work to insure coordination between the Work and the OWNER.

1. Prepare agenda for meetings
2. Distribute written notice of each meeting four days in advance of meeting date
3. Make physical arrangements for meetings
4. Preside at meetings
5. Record the minutes; include all significant proceedings and decisions
6. Reproduce and distribute copies of minutes within three days after each meeting
   a. To all participants in the meeting
   b. To all parties affected by decisions made at the meeting
   c. Furnish one copy of minutes to ENGINEER

B. Representatives of contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. ENGINEER may attend meetings to ascertain that Work is expedited consistent with Contract Documents and the construction schedules.

D. Related Requirements in Other Parts of the Project Manual

1. Pre-Bid Conferences: Instructions to Bidders

E. Related Requirements Specified in Other Sections

1. Summary of Work: Section 01010

1.02 PRE-CONSTRUCTION MEETING

A. The CONTRACTOR shall schedule a pre-construction meeting within 15 days after date of Notice to Proceed.

B. Location. A central site, convenient for all parties, designated by CONTRACTOR.

C. Attendance

1. OWNER's Representative
2. ENGINEER and his professional consultants
3. Resident Project Representative
4. CONTRACTOR's Superintendent
5. Major Subcontractors
6. Major Suppliers
7. Others as Appropriate

D. Suggested Agenda

1. Distribution and discussion of:
   a. List of major subcontractors; and
   b. Projected Construction Schedules
2. Critical work sequencing
3. Major equipment deliveries and priorities
4. Project Coordination
   a. Designation of responsible personnel
   b. Designation of EEO
5. Procedures and processing of
   a. Field decisions
   b. Proposal requests
   c. Submittals
   d. Change Orders
   e. Applications for Payment
6. Adequacy of distribution of Contract Documents
7. Procedures for maintaining Record Documents
8. Use of premises
   a. Office, work and storage areas
   b. Owner's requirements
9. Construction facilities, controls and construction aids
10. Temporary utilities
11. Safety and first-aid procedures
12. Security procedures
13. Housekeeping procedures

1.03 COORDINATION MEETINGS

A. Schedule periodic meetings, as required.

B. Hold called meetings as required by progress of the Work and as required to coordinate the work with the OWNER.

C. Location of the meetings: The project field office of the CONTRACTOR

D. Attendance

1. ENGINEER, and his professional consultants as needed
2. Subcontractors as appropriate to the agenda
3. Suppliers as appropriate to the agenda
4. Others

E. Suggested Agenda

1. Review, approval of minutes of previous meeting
2. Review of work progress since previous meeting
3. Field observations, problems, conflicts
4. Problems which impede Construction Schedule
5. Review of off-site fabrication, delivery schedules

6. Corrective measures and procedures to regain projected schedule
7. Revisions to Construction Schedule
8. Plan progress, schedule, during succeeding work period
9. Coordination of schedules
10. Review submittal schedules; expedite as required
11. Maintenance of quality standards
12. Review proposed changes for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other contracts of the Project.
13. Other business

-End of Section-

SECTION 01340
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Submit Shop Drawings, Product Data and Samples required by the Contract Documents.

B. Related Requirements in Other Parts of the Project Manual:

1. Definitions and Additional responsibilities of Parties: Conditions of the Contract.

C. Related Requirements Specified in Other Sections:

1. Project Record Documents: Section 01720

2. Sitework: Division 2

3. Concrete: Division 3

D. Designate in the construction schedule or in a separate coordinated schedule the dates for submission and the dates that reviewed Shop Drawings, Product Data, and Samples will be needed.

1.02 SHOP DRAWINGS

A. Drawings shall be presented in a clear and thorough manner.

1. Details shall be identified by reference to sheet and details or schedules shown on Drawings.

B. Minimum sheet size: 8 1/2" x 11".

1.03 PRODUCT DATA

A. Preparation

1. Clearly mark each copy to identify pertinent products or models.

2. Show performance characteristics and capacities.

3. Show dimensions and clearances required.

4. Show wiring or piping diagrams and controls.

B. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the Work.

2. Supplement standard information to provide information specifically applicable to the Work.

1.04 SAMPLES

A. Office samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.

2. Full range of color, texture, and pattern.

1.05 CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings, Product Data, and Samples prior to submission.

B. Determine and verify:

1. Field measurements

2. Field construction criteria

3. Catalog numbers and similar data

4. Conformance with specifications

C. Coordinate each submittal with requirements of the Work and of the Contract Documents.

D. Notify ENGINEER in writing at the time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Begin no fabrication or work which requires submittals until return of submittals with ENGINEER's approval.

1.06 SUBMISSION REQUIREMENTS

A. Current as-built drawings shall be submitted with each Application for Payment.

B Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any CONTRACTOR.

C. Number of submittals required:

1. Shop Drawings: Submit the number of opaque reproductions which the CONTRACTOR requires plus two copies which will be retained by the ENGINEER.

2. Product Data: Submit the number of copies which the CONTRACTOR requires plus two which will be retained by the ENGINEER.

3. Samples: Submit the number stated in each specification section.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contract identification.

4. The names of:

a. Contractor
b. Supplier
c. Manufacturer

5. Identification of the product with the specification section number.

6. Field dimensions clearly identified as such.

7. Relation to adjacent or critical features of the Work or materials.

8. Applicable standards such as ASTM or Federal Specification numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. A 9 in. x 3 in. blank space for CONTRACTOR and ENGINEER stamps.

12. CONTRACTOR's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.

1.07 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by the ENGINEER and resubmit until approved.

B. Shop Drawings and Product Data:

1. Revise initial drawings or data and resubmit as specified for the initial submittal.

2. Indicate any changes which have been made other than those requested by the ENGINEER.

C. Samples: Submit new samples as required for initial submittal.

D. In the event a third submittal is required due to previous submittals being incomplete or incorrect or not in compliance with the Contract Documents, the CONTRACTOR will be charged one-half of the cost incurred by the ENGINEER for the review of the third submittal. The CONTRACTOR shall bear the total cost incurred by the ENGINEER for all subsequent reviews. The ENGINEER's costs charged to the CONTRACTOR will be at the cost plus rate generally charged by the ENGINEER and will be deducted by the OWNER from payments due to the CONTRACTOR.

1.08 DISTRIBUTION

A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the ENGINEER stamp of approval to:

1. Job site file
2. Record Documents file
3. Other affected contractors
4. Subcontractors
5. Supplier or Fabricator

B. Distribute samples which carry the ENGINEER stamp of approval as directed by the ENGINEER.

1.09 ENGINEER DUTIES

A. Review submittals with reasonable promptness and in accord with schedule.

B. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal.

C. Return submittals to CONTRACTOR for distribution or for re-submission.

-End of Section-

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall employ and pay for the services of an independent testing laboratory to perform specified testing.

1. CONTRACTOR shall cooperate with the laboratory to facilitate the execution of its required services.

2. Employment of the laboratory shall in no way relieve CONTRACTOR'S obligations to perform the Work of the Contract.

B. Related Requirements in Other Parts of the Project Manual

1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.

C. Related Requirements Specified in Other Sections

1. Laboratory tests required and standards for testing are stated in the respective sections of the Specifications.

D. Testing Laboratory Inspection, Sampling, and Testing is required for:

1. Disinfection of Domestic Water Lines: Section 01656
2. Pipe System Testing: Section 01666
3. Compaction Control and Testing: Section 02250

1.02 RESPONSIBILITIES OF THE CONTRACTOR

A. Cooperate with laboratory personnel, provide access to Work, and to manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities or representational samples of materials and mixes which require control by the testing laboratory.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials and mixes which require control by the testing laboratory.

D. Furnish copies of product test reports as required.

E. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. Reimburse OWNER for laboratory personnel and travel expenses incurred due to inconveniences caused by CONTRACTOR'S negligence.

G. Make arrangements with laboratory and pay for additional samples and tests required for the following:

1. CONTRACTOR'S convenience.

2. When initial tests indicate Work does not comply with Contract Documents

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 COMPACTION TESTING

A. The CONTRACTOR shall perform field density testing and laboratory testing to assure the OWNER and ENGINEER that soil compaction is in accordance with the Drawings and Specifications.

B. Costs for compaction testing shall be included in the CONTRACTOR's unit price for select backfill.

3.02 CONCRETE TESTING

A. Testing, as designated in Division 3: Concrete, shall be performed by the CONTRACTOR, or independent testing laboratory, as required, to assure the OWNER and ENGINEER that construction is in accordance with the Drawings and Specifications.

B. Costs for concrete testing including slump tests, compressive strength tests, air content tests, and any other measure or standard of concrete material quality shall be considered incidental to the Contract.

-End of Section-

SECTION 01510
TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Furnish, install, and maintain temporary utilities required for construction, remove on completion of Work.

B. Related Requirements Specified in Other Sections:

1. Summary of Work - Section 01010.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with National Electric Code.

B. Comply with Federal, State, and local codes and regulations and with utility company requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY UTILIZATION

A. CONTRACTOR shall familiarize himself with the site and the Work to be performed and make all necessary arrangements with the utility company for temporary utilities.

B. The CONTRACTOR shall coordinate with the utility company and the OWNER during temporary service outages.

C. The CONTRACTOR shall provide electrical service required for power and lighting.

D. All arrangements for testing of the electrical system shall be arranged by the CONTRACTOR and with the cooperation and consent of the utility company.

E. All costs associated with electricity utilization shall be the CONTRACTOR'S responsibility.

2.04 TEMPORARY WATER

A. CONTRACTOR shall be responsible for all costs associated with water usage required for construction procedures. Costs for water usage during construction by CONTRACTOR shall be considered incidental to the Contract.

2.05 TEMPORARY SANITARY FACILITIES

A. Provide sanitary facilities in compliance with laws and regulations.

B. Service, clean and maintain facilities and enclosures.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Comply with application requirements specified in Divisions 2 through 16.

B. Maintain and operate systems to assure continuous service.

C. Modify and extend systems as work progress requires.

3.02 REMOVAL

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

-End of Section-

SECTION 01530
BARRIERS AND TRAFFIC CONTROL DEVICES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Furnish, install, and maintain suitable barriers and traffic control devices as required to prevent public entry and to protect the Work, existing facilities, trees, and plants from construction operations; remove when no longer needed, or at completion of Work.

B. Related Requirements Specified in Other Section:

1. Summary of Work - Section 01010

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Federal, State and local codes and regulations.

B. Traffic control devices must comply with the State of Indiana Department of Transportation Standard Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS: GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 FENCING

A. Materials to the CONTRACTOR's option, minimum fence height 6 feet.

2.03 BARRIERS

A. Per INDOT Standard Drawings.

PART 3 - EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes.

B. Maintain barriers and traffic control devices during entire construction period.

C. Relocate barriers and traffic control devices as required by the progress of construction.

3.02 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by ENGINEER.

B. Repair damage caused by installation, and clean the area.

-End of Section-

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Material and equipment incorporated into the Work:

1. Shall conform to applicable specifications and standards.

2. Shall comply with size, make, type and quality specified, or as specifically approved in writing by the ENGINEER.

3. Manufactured and Fabricated Products

a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
c. Two or more items of the same kind shall be identical, by the same manufacturer.
d. Products shall be suitable for service conditions.
e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

B. Related Requirements in Other Parts of the Project Manual:

1. Conditions of the Contract.

C. Related Requirements Specified in Other Sections:

1. Summary of Work: Section 01010
2. Testing Laboratory Services: Section 01410
3. Division 2 - Sitework
4. Division 3 – Concrete
5. Pre-Manufactured Booster Station – Section 11360
6. Division 16 – Electrical

1.02 REUSE OF EXISTING MATERIAL

A. Except as specifically indicated or specified, materials and equipment removed from existing structures shall not be used in the completed Work.

B. For material and equipment specifically indicated or specified to be reused in the Work:

1. Use special care in removal, handling, storage and reinstallation, to assure proper function in the completed Work.

2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to ENGINEER.

1. Maintain one set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with ENGINEER for further instructions.

2. Do not proceed with Work without clear instructions.

C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage

1. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. Protection After Installation

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products List

1. Within 30 days after Contract Date, submit to ENGINEER a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. CONTRACTOR'S Options

1. For products specified only by reference standard, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.

3. For products specified by naming a product or manufacturer and "or equal", CONTRACTOR can use a product or manufacturer not specifically named, provided the product or manufacturer is equivalent in quality and suitable for the intended purpose.

C. Substitutions

1. For a period of 30 days after Contract Date, the ENGINEER will consider written requests from CONTRACTOR for substitution of products.

2. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate, including:

a. Comparison of the qualities of the proposed substitution with that specified.
b. Changes required in other elements of the work because of the substitution.
c. Effect on the construction schedule.
d. Cost data comparing the proposed substitution with the product specified.
e. Any required license fees or royalties.

f. Availability of maintenance service, and source of replacement materials.

3. ENGINEER shall be the judge of the equality of the proposed substitution and his decision shall be final, except as otherwise provided by law and funding agency regulations.

D. CONTRACTOR'S Representation

1. A request for a substitution constitutes a representation that CONTRACTOR:

a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.

b. Will provide the same warranties or bonds for the substitution as for the product specified.

c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.

d. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

E. ENGINEER will review requests for substitutions with reasonable promptness, and notify CONTRACTOR, in writing, of the decision to accept or reject the requested substitution.

F. The substitution requirements of this Section are in addition to the requirements of Section 00700, General Conditions, and Section 00800, Supplementary Conditions.

1.07 MANUFACTURER'S EXPERIENCE, CASH DEPOSIT, OR BOND

A. Where manufacturer's experience, cash deposit, or bond is specified in equipment Specification Sections, the following requirements apply:

1. The equipment manufacturer shall have a minimum of the specified number of installations of similar type and size as the specified equipment. These installations shall have been in successful operation for the number of years from the date of Project Contract Award specified in the equipment specification section. The manufacturer shall submit to the ENGINEER evidence of the specified experience. The evidence shall include a list of installations similar to the specified equipment, technical and performance data on the equipment, and name, address, and telephone number of persons responsible for operation of the equipment.

2. In lieu of the specified experience, a manufacturer whose equipment can meet all technical and performance requirements of the Specifications may be considered if the CONTRACTOR obtains for the OWNER a cash deposit or bond from the equipment manufacturer which will guarantee replacement for a period of time equaling the specified years of experience minus the manufacturer's actual experience at the date of Project Contract Award.

3. The cash deposit or bond shall be in an amount equal to the cost of the replacement equipment and the cost of removing the equipment and installing replacement equipment, plus an inflation factor of 15% per year over the term of the deposit or bond.

4. If a cash deposit is provided, the manufacturer shall enter into an escrow agreement with the OWNER and a bank of the OWNER's choice. A sample Escrow Agreement Form will be provided by the OWNER upon request.

5. If a bond is provided, the bond shall be provided by a surety acceptable to the OWNER.

6. A cash deposit or bond in lieu of the specified experience shall be provided to the OWNER prior to the purchase and delivery of the equipment.

-End of Section-

SECTION 01560
TEMPORARY CONTROLS

PART 1 – GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall provide and pay for temporary controls required on the Project.

1. Provide control over environmental conditions at the construction site and related areas under the CONTRACTOR's control.

2. Remove physical evidence of temporary controls at completion of work or as specified herein.

B. Related Requirements in Other Parts of the Project Manual:

1. Conditions of the Contract

C. Related Requirements Specified in Other Sections:

1. Earthwork - Division 2

1.02 DUST CONTROL

A. CONTRACTOR shall maintain a clean work site during the Project and shall take all necessary precautions to control dust and mud associated with the Work. Acceptable materials and methods for dust control include spray-on adhesives, irrigation, and calcium chloride applications made as necessary to control dust. Take necessary steps to prevent the tracking of mud onto adjacent streets and highways.

1.03 EROSION CONTROL

A. CONTRACTOR shall conduct and schedule his operations as to avoid or minimize siltation of streams, lakes, and reservoirs. Where, in the opinion of the ENGINEER, the land has a potential for erosion the areas which can be exposed by construction operations at any one time will be subject to approval of the ENGINEER and the duration of exposure of uncompleted construction to the elements shall be as short as practicable.

B. Erosion control features shall be constructed concurrently with other Work as directed by the ENGINEER.

C. Unless specified otherwise herein or on the Drawings, the materials and methods of sediment/erosion control shall be performed in accordance with 327 IAC 15.

1.04 TRAFFIC CONTROL

A. The CONTRACTOR shall be responsible for providing and installing warning signs, protecting devices, and flagmen as necessary for the protection of pedestrians, vehicles, and workers. Traffic controls shall be modified or replaced as directed by the ENGINEER if inadequate in his opinion.

1.05 WATER CONTROL

A. Control surface water to prevent ponding or damage to the project, the site or adjoining properties. Provide, operate, and maintain pumps as required.

B. Prevent earth, backfill materials, surfacing materials from entering into storm sewers, sanitary sewers, or drainage ditches during periods of rainfall and runoff.

1.06 DEBRIS CONTROL

A. Initiate and maintain a specific program to prevent accumulation of debris at construction site.

B. Schedule collection and disposal of debris.

1.07 POLLUTION CONTROL

A. Prevent the discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures to contain all spillage, and to remove contaminated soils or liquids.

C. Take measures necessary to prevent pollutants from entering public waters.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01656
DISINFECTION OF DOMESTIC WATER LINES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Work to be performed under this Section of the Specifications shall include all labor, materials, equipment, and transportation necessary for disinfecting and bacteriological testing the water mains and appurtenances shown on the Drawings and specified herein.

1.02 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

B. All Work shall be performed in accordance with 327 IAC 8-3.2-18.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Pipe System Testing: Section 01666.

1.04 QUALITY ASSURANCE

A. In completing this Work, the CONTRACTOR shall comply with the laws, ordinances, and rules of the OWNER and the State of Indiana in every way.

1.05 SUBMITTALS

A. Submit proposed method of disinfection including materials to be used to the ENGINEER for approval.

PART 2 - PRODUCTS

2.01 DISINFECTION

A. One of the following types of chlorine shall be used for the disinfection of the water mains.

1. Chlorine gas-water mixture.

2. A mixture of water and high test calcium hypochlorite (65-70% C1).

3. Hypochlorite tablets.

PART 3 - EXECUTION

3.01 DISINFECTION

A. Before acceptance of the potable water system, disinfect each unit of the completed water supply, distribution, and service line in accordance with AWWA C651.

B. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.

C. Furnish two copies of a certificate of Disinfection from an independent laboratory to the ENGINEER.

D. The method of chlorination shall be in accordance with AWWA C651, Section 5 unless approved otherwise by the ENGINEER.

E. Devise a method for disposal of wastewater from disinfection as approved in advance by the ENGINEER.

-End of Section-

SECTION 01666
PIPE SYSTEM TESTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work under this section includes:

1. Piping system testing.
2. Testing equipment.
3. System testing.

B. Related Work specified elsewhere:

1. Utility and Site Piping and Fittings: Section 02610

C. Provide all necessary equipment and instrumentation required for proper completion of testing. Source and quality of water shall be approved by the ENGINEER.

1.02 PIPING SYSTEM TESTING

A. General Requirements

1. Leakage testing procedures do not apply to storm sewers in general.

2. All flexible thermoplastic pipe used for storm or sanitary sewers shall be tested for deflection if specified in the bidding documents.

3. The quantity of gravity sanitary sewer pipe tested for leakage shall be as specified in the bidding documents or if not specified shall be the first 1,200 feet of pipe plus ten percent of the remaining footage.

4. The quantity of flexible thermoplastic gravity sewer pipe tested for deflection shall be as specified in the bidding documents or if not specified shall be the first 1,200 feet of pipe plus ten percent of the remaining footage.

5. Test procedures and method of disposal of water shall be approved by the ENGINEER. All tests shall be made in the presence of the ENGINEER. Preliminary tests made by the CONTRACTOR without being observed by the ENGINEER will not be accepted. Notify the ENGINEER at least eight hours before any work is to be inspected or tested.

6. All defects in piping systems shall be repaired and/or replaced and re-tested until acceptable. Repairs shall be made to the standard of quality specified for the entire system.

7. Sections of the system may be tested separately, but any defect which may develop in a section previously tested and accepted shall be promptly corrected and re-tested. Pressure tests shall be made between valves to demonstrate ability of valves to sustain pressure.

8. All piping shall be tested in accordance with the following test methods, in addition to any test required by local and state codes or building authorities.

B. Flushing

1. Prior to testing, flush all piping systems with water to remove construction debris.

C. Underground Gravity Pipe Testing, General

1. All pipe subject to less than 5 psig pressure shall be tested as gravity pipe.

2. After backfill has been placed, the ENGINEER will visually inspect all gravity flow lines to check alignment and grade. All obstructions shall be removed. Any sewer in which the direct light of a lamp cannot be viewed in either direction between adjacent manholes shall be considered unsatisfactory, unless the line is designed with horizontal deflections, and shall be repaired by the CONTRACTOR without additional compensation.

3. Portions of gravity pipe in conflict with potable water lines shall be pressure tested.

4. If directed by the ENGINEER, the CONTRACTOR will provide necessary equipment and perform an initial infiltration test for gravity pipe. In the event the ENGINEER deems conditions are unacceptable for performing an infiltration test, the ENGINEER may require the CONTRACTOR to perform an exfiltration test.

5. When leakage occurs in excess of the specified limits, defective pipe or joints shall be located and repaired. The CONTRACTOR, at his own expense, shall remove and reconstruct as much of the work as necessary to obtain a sewer test within the allowable leakage limits.

6. All tests shall be performed by the CONTRACTOR.

D. Infiltration Tests of Gravity Pipe

1. When the ground water level is a minimum of 24" above the top of the pipe at the upper end, an infiltration test shall be performed by sealing off a length of pipe and measuring the depth of flow over a measuring weir, or by pumping the infiltrated water into containers for measurement. Tests shall be conducted for a minimum of four hours. Infiltration leakage shall not exceed 200 gallons per 24 hours, per inch diameter, per mile of sewer (0.038 gallons/day/inch/foot).

E. Exfiltration Tests of Gravity Pipe

1. When the ground water level is below the top of the pipe, the pipe shall be tested for leakage by exfiltration. Exfiltration leakage test shall consist of isolating the particular section, filling with water to a point 2 feet above the top of the pipe at the upper manhole, and allowing it to stand not less than 4 hours. The section shall then be refilled with water up to the original level and after 1 hour the drop in water surface shall be measured. The computed leakage shall not exceed 240 gallons per inch diameter, per 24 hours, per mile of sewer (0.045 gal./day/inch/foot). The length of pipe tested shall be limited so that the pressure on the centerline of the lower end of the section tested shall not exceed six feet of water column.

F. Air Testing of Gravity Pipe

1. In lieu of exfiltration tests on lines 24 inches and smaller, the CONTRACTOR may submit an outline of proposed methods for testing with low pressure air for the ENGINEER's approval.

G. Pressure Piping Testing

1. All pressure and leakage tests shall conform to the latest revisions of AWWA standards.

2. All piping subject to 5 psig pressure or more shall pass a hydrostatic pressure test and leakage test.

3. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the ENGINEER.

4. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the ENGINEER.

5. All service connections to water mains shall be completed prior to testing.

6. Sections of piping between valves and other short sections of line may be isolated for testing. If shorter sections are tested, test plugs or bulkheads required at the ends of the test section shall be furnished and installed by the CONTRACTOR, together with all anchors, braces, and other devices required to withstand the hydrostatic pressure without imposing any thrust on the pipe line. The CONTRACTOR shall be solely responsible for any damage which may result from the failure of test plugs or supports.

7. Devise a method for disposal of wastewater from hydrostatic tests as approved in advance by the ENGINEER.

8. All apparent leaks discovered within one year from the date of final acceptance of the work by the OWNER shall be located and repaired by the CONTRACTOR, regardless of the total line leakage rate.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01700
CONTRACT CLOSEOUT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

B. Related Requirements in other parts of the Project Manual:

1. Fiscal provisions, legal submittals, and additional administrative requirements: Conditions of the Contract.

C. Related requirements specified in other Sections:

1. Project Record Documents: Section 01720

1.02 SUBSTANTIAL COMPLETION

A. When CONTRACTOR considers the Work is substantially complete, he shall submit to ENGINEER:

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Substantial completion shall be defined as the water system fully functioning with only cleanup and restoration remaining.

C. Within a reasonable time after receipt of such notice, ENGINEER will make an inspection to determine the status of completion.

D. Should ENGINEER determine that the Work is not substantially complete:

1. ENGINEER will promptly notify the CONTRACTOR in writing, giving the reasons therefore.

2. CONTRACTOR shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the ENGINEER.

3. ENGINEER will re-inspect the Work.

E. When the ENGINEER finds that the Work is substantially complete, he will:

1. Prepare and deliver to OWNER a tentative Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by the OWNER as provided in Conditions of the Contract, and when ENGINEER considers the Work substantially complete, he will

execute and deliver to the OWNER and the CONTRACTOR a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.03 FINAL INSPECTION

A. When CONTRACTOR considers the Work is complete, he shall submit a written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the OWNER'S representative and are operational.

5. Work is completed and ready for final inspection.

B. ENGINEER will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should ENGINEER consider that the Work is incomplete or defective:

1. ENGINEER will promptly notify the CONTRACTOR in writing, listing the incomplete or defective work.

2. CONTRACTOR shall take immediate steps to remedy the stated deficiencies, and send a second written certification to ENGINEER that the Work is complete.

3. ENGINEER will re-inspect the Work.

D. When the ENGINEER finds that the Work is acceptable under the Contract Documents, he shall request the CONTRACTOR to make closeout submittals.

1.04 REINSPECTION FEES

A. Should ENGINEER perform re-inspections due to failure of the Work to comply with the claims of status Substantial Completion made by the CONTRACTOR:

1. OWNER will compensate ENGINEER for such additional services.

2. OWNER will deduct the amount of such compensation from the final payment to the CONTRACTOR.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Project Record Documents: comply with requirements of Section 01720.

B. Evidence of Payment and Release of Liens: comply with requirements of General and Supplementary Conditions.

C. Certificate of Insurance for Products and Completed Operations.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to ENGINEER.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

a. Previous Change Orders
b. Deductions for uncorrected work
c. Penalties and bonuses
d. Deductions for liquidated damages
e. Deductions for re-inspection payments
f. Other adjustments

3. Total Contract Sum, as adjusted.

4. Previous payments.

C. ENGINEER will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. CONTRACTOR shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01710
CLEANING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Execute cleaning during progress of Work and at completion of the Work as required by General Conditions.

B. Related requirements in other parts of the Project Manual:

1. Conditions of the Contract.

C. Related requirements specified in other sections:

1. Summary of Work - Section 01010

1.02 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep work, the site, and adjacent properties free from accumulation of waste materials, rubbish, and wind-blown debris resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from the site periodically, and dispose of at legal disposal areas away from the site.

D. Keep streets adjacent to work site clean of debris and dirt resulting from construction activity. Sweep and flush streets and roads as needed or as requested by OWNER.

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on "as needed" basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

C. Keep dust and debris at construction site streets to a minimum throughout the duration of the project.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, labels, and other foreign materials from interior and exterior surfaces.

C. Broom-clean paved surfaces and other surfaces surrounding the Work.

D. Prior to final completion or OWNER occupancy, CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire work is clean.

3.04 RESTORATION OF PROPERTY

A. All public and private property shall be restored to original condition as soon as possible.

B. Restoration of property shall include repairing or replacing fences, trees, shrubs, lawns, or any other items damaged or removed due to the CONTRACTOR's activities.

-End of Section-

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Maintain at the site for the OWNER one record copy of:

1. Drawings and "As-built"
2. Specifications
3. Addenda
4. Change Orders and other Modifications to the Contract.
5. ENGINEER’s Field Orders or written instructions.
6. Approved Shop Drawings, Product Data and Samples.
7. Field Test Records.
8. Construction photographs as required by the ENGINEER.

B. Related Requirements in Other Parts of the Project Manual:

1. Conditions of the Contract.

C. Related Requirements Specified in Other Sections:

1. Testing Laboratory Services: Section 01410
2. Miscellaneous other Sections of the detailed Specifications.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in CONTRACTOR's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

C. Make documents and samples available at all times for inspection by ENGINEER.

D. Current as-built drawings shall be submitted with each Application for payment.

1.03 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.

1. Do not conceal any work until required information is recorded.

C. As-built Drawings: Legibly mark to record actual construction.

1. Depths of various elements of foundation in relation to finish first floor datum.
2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
4. Field changes of dimension and detail.
5. Changes made by Field Order or by Change Order.
6. Details not on original Contract Drawings.

D. Specifications and Addenda; Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

1.04 SUBMITTAL

A. At Contract close-out, deliver final Record Documents to ENGINEER for the OWNER. Submit current as-built drawings with each Application for Payment.

B. Accompany submittal with transmittal letter in duplicate, containing:

1. Date
2. Project title and number.
3. CONTRACTOR'S name and address.
4. Title and number of each Record Document.
5. Signature of CONTRACTOR or his authorized representative.

C. The submittal of incomplete Record Documents or the failure to submit Record Documents may result in a deduct in compensation on the final payment to the CONTRACTOR.

PART 2 - PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

-End of Section-

SECTION 01730
OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDED

A. CONTRACTOR shall compile product data and related information appropriate for OWNER's maintenance and operation of products provided as specified herein and elsewhere.

B. Instruct OWNER's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Miscellaneous sections of the detailed specifications.
2. Project Record Documents: Section 01720
3. Backflow Prevention Device and Enclosure – Section 02610
4. Automatic Water Distribution Flushing Equipment: Section 02610
5. Packaged Booster Station – Section 11360
6. Electrical: Division 16

1.03 SUBMITTALS

A. Form: Manufacturer's standard product or equipment data of same type and form furnished to manufacturer's maintenance personnel.

B. Provide sturdy manila or kraft envelope, properly labeled, or sufficient size to contain all submittals.

1.04 MANUAL CONTENT

A. Neatly typewritten table of contents for each volume, arranged in systematic order. Follow Project Manual format.

1. Contractor, name of responsible principal, address and telephone number.

2. List of each product required to be included, indexed to volume content.

3. List each product, the name, address and telephone number content.

a. Subcontractor or installer.
b. Maintenance contractor, as appropriate.
c. Identify area of responsibility of each.
d. Local supply source for parts and replacement.

B. Product Data

1. Include only sheets pertinent to specific product.
2. Label each sheet to:

    a. Clearly identify specific product or part installed.
    b. Clearly identify data applicable to installation.
    c. Delete references to inapplicable installation.

C. Drawings

1. Supplement product data with drawings as necessary to clearly illustrate:

    a. Relationship of component parts of equipment and systems.
    b. Control and flow diagrams.

2. Coordinate drawings with information in Product Record Documents to assure correct illustration of completed installation.

3. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for particular installation.

1. Organize in consistent format under separate headings for different procedures.

2. Provide logical sequence of instructions for each procedure.

E. Copy of each warranty, bond or service contract issued.

1. Provide information sheet for Owner's personnel. Give:

    a. Proper procedures in event of failure.
    b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit to ENGINEER three copies of complete manual in final form.

B. Content, for each unit and component parts.

1. Description of unit and component parts.

    a. Function, normal operating characteristics and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating Procedures

    a. Start-up, break-in routine and normal operating instructions.
    b. Regulation, control, stopping, shut-down and emergency instructions.
    c. Summer and winter operating instructions.

d. Special operating instructions.

3. Maintenance Procedures

a. Routine operations
b. "Trouble-shooting" guide
c. Disassembly, repair and reassembly
d. Alignment, adjusting and checking

4. Service and Lubrication Schedule

a. List of required lubricants

5. Manufacturer's current printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.
b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by control manufacturer.

9. Charts of valve tag numbers, with location and function of each valve.

10. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

11. Other data as required in pertinent specification sections.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.

a. Function, normal operating characteristics and limiting conditions.
b. Performance curves, engineering data and tests.
c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panelboards.

a. Electric service
b. Controls

3. As-installed color-coded wiring diagrams.

4. Operating procedures.

5. Maintenance procedures.

a. Routine operations.

b. "Trouble-shooting" guide.
c. Disassembly, repair and reassembly.
d. Adjustment and checking.

6. Manufacturer's current printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

D. Prepare and include additional data when need for such data as becomes apparent during instruction of OWNER's personnel.

E. Additional requirements for operating and maintenance data: Respective specification sections.

F. Provide complete information for all products specified.

1.06 SUBMITTAL SCHEDULE

A. Submit two copies of draft of proposed formats and outlines of contents prior to start of work.

1. ENGINEER will review draft and return one copy with comments.

B. Submit one copy of complete data in final form 15 business days prior to final inspection or acceptance.

C. Submit specified number of copies of approved data in final form 1 business day after final acceptance or approval.

1.07 INSTRUCTIONS OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

1. Review all contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

- End of Section -

SECTION 02000
SITE WORK

PART 1 – GENERAL

1.01 REFERENCED STANDARDS

A. All references to the "STD. SPECS." shall be understood to refer to the "Standard Specifications" prepared by the Department of Transportation of the State of Indiana, latest edition.

B. The "STD. SPECS." shall govern the General Site Work construction of the Project.

1.02 CONFLICTS

A. General Provisions Section 100 of the "STD. SPECS." shall not apply where they are in conflict with the General Conditions included in these construction documents.

1.03 SPECIAL PROVISIONS

A. The following special provisions supplement the said specifications and in the case of conflict with any part or parts of said specifications, these special provisions shall take precedence and shall govern.

Public Safety and Convenience

The CONTRACTOR shall at all times so conduct his work so as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents of the vicinity of the work, and to insure the protection of persons and property in a manner satisfactory to the ENGINEER. No road or street shall be closed to the public except with the permission of the ENGINEER and proper governmental authority. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to insure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches which shall not be obstructed except as approved by the ENGINEER. It is absolutely necessary that one lane of roadway can be used for fire, police, and other emergency vehicles at all times under weather conditions.

Prosecution and Progress of Work

The CONTRACTOR shall notify the ENGINEER at least twenty-four (24) hours in advance of either discontinuing or resuming operations. If an engineer or inspector for the OWNER is not on the job and notification as required has been given, the CONTRACTOR in charge of the work shall immediately notify the ENGINEER that work has been resumed and request that the ENGINEER in charge of work for the OWNER be notified.

Work performed without proper notification to the ENGINEER as indicated herein may be rejected by the ENGINEER, and no compensation will be made for said work. In addition, the CONTRACTOR may be required to remove the item of construction at his own expense and replace the item of construction in accordance with the Drawings and Specifications.

Notification of Utilities Prior to Construction

The CONTRACTOR shall be responsible for contacting Indiana Underground Plant Protection Services, Indiana811, at least seventy-two (72) hours prior to starting construction so that utility representatives will have adequate time to locate and mark their utility locations in the field prior to commencing actual construction work.

Existing Underground Facilities

The OWNER and ENGINEER assume no responsibility for the presence, specific size, or location of underground distribution systems of the public utility corporations. No responsibility for the protection of said underground systems will be assumed by the OWNER. If such protection is found to be necessary for water mains, gas mains, steam mains, underground electrical distribution systems, underground telephone circuit systems, or any other underground systems of non-municipal ownership, the cost of same, in whole or in part, is disclaimed by the OWNER.

-End of Section-

SECTION 02102
CLEARING AND GRUBBING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Work to be performed under this Section shall include all labor, materials, equipment, and transportation necessary for completing all site clearing as shown on the Drawings.

B. Site clearing shall include, but not be limited to, the following applicable items, as noted on the Drawings:

1. Removal of trees and other vegetation
2. Topsoil stripping
3. Clearing and grubbing

The disposal of all unused material from the site clearing shall be the responsibility of the CONTRACTOR.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Removal of peat, moss, lignite and vegetable matter below ground other than as specified in Section 02221.

B. Protection shall be afforded workmen and passersby - Section 01530.

1.03 MEASUREMENT AND PAYMENT

A. Trees, shrubs, or bushes to remain within the limits of clearing and grubbing shall be clearly marked by means of paint marking.

B. Payment for clearing and grubbing is described in Section 01150 - Measurement and Payment.

C. Clearing and/or grubbing done for CONTRACTOR's convenience will not be considered for payment for work under this Section.

D. Trees or shrubs outside of clearing and grubbing limits damaged during work included under this Section shall be replaced by the CONTRACTOR at no additional cost to the OWNER or, at the OWNER's option, compensation provided.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. State and local code requirements shall control the disposal of trees and shrubs.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wound paint shall be a standard bituminous product.

B. Herbicides shall be at the CONTRACTOR's option as approved by the ENGINEER.

C. Explosives shall not be used.

2.02 TOPSOIL

A. Topsoil as referenced in this section is defined as the upper friable clay loam layer of soil found in a depth of not less than four inches and having organic composition. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over two inches in diameter, and without weeds, roots, and other objectionable material.

PART 3 - EXECUTION

3.01 CLEARING

A. Limits of clearing shall be all areas within construction limit lines as shown on the drawings or within five feet of the proposed water main if not shown on the drawings or as approved by the ENGINEER.

B. Remove trees, saplings, shrubs, bushes, vines and undergrowth within the limits of clearing.

3.02 GRUBBING

A. Limits of grubbing shall coincide with the limits of clearing.

B. Remove all stumps, roots over two inches in diameter, and matted roots within the limits of grubbing to the depths below:

1. Footings - 18 inches
2. Walks - 12 inches
3. Roads - 18 inches
4. Parking Areas - 12 inches
5. Lawn Areas - 8 inches
6. Fills - 12 inches
7. In the case of footings, roads, walks, or other construction on fills, the greater depth shall apply.

3.03 TOPSOIL STRIPPING AND STOCKPILING

A. Topsoil shall be stripped where construction is to occur. The topsoil shall be stripped to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

B. Where trees are indicated to be left standing, topsoil stripping shall be stopped a sufficient distance to prevent damage to the main root system.

C. Stockpile topsoil in storage piles in areas shown on the Drawings, or as directed by the ENGINEER. Construct storage piles to freely drain surface water. Cover storage piles, if required, to prevent windblown dust.

3.04 DISPOSAL OF WASTE MATERIALS

A. Burning of materials on the site will not be permitted.

B. Removal

1. Material to be removed shall be removed from the site daily as it accumulates.

2. Should the CONTRACTOR elect to continue work beyond normal working hours, material to be removed shall not be allowed to accumulate for more than 48 hours.

-End of Section-

SECTION 02221
TRENCHING, BACKFILLING, AND COMPACTION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Work to be performed under this Section of the Specifications shall include all labor, materials, equipment, and transportation necessary for furnishing and installing the piping and appurtenances shown on the Drawings and specified herein.

B. Work under this Section includes, but is not limited to, the following:

1. Trenching for utilities and piping.
2. Excavation for valve boxes and appurtenances.
3. Backfilling and compacting.

1.02 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

l.03 RELATED WORK SPECIFIED ELSEWHERE

A. Seeding: Section 02485

B. Paving and Surfacing: Section 02500

l.04 QUALITY ASSURANCE

A. In this Work the CONTRACTOR shall comply with the requirements of the laws, ordinances, and rules of the OWNER and the State of Indiana in every way.

B. All Work shall be completed in a conscientious manner. The ENGINEER shall have the authority to reject any work which, in his opinion, does not present an orderly and reasonably neat appearance, provided that such item can be properly installed in such orderly way by usual methods.

C. The Drawings and Specifications are intended to include all details for the Work specified; however, the CONTRACTOR shall be responsible for all details which may be necessary to properly complete the Work. The CONTRACTOR shall assume full responsibility for additional costs which may result from unauthorized deviations from Specifications.

l.05 SUBMITTALS

A. Provide a three (3) pound sample of granular cradle material for ENGINEER's approval.

B. Provide a three (3) pound sample of selected granular backfill for ENGINEER's approval.

C. Provide a five (5) pound sample of trench stabilization material for ENGINEER's approval.

D. Submit copies of "as-built" plans showing any changes in location and installation of the Work.

l.06 JOB CONDITIONS

A. Existing Utilities

1. The location of underground utilities is not guaranteed. It is the responsibility of the CONTRACTOR to determine the exact locations. The CONTRACTOR shall be responsible for contacting Indiana Underground Plant Protection Services, Indiana811, at least seventy-two (72) hours prior to starting construction so that utility representatives, including Rochester Utilities and private utilities, will have adequate time to locate and mark their utility locations in the field prior to commencing actual construction work. The CONTRACTOR shall verify the location of underground utilities with utility owners and shall comply with their requirements regarding notice of work and protection of utilities.

2. Locate existing underground utilities in the areas of the Work. If utilities are to remain in place, provide adequate means of protection during excavation operations.

3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the utility owners and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

4. Do not interrupt existing utilities serving facilities occupied and used by the OWNER or others, except when permitted in writing by the ENGINEER, and then only after acceptable temporary utility services have been provided.

5. All poles, fences, sewer, gas, water or other pipes, wires, conduits, manholes, buildings, structures and property in the proximity of any excavation shall be supported and protected from damage by the CONTRACTOR during construction.

6. Wherever sewer, gas, water or other pipes or conduits cross the excavation, the CONTRACTOR shall support said pipes and conduits without damage to them and without interrupting their use during the progress of the Work.

PART 2 - PRODUCTS

2.01 PIPE BEDDING

A. Each pipe shall be laid in Class "B" bedding unless specifically noted otherwise, as shown on the plans and the Construction Details. All costs for bedding shall be included in the cost of the water main pipe.

1. Definition of Terms for Bedding Explanation
Bc = Outside diameter of pipe, inches

D = Inside diameter of pipe, inches

d = Depth of bedding material below the pipe bell, inches

The values of "d", depth of bedding material below the bell of the pipe shall be as follows:

D	d (min)
27" and smaller	3"
30" to 60"	4"
66" and larger	6"

2. Class "A" Bedding (Concrete Cradle)

a. Class "A" bedding is that method of bedding in which the conduit is set on "d" inches of concrete in an earth foundation and encased in concrete up to ¼" of "Bc" to fit the lower part of the conduit's exterior breadth. The remainder of the conduit is to be surrounded to a height of at least twelve (12) inches above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side of the conduit, as far as practicable, shall be in layers not to exceed six (6) inches in thickness.

b. The concrete use for Class "A" bedding shall be plain concrete with a 28-day compressive strength of 3,000 psi, unless otherwise specified. Refer to "Pipe Bedding details" of the Construction Standards for further details on Class "A" bedding.

3. Class "B" Bedding

a. Class "B" bedding is that method of bedding in which the conduit is set on "d" inches of a fine granular material (sand cushion) in an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least 60% of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve (12) inches above its top with densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill shall be tamped thoroughly on each side and under the conduit, as far as practicable, in layers not to exceed six (6) inches in thickness. Bell excavation is to be provided. Refer to "Pipe Bedding Details" of the Construction Standards for further details on Class "B" Bedding.

b. Class “B” bedding material shall meet the gradation as set forth in the Indiana Dept. of Transportation Standard Specifications, current edition, Section 211, B Borrow and Structure Backfill, except that no more than 12% or less than 5% shall pass the No. 200 sieve (silt or clay).

2.02 TRENCH OR EXCAVATION BOTTOM STABILIZATION MATERIAL

A. Provide coarse angular stabilization material, at least 70% of which shall range in size from l inch to 3 inches.

2.03 BACKFILL MATERIALS

A. Backfill Materials:

1. B-Borrow shall comply with INDOT Standard Specifications, current edition. Maximum stone size shall not exceed 1 inch or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2. Earth backfill material shall contain no more than 5% organic material, no particles larger than four inches and shall be free of trash, rubble and debris. The Plastic Index of the fraction passing the no. 40 sieve shall not be more than 25.

3. Coarse aggregate material shall be No. 53 or 73 complying with INDOT Standard Specifications, current edition.

PART 3 - EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS

A. Provide barriers, warning lights and other devices at all excavations to adequately protect pedestrians and motorists.

B. Sidewalks, roads, streets, and pavements shall not be blocked or obstructed by excavated materials, except as authorized by the OWNER, in which case adequate temporary provisions must be made for satisfactory temporary passage of pedestrians and vehicles. Banks shall be trimmed to minimize inconvenience to public travel or to tenants occupying adjoining property.

C. Where necessary to place excavated material adjacent to buildings, erect barriers to keep earth at least 4 feet from such buildings. Earth deposited on lawns shall be carefully removed to preserve the turf. All shade trees, shrubs, etc., shall be protected. Boring and jacking shall be used, if necessary, except where ENGINEER's permission is granted to remove trees and shrubs.

D. Where open excavations cross existing rigid surfacing (including drives or walks), the surfacing shall be removed for a width one foot beyond the anticipated edge of the excavation. The pavement break shall be sawed to ensure a straight joint. Surface replacement shall match existing surfacing except where otherwise indicated on the Drawings or specified in Section 02500. Where open excavation is allowed along roadways, excavation, backfill and surface replacement shall conform to the requirements of all applicable highway permits. In no case shall surface replacement edges bear on less than 12 inches of undisturbed soil.

E. Prior to excavation on croplands, if any, all topsoil shall be stripped the width of the permanent easement to a depth of 12 inches and stockpiled within the easement area. Care shall be taken to prevent the inclusion of any material in the topsoil which would be unsuitable for agricultural purposes or hazardous to agricultural equipment. After backfilling and trench settlement, replace topsoil to match original ground surface.

3.02 SHEETING AND SHORING

A. The structural strength and safety of all sheeting, shoring, and bracing shall be the sole responsibility of the CONTRACTOR. Repair any damage resulting from failure to provide adequate supports.

B. Provide timber work, shoring, bracing, sheeting and sheet piling where necessary to retain banks of excavations, prevent cave-in of adjacent ground, prevent displacement of utilities and structures and to protect the public safety. Further, comply with the local codes and authorities having jurisdiction.

C. Provide and maintain all sheeting and shoring in good serviceable condition at no extra cost to the OWNER.

D. Remove all excavated material from the periphery of braced excavations a distance equal to the depth of the excavation to eliminate surcharge on the sheeting and bracing system.

E. Sheeting and bracing shall be removed in such a manner as to avoid endangering piping, structures, utilities or property, whether public or private

F. The ENGINEER may direct in writing that supports in trenches be cut off at any specified elevation, in which case the CONTRACTOR shall be paid for the supports left in place as Extra Work.

G. The CONTRACTOR may leave in place, to be embedded in the backfill of the excavation, any or all supports for the purpose of preventing injury to persons or property, whether public or private. However, no supports which are within 4 feet of the ground or pavement surface may be left in place without written permission of the ENGINEER. No extra payment will be made for supports left in place at the CONTRACTOR's option.

H. The right of the ENGINEER to order supports left in place shall not be construed as creating an obligation on his part to issue such orders. Failure by the ENGINEER to exercise this right shall not relieve the CONTRACTOR from total liability for damages to persons or property resulting from the failure of the CONTRACTOR to leave in place sufficient supports to prevent any caving or moving of the ground adjacent to the excavation.

3.03 DEWATERING AND DRAINAGE

A. At all times during construction, keep excavations free from standing water. Sumps, if required, shall be located outside of load bearing areas so that bearing surfaces will not be disturbed. Water pumped from the excavation shall be discharged to prevent re-entry into the soil strata being dewatered. Water containing silt in suspension shall not be pumped into sewer lines or adjacent streams. The method of disposing of water pumped from the excavation shall be

approved by the ENGINEER prior to actual disposal. No water shall be pumped or allowed to flow into the existing or newly constructed sanitary sewer system.

B. The dewatering system shall take into consideration both the construction procedures and the depth of the foundation relative to the ground water level. The system shall be subject to approval by the ENGINEER.

3.04 EXCAVATION

A. Trenching

1. Excavation of trenches shall not advance more than 50 feet ahead of the completed pipe installation except as approved by the ENGINEER.

2. All excavations shall be made by open cut unless otherwise indicated. Sides of trenches shall be kept as nearly vertical as possible, especially from the trench bottom to a level of one foot above the top of the pipe. Trench bottoms shall be excavated true to line and shall be not less than 18 inches wider nor more than 30 inches wider than the outside diameter of the pipe so a clear space of 9 to 12 inches is provided on each side of the pipe. Minimum trench width for small diameter pipe shall be 24 inches. Grade of the trench bottom shall be consistent with the method of bedding selected.

B. Minor Structural Excavation

1. Minor structures are defined as manholes, junction boxes, meter vaults, pipe support piers, etc. Do not excavate for any structure until that structure is scheduled for construction. Excavate to the depth and dimensions necessary for the construction.

2. The bottom of all excavations shall be undisturbed earth unless otherwise indicated, and shall be approved by the ENGINEER before any subsequent Work is started.

3. Excavations carried below depths indicated on the Drawings without the previous approval of the ENGINEER shall be filled with 3000 psi concrete or well-compacted granular cradle material to the correct level at the expense of the CONTRACTOR.

4. Maintain excavations in good order. If the bearing capacity of the foundation soils is reduced because the excavation is allowed to remain open prior to commencing work, the weathered soil shall be removed and replaced with lean (2500 psi) concrete or well-compacted granular cradle material at the expense of the CONTRACTOR.

C. Stabilization

1. When unsuitable soil conditions are encountered in the bottom of trenches or excavations, the unsuitable materials shall be removed and replaced with approved coarse granular stabilization material as specified herein until the trench is brought to proper grade. The depth of stabilization shall be as directed by the ENGINEER and shall be built up in 6 to 12 inch layers. Each layer shall be adequately tamped. Concrete cradle may be used if approved by the ENGINEER.

D. Rock Excavation

1. Where rock is encountered the CONTRACTOR shall excavate the trench to a depth of 8 inches below the bottom of the pipe and to a width of 12 inches plus the outside diameter of the pipe. All loose material shall be removed from the trench. A minimum of 8 inches of approved bedding shall be tamped in place under the pipe and additional bedding shall be tamped and cradled around the pipe to a height equal to the centerline of the pipe.

2. Rock shall be that material occurring in a natural state which requires blasting, barring, or wedging for removal from its original bed and having a compressive strength in excess of 300 pounds per square inch. It specifically includes all ledge rock, bed rock or boulders larger than one cubic yard in volume.

3.05 BEDDING AND COVER FOR PIPING

A. General

1. Bedding is defined as the shaped and tamped material which supports piping. Cover, as specified hereafter, is defined as the compacted material extending from the top of the bedding to a point one foot above the top of the pipe.

2. All buried piping shall be continuously bedded and covered, except where concrete encasement, concrete cradles, or boring and jacking are indicated or unless otherwise indicated on the Drawings.

B. Bedding Procedures

1. Bedding support shall consist of over-excavation of the trench bottom and refilling to proper grade with a minimum of 3" of compacted granular cradle material. Bell holes shall be dug for all pipe holes.

2. Following placement and inspection of joints, tamped cradle material shall be continued upward for the full width of the trench to the centerline of the pipe.

C. Bedding Alternate

1. Where the natural foundation soil consists of granular material suitable in its natural state for pipe bedding and when approved by the ENGINEER, no granular cradle will be required. In such cases the trench bottom shall be accurately rounded and graded to provide continuous uniform bearing on undisturbed soil of at least one-fourth of the pipe circumference.

2. Bell holes shall be dug for pipe bells. They shall have sufficient depth to allow the pipe jointer to work freely around the pipe from the outside. Under no condition shall they be so shallow that the pipe will be supported by the bell. After the joint is made, the bell hole shall be carefully filled with sand, fine earth, or clay without tamping.

D. Bedding in Cinders and Special Soils

1. Where cinder fill, garbage dumps, slag piles, or harmful corrosive conditions exist in the soil or backfill, protect the pipe by placing limestone screenings from a point 10 inches

below the pipe to 12 inches above the pipe for the full width of the trench, adequately tamped to provide support for the pipe.

E. Concrete Bedding

1. Where subgrade conditions warrant extra precautions for the bedding of the pipe and as approved by the ENGINEER, concrete cradle shall be installed in conformance with the size and dimensions of granular cradle or as otherwise indicated.

F. Pipe Cover

1. After completion of bedding and preliminary approval of piping and/or testing, the pipe shall be covered to a point one foot above the top of the pipe for the full trench width. Cover material may be cohesive (non-clay), nonorganic, previously excavated soil, free from lumps, rocks, and debris, and subject to approval of the ENGINEER except where granular backfill is hereafter specified above the bedding cradle.

2. All cover materials shall be carefully deposited to avoid damage to the pipe and shall be compacted as specified in Paragraph 3.08 of this Section.

3. All flexible thermoplastic pipe shall be installed with granular cradle material to one foot above the top of the pipe.

3.06 TRENCH BACKFILL

A. After cover has been placed, backfilling procedures shall be in accordance with the following schedule or as shown on the Drawings:

Surface Feature	**Method**
Unimproved areas, cropland, parks, undeveloped recreational areas	1
Lawns, boulevards, landscaped areas, plant site	1
Rigid surfacing including bituminous concrete portland cement concrete and brick paving for streets, alleys, and parking areas	2, 4, 5
Aggregate surfaced streets, alleys, driveways and parking areas	2, 4, 5
Non-rigid bituminous paving including "oil and chip" and bituminous treatments for streets, alleys, driveways, and parking areas	2, 4, 5
Adjacent to foundations, utilities, etc.	3

B. Method 1

1. From the top of the pipe cover to the surface of the ground, backfill consisting of previously excavated soil free of frozen material and large rocks may be deposited by dragline, bulldozer, or other suitable equipment. Depositing in layers or tamping will not be required. Sufficient surplus excavated material shall be neatly rounded over the trench to compensate for settlement.

C. Method 2

1. Backfill shall be structure backfill. Coarse aggregate material shall be No. 53 or 73 complying with INDOT Standard Specifications, current edition. The granular backfill shall be carefully deposited in uniform lifts, and each lift shall be wetted adequately and mechanically compacted with vibratory compactors.

D. Method 3

1. Backfilling shall consist of using Method 2 in the area of influence under the foundation or utility, and above that level to the surface using the backfill method required by the surface features. The area of influence shall be considered the area under a line sloped downward at 45 degrees from the near edge of foundation or utility.

E. Method 4

1. In lieu of compaction in 6-inch layers, selected granular backfill may be placed in one operation and water jetted. Jetting shall follow backfilling operations as soon as practicable but not later than 30 days after backfill placement. Paving, if any, shall not be placed until surface subsidence has occurred, a minimum of 30 days after jetting, or as approved by the ENGINEER.

F. Method 5

1. Select granular backfill shall be deposited in uniform layers not exceeding 12-inches thick (loose measure), and each layer inundated or deposited in water. Water soaking shall follow backfill operations as soon as practicable, but not later than 30 days after backfill placement. Paving, if any, shall not be placed until surface subsidence has occurred, a minimum of 30 days after jetting, or as approved by ENGINEER.

3.07 MINOR STRUCTURAL BACKFILL

A. General

1. Do not backfill until new concrete has properly cured, coatings have been approved, and any required tests have been accepted.

2. Exercise care during backfilling operations to avoid any puncture, break or other damage to waterproofing systems, if any. Backfill adjacent to waterproofing in the presence of the ENGINEER.

3. Where backfilling is required on both sides of structures, backfill and compact simultaneously on opposite sides in even layers. Other backfilling sequences shall be as specifically noted.

B. Materials

1. Backfill in lawns, and landscaped areas shall be previously excavated materials free from cinders, construction debris, vegetation or other extraneous material and suitable for the intended purpose.

2. Backfill in influence areas beneath piping, foundations, and paving shall be approved selected granular backfill unless otherwise approved by the ENGINEER.

3. "Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

3.08 COMPACTION

A. General

1. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the site, subject to the approval of the ENGINEER.

2. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the ENGINEER.

3. Non-cohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping or approved equivalent, unless otherwise indicated.

B. Mechanical Compaction

1. Unless otherwise indicated or approved by the ENGINEER, place fills in the loose lift thicknesses indicated hereafter and compact to a dry density not less than the following percentage of maximum dry density, determined by the Standard Proctor Test, ASTM D698, unless otherwise noted.

Type of Fill	Usage	Lift Thickness	Compaction %
Trenched Pipe Bedding	Beneath piping	6"	95
Trenched Pipe Cover	Over and/or around piping	6"	95
Utilities Trench Backfill	"Influence area"	6"	95
	Adjacent to or under structures	9"	98
	Croplands, lawns	12"	85
Structural Fill	All locations under minor structures	6"	95
Embankment	All locations	12"	85

3.09 CLEANUP AND GRADING

A. Clean up as soon as practicable following pipe installation and testing. Perform preliminary cleanup and grading operations immediately after backfilling. Dress disturbed areas to match adjacent grades.

B. All surfaces shall be finished to provide adequate drainage. The finished surface shall be reasonably smooth, compacted, free from irregular surface changes and comparable to the smoothness obtained by blade-grader operations. Slope grades to drain away from structures at a minimum of l/4 inch per foot for 10 feet.

C. Replace topsoil in all lawn areas and croplands. Topsoil shall be spread evenly and compacted to a thickness of not less than 4 inches in lawn areas and 12 inches in croplands.

D. All surplus excavated material shall be disposed of by the CONTRACTOR.

-End of Section-

SECTION 02250
COMPACTION CONTROL AND TESTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work specified herein and elsewhere:

1. Work under this Section includes:

a. Compaction control and field density testing requirements for all earth work, including pavement subgrade.

2. Related Work specified elsewhere:

a. Trenching, Backfilling, and Compaction: Section 02221
b. Finish Grading: Section 02260
c. Paving and Surfacing: Section 02500

1.02 TESTING

A. CONTRACTOR shall select an independent soils laboratory to ensure adequate density is being obtained. The soils testing laboratory shall be approved by the OWNER and ENGINEER prior to the start of construction. The CONTRACTOR will pay all costs to make tests. The laboratory shall submit test reports to the ENGINEER and the OWNER.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 COMPACTION

A. General

1. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the site, subject to approval of the ENGINEER.

2. Cohesive materials shall be disked sufficiently on each lift to break down oversized clods, mix the different materials, secure a uniform moisture content, and insure uniform density and compaction. Non-cohesive material need not be disked.

3. Cohesive materials shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent. Non-cohesive materials shall be compacted with vibrator, roller or equivalent, unless otherwise indicated.

B. Topsoil

1. Topsoil, as specified in Section 02260, shall be compacted with a "cultipacker", roller, or approved equivalent equipment weighing 100 to 160 pounds per lineal foot of roller width.

3.02 FILL LIFT THICKNESSES AND COMPACTION DENSITIES

A. Unless otherwise indicated or approved by the ENGINEER, place fills in the loose lift thickness as indicated hereafter and compact to a dry density not less than the following percentage of maximum dry density, determined by the Standard Proctor Test, ASTM D698, unless otherwise noted. See Table I at the end of this Section.

3.03 TESTING

A. For mechanical compaction, the CONTRACTOR shall provide samples for the following field density tests to ensure required densities are being obtained:

1. One test for each 10,000 square feet or fraction thereof per lift of general backfilling.

2. Two tests for per lift of structural fill under slabs, foundations, and pavements.

3. One test per lift for each other type of fill, if so directed by the ENGINEER.

4. For water and/or sewer trenches with select backfill, compaction tests shall be performed every 2' vertically and every 100' horizontally along the trench.

B. Tests shall be in accordance with ASTM D1556 or other tests suitable for the materials being tested.

C. For select backfill compacted by means of water jetting, compaction tests shall be performed every 50’ horizontally along the utilities’ path.

C. The CONTRACTOR shall pay for all field density tests. Subsequent tests and associated costs necessitated as a result of the initial tests failing to meet specified requirements will be at the expense of the CONTRACTOR.

TABLE I. FILL LIFT THICKNESS AND COMPACTION DENSITIES

Type of Fill	Usage	Lift Thickness	Compaction %	ASTM
Trenched Pipe Bedding	Beneath piping	6"	95	D698
Trenched Pipe Cover	Over and/or around piping	6"	95	D698
Utilities Trench Backfill	"Influence area" beneath other piping or utility lines	8"	95	D698
	"Influence area" beneath rigid paving and railroad tracks	6"	95	D698
	"Influence area" beneath non-rigid paving	9"	92	D698
	Adjacent to or under structures	9"	98	D698
	Lawns and landscaped areas	12"	85	D698
Structural Fill	All locations under major structures	6"	98	D698
	All locations under minor structures (manholes, etc.)	6"	95	D698
Granular Fill	Below concrete slab bedding, foundations, rigid paving, and excavated areas adjacent to structures	8"	95	D698
	All other uses	12"	85	D698
Granular Bedding	Beneath concrete slabs	6"	95	D698
Granular Drainage Blanket	Below concrete slabs, paving, or piping	9"	95	D2049
	All other uses	12"	85	D2049
Granular Filter	Around open joint or perforated drain pipes and at pressure relief valves	9"	95	D698
Structural Backfill	See Trench Backfill			
General Site Grading	Fill for Levees and Roadways [(1)]	8"	95	D698
	Fill in other locations not covered herein	12"	85	D698
	Topsoil placement	12"	85	D698

"Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

(1) Fills and roadways between 1-1/2 feet and 3 feet, inclusive; first lift compaction not less that 90% and the balance minimum compaction of 95%.

Fills over 3 feet for levees and roadways; first 1/3 of embankment, not to exceed 2 feet, shall be compacted to yield a minimum of 90% of compaction, the next 1 foot shall be compacted to 93% of compaction, and the remaining embankment to 95% of compaction.

-End of Section-

SECTION 02260
FINISH GRADING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Topsoil placement
b. Final grading of the site

2. Related work specified elsewhere:

a. Clearing and Grubbing: Section 02102
b. Seeding: Section 02485

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be fertile, friable, natural topsoil typical of the area, free from subsoil, stones, plants, roots or other extraneous material and shall not be used while muddy or frozen.

B. Topsoil shall contain not less than 8% organic matter (AASHTO T194). The topsoil shall consist of either natural topsoils typical of the locality and free from coarse stone aggregate or surface soils stripped from the site and enriched with humus at a rate of 8% by volume. The soil mixture prepared by mixing surface soils and humus shall be free of oil, cinders, coarse stone, and woody root material.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide all topsoil placement and finish grading and filling to achieve the lines and grades indicated on the Drawings. All earthwork shall be done in a manner that provides drainage.

3.02 TOPSOIL PLACEMENT

A. Place topsoil in all areas of new grading except as indicated on the Plans. The compacted subgrade to receive topsoil shall be scarified to a depth of 3 inches. Topsoil shall be spread evenly and compacted, to a thickness of not less than 6 inches, to the proposed elevations and grades. Grade flush with walks, curbs, and paving. Topsoil shall be compacted with a "cultipacker," roller, or approved equivalent equipment weighing 100 to 160 pounds per lineal foot of roller width.

3.03 FINISH GRADING

A. All areas of the Project including all previously grassed areas that have been disturbed, borrow sites, excavated and filled sections and adjacent transition areas shall be uniformly smooth-graded. Depressions from settlement shall be filled and compacted. Tops of embankments and breaks in grade shall be rounded. All surfaces shall be finished to provide adequate drainage. Finished surfaces shall be reasonably smooth, compacted, free from irregular surface changes and comparable to the smoothness obtained by blade-grader operations.

B. Slope grades to drain away from structures at a minimum of 1/4 inch per foot for 10 feet.

C. Finished surfaces adjacent to paved or surfaced areas and within 10 feet of structures shall be within l inch of the proposed grade. All other areas shall be within 3 inches of the proposed grade.

D. Newly graded areas shall be protected from traffic and erosion. All settlement or washing away that may occur from any cause prior to seeding or acceptance shall be repaired and grades re-established to the required elevations and slopes at no additional cost to the OWNER.

E. Unless otherwise indicated, all surplus material shall be disposed of by the CONTRACTOR.

-End of Section-

SECTION 02261
DITCH SHAPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work performed under this Section of the Specifications shall include all labor, materials, equipment, and transportation necessary for replacing storm culverts and establishing the ditch grade as shown on the Drawings.

1.02 RELATED WORK ELSEWHERE

A. Seeding: Section 02485

B. Paving and Surfacing: Section 02500

1.03 SUBMITTALS

A. Submit product data of corrugated metal pipes, flared-end sections, and method of attaching end sections.

PART 2 - MATERIALS

2.01 GENERAL

A. Replacement driveway culverts shall be galvanized corrugated steel pipes having a 1-1/2" x 1-1/4" corrugation, a minimum wall thickness of 0.034 inches, and the nominal diameter shown on the Drawings. Each pipe end shall have a flared end section of same material and minimum wall thickness and be approved by ENGINEER.

PART 3 - EXECUTION

3.01 GENERAL

A. Replacement of driveway culverts with pipes shall be per Section 715 of Standard Specifications, latest edition.

B. CONTRACTOR shall remove all deposited soil material and debris from the driveway culverts indicated to be cleaned on the Drawings. This Work shall be considered incidental to the Contract and no additional compensation will be allowed.

C. The unit cost for flared end sections shall include all labor, materials, and equipment for complete installation of the sections onto the corrugated steel pipe.

D. The ditch flow line shall match the grades shown on the Drawings. The ditch side slopes shall have slopes no steeper than 3:1.

E. The cost of ditch shaping required to ensure adequate storm flow shall be considered incidental to the Contract.

-End of Section-

SECTION 02400
DEWATERING AND DRAINAGE

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere:

1. Work under this Section includes:
   a. Dewatering and drainage for all earthwork and excavations.

2. Related work specified Elsewhere:
   a. Division 2.

1.02 RESPONSIBILITY

A. The CONTRACTOR is solely responsible for the design, installation, operation, and subsequent removal of dewatering systems and their safety and conformity with local codes and regulations.

PART 2 - PRODUCTS -- NOT USED

PART 3 - EXECUTION

3.01 DEWATERING AND DRAINAGE

A. At all times during construction, keep excavations free from standing water. Sumps, if required, shall be located outside of load bearing areas so the bearing surfaces will not be disturbed. Water pumped from the excavation shall be discharged to prevent re-entry into the soil strata being dewatered. Water containing silt in suspension shall not be pumped into sewer lines or adjacent streams. The method of disposing of water pumped from the excavation shall be approved by the ENGINEER prior to actual disposal.

B. The dewatering system shall take into consideration the construction procedures, the soil type, and the depth of the foundation relative to the ground water level. The system shall be subject to approval by the ENGINEER.

C. Operation of the dewatering system shall be continued until the sides of the structure are carried above the natural ground level and the maximum weight of water displaced by the structure is less than 90 percent of the uplift resisting capacity consisting of dead weight of the structure and backfill. The CONTRACTOR shall submit uplift calculations to the ENGINEER for approval prior to discontinuing dewatering.

D. Provide a standby system for emergency operation in case of failure of the primary power source or mechanical failure of the system.

E. If ground water causes unstable conditions on the floor at the excavation, the CONTRACTOR shall lower the ground water in the area of the excavation to at least two feet below the floor of the excavation. This shall be considered incidental to the excavation, and no additional payment will be allowed.

-End of Section-

SECTION 02485
SEEDING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The CONTRACTOR shall supply all labor, materials, equipment, and transportation necessary to complete the Work performed under this Section.

B. Work under this Section shall include, but not be limited to, the following:

1. Fine grading and preparation of lawn areas.
2. Seeding of new lawn areas.
3. Sodding of new lawn areas.
4. Replanting of unsatisfactory or damaged lawns.

1.02 REFERENCE STANDARDS

A. State of Indiana Department of Transportation, "Standard Specifications", latest edition, referred to herein as the "STD. SPECS."

B. All erosion control practices shall be in accordance with: "Indiana Storm Water Quality Manual," latest edition, as prepared by the Indiana Department of Environmental Management.

1.03 CONFLICTS

A. In the event of conflicts between the Contract Documents and Referenced Standard Requirements, the more stringent and higher quality requirement shall be included in the Bid.

1.04 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

1.05 RELATED WORK SPECIFIED ELSEWHERE

A. Trenching, Backfilling, and Compaction: Section 02221.

B. Finish Grading: Section 02260

1.06 JOB CONDITIONS

A. Existing Conditions: Begin seeding or sodding only after preceding work affecting ground surface is completed.

B. Environmental Requirements

1. Seeding may proceed between March 1 to May 10 and August 10 to September 30; sodding may proceed from May 1 to June 1 and from September 1 to September 30; and at other times upon written approval from the ENGINEER.

2. Do not seed or sod saturated or frozen soil.

3. Do not seed when the wind speed exceeds 10 MPH.

C. Protection: Erect signs and barriers to restrict foot and vehicular traffic from seeded and sodded areas.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be fertile, friable topsoil typical of the area which is reasonably free from subsoil, clay lumps, stones, and other objects over 2 inches in any dimension and without weeds, roots, and other objectionable material.

2.02 SOIL CONDITIONERS

A. Lime

1. Lime shall be agricultural grade dolomitic limestone and it shall contain not less than 80 percent calcium carbonate equivalent.

2. The lime shall be ground sufficiently fine so that at least 80 percent will pass through a No. 8 sieve.

3. Moisture content at time of delivery shall not exceed 8 percent.

B. Fertilizer: Fertilizer shall be a composition recommended by a local County Agricultural Agency or State Agricultural Extension Service or a standard commercial fertilizer with an analysis of 12-12-12.

2.03 GRASS MATERIALS

A. Seed

1. Provide fresh, clean, new-crop complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

2. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

3. Sow not less than the quantity of seed specified below:

a. For fall planting:

Common Name	Botanical Name	Min. % Pure Seed	Min. % Germ.	Max. % Weed Seed	Mix. % By Wt.
Ky. Blue Grass	Poa Pratensis	85	80	0.50	58.8
Perennial Ryegrass	Lolium Perenne	98	90	0.50	23.5
Redtop or	Agrostis alba	92	85	1.00	
Red Fescue	Festuca rubra var.	98	85	0.50	11.8
White Dutch Clover	Trifolium repens	98	90	0.50	5.9
					100.0

b. For spring planting:

Common Name	Botanical Name	Min. % Pure Seed	Min. % Germ.	Max. % Weed Seed	Mix. % By Wt.
Ky. Blue Grass	Poa Pratensis	85	80	0.50	39.5
Perennial Ryegrass	Lolium Perenne	98	90	0.50	15.6
Redtop or	Agrostis alba	92	85	1.00	
Red Fescue	Festuca rubra var.	98	85	0.50	7.4
Spring Oats					37.5
					100.0

B. Sod

1. Provide strongly rooted sod, not less than 2 years old, and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant) and composed principally of Kentucky Bluegrass (Poa pratensis).

2. Sod shall have at least 1 inch of soil adhering firmly to the roots and cut rectangular pieces with the shortest side not less than 12 inches. At the time of cutting sod, the grass shall be cut to a height not less than 2 inches nor more than 4 inches.

3. Sod grown on soil high in organic matter, such as peat, will not be acceptable.

4. Sod cut for more than 48 hours shall not be used without the approval of the ENGINEER.

C. Vegetative Mulch: Vegetative mulch for seeded areas shall be a high quality, air-dried straw of wheat, rye, oats, beans or other approved straw, and shall be free from Johnson grass, broom sedge, noxious weeds and weed seeds detrimental to growth of grass.

D. Jute Matting: Jute matting for erosion control shall be of plain, uniform, open-weave, new and unbleached single jute yarn. The matting shall have approximately 1 inch square openings between strands and shall weigh approximately 1 pound per square yard.

2.04 WATER

A. Water shall be free from oil, acid, alkali, salts, and other harmful substances.

PART 3 - EXECUTION

3.01 FINE GRADING OF TOPSOIL

A. Topsoil shall be graded reasonably smooth and level to within 3/4 inch above or below finished grades after final settlement. All lumps shall be removed and depressions or eroded areas filled in with additional topsoil before acceptance for seeding or sodding.

3.02 SOIL PREPARATION

A. Preparation for seeding and sodding shall not be started until all other site and utility work within the areas to be seeded or sodded has been completed. Limit preparation to areas which will be planted in the immediate future.

B. Loosen topsoil by tilling it to a depth of at least 4 inches and smooth out all surface irregularities resulting therefrom. Leave area free of rocks or hard soil clods which will not pass through the tines of a standard garden rake.

C. At least 7 days before applying fertilizer, spread lime uniformly in sufficient quantity to produce in the soil a pH of 6.5. Work lime thoroughly into topsoil to a depth of 4 inches.

D. At the time of seeding and along with tillage operations, apply fertilizer uniformly at a rate of 400-600 pounds per acre. Work fertilizer into soil to a depth of approximately 3 inches.

3.03 SEEDING

A. Seed all grassed areas disturbed by construction operations and as indicated on Drawings.

B. Apply seed during favorable climatic conditions. Do not seed in windy weather or when soil is very wet.

C. Sow grass seed at the rate of 3 pounds per 1000 square feet.

D. At the time of seeding and along with tillage operations, apply fertilizer uniformly at a rate of 400-600 pounds per acre. Work fertilizer into soil to a depth of approximately 3 inches.

E. Sow seed either mechanically or by broadcasting in two directions at right angles to each other to achieve an even distribution of seed.

F. After seeding, rake seed lightly into ground and roll with a roller weighing between 100 and 200 pounds per foot of roller width. Immediately after rolling, water seeded areas thoroughly with a fine mist spray. Keep soil thoroughly moist until seeds have sprouted and achieved a growth of 1 inch.

3.04 MULCHING SEEDED AREAS

A. Vegetative Mulch

1. Apply mulch at the rate of two tons per acre within 24 hours after seeding.

2. Apply mulch with either hand or machine methods.

3. The mulch shall be loose enough to permit air to circulate but compact enough to reduce erosion.

4. If baled mulch material is used, care shall be taken that the material is in a loosened condition and contains no lumps or knots of compacted material.

B. Jute Mat

1. Provide jute matting for erosion control on any slope greater than 1 vertical to 6 horizontal and on the side and bottoms of ditches and swales.

2. Jute mat shall be held in place by means of wire staples. The staples shall be driven at a 90^{o} angle to the plane of the soil. Staples shall be spaced at not more than 3 feet apart in 3 rows for each strip, with a row along each edge and one row alternately spaced in the middle.

3. Jute mat used as a ditch lining shall be applied with the lengths running parallel to the flow of water. Where more than one width is required, a lap joint not less than 2 inches shall be used, with the upslope width on top.

4. When jute mat is used on slopes, the mat may be placed with length running from the top of the slope to the toe of the slope, or the mat may be placed with the length running parallel to the contours.

3.05 SODDING

A. Provide sod in areas indicated on the Drawings. At the CONTRACTOR's option, sodding may be substituted for seeding, but at no additional cost to the OWNER. Sodding shall be used in ditches and drainage swales and on all embankment slopes steeper than 3 to 1 unless protection is provided against erosion of seeding.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

C. On slopes 1 horizontal to 2 vertical, stake sod with not less than 4 stakes per square yard and with at least one stake for each piece of sod. Stakes shall be driven with the flat side facing the slope. Use 1-inch by 1-inch by 6-inch wooden pegs with one end sharpened.

D. Do not place sod when the ground surface is frozen or when air temperature may exceed 90^{o}F.

E. Water the sod thoroughly within eight hours after placement and as often as necessary to become well established.

F. In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. The exposed edges of sod shall be buried flush with the adjacent soil.

3.06 RECONDITIONING LAWN AREAS

A. Recondition existing lawn areas damaged by CONTRACTOR's operations, including storage of materials or equipment and movement of vehicles. Also recondition existing lawn areas where minor re-grading is required.

B. Recondition other existing lawn areas where indicated.

C. Provide fertilizer, seed or sod and soil amendments as specified for new lawns and as required to provide a satisfactory reconditioned lawn. Provide new topsoil as required to fill low spots and meet new finish grades.

D. Cultivate bare and compacted areas thoroughly to provide a good, deep planting bed.

E. Remove diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from CONTRACTOR's operations, including oil drippings, stone, gravel, and other construction materials.

F. Water newly planted areas and keep moist until new grass is established.

3.07 APPLICATION OF FERTILIZER

A. Six weeks after completion of seeding or sodding apply granular fertilizer over all areas at the rate of two pounds of nitrogen nutrients per 1000 square feet of area.

3.08 MAINTENANCE

A. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

B. Re-mulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

C. Replant bare areas using same materials specified for lawns.

3.09 CLEAN UP

A. At the time of final inspection of work, but before final acceptance, remove from seeded and sodded areas all debris, rubbish, excess materials, tools and equipment.

3.10 LAWN REPLACEMENT

A. Lawns not showing a close uniform stand of specified grasses at the end of one growing cycle, including one summer and one winter season, shall be replaced and maintained until acceptance. Scattered bare spots, none of which is larger than one square foot, will be allowed up to a maximum of 3 percent of any lawn area.

-End of Section-

SECTION 02500
PAVING AND SURFACING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work specified herein and elsewhere

1. The Work under this section include

a. Surface Treatment and Restoration

2. Related work specified elsewhere:

a. Clearing and Grubbing: Section 02102
b. Trenching, Backfilling and Compaction: Section 02221

1.02 REFERENCE STANDARDS

A. State of Indiana Department of Transportation "Standard Specifications", latest edition, referred to herein as the "STD. SPECS."

1.03 CONFLICTS

A. In the event of any conflicts between the Contract Documents and Referenced Standard requirements, the more stringent and higher quality requirements shall be included in the Bid.

1.04 SAMPLES

A. An INDOT certified mix design for all Hot Mix Asphalt (HMA) and Portland Cement (PC) Concrete used shall be submitted at least fifteen days (15) prior to beginning Work. The CONTRACTOR shall submit to the ENGINEER a sample of any materials requested by the ENGINEER.

B. A list of all material sources used shall be submitted at least fifteen (15) days prior to beginning Work. The CONTRACTOR shall submit to the ENGINEER a sample of any materials requested by the ENGINEER. Only INDOT certified material sources will be allowed.

C. At least fifteen (15) days prior to beginning Work, the CONTRACTOR shall submit to the ENGINEER, a sample of any materials requested by the ENGINEER.

PART 2 - PRODUCTS

2.01 SUBGRADE MATERIALS

A. All earthwork is specified elsewhere in Division 2.

2.02 AGGREGATES

A. Coarse aggregates shall conform to the applicable provisions of "STD. SPECS." Section 904.03 for material requirements.

B. Fine aggregates shall conform to the applicable provisions of the "STD. SPECS." Section 904.02 for material requirements.

2.03 CONCRETE

A. Concrete shall be in compliance with "STD. SPECS." Sections 502 and 702.

2.04 BITUMINOUS MATERIALS

A. Bituminous materials shall be in compliance with "STD. SPECS." Section 902.

PART 3 - EXECUTION

3.01 REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT, DRIVEWAY PAVEMENT OR SIDEWALK

A. At locations where existing bituminous concrete surfaces, concrete pavement, concrete driveway pavement or concrete sidewalk sections to be removed abut rigid surfaces that are to remain, a uniformly straight cut shall be obtained by the use of a diamond concrete saw. The use of pneumatic tools to make these cuts will not be allowed.

B. In all cases of surface replacement, the new surface edges shall bear on no less than 12 inches of undisturbed soil.

C. Pavement and surface replacement shall consist of like materials and construction as the existing course prior to removal. Thickness of each course shall be at least as thick as existing course prior to removal.

3.02 SUBGRADE

A. Preparation of the subgrade for paving shall comply with all applicable portions of Section 207 of the "STD. SPECS."

3.03 BASE COURSE

A. Aggregate Base Course shall conform to applicable provisions of "STD. SPECS." Article 302.

B. The Aggregate Base Course shall extend under any proposed concrete curb & gutter.

3.04 BITUMINOUS MIXTURE EMULSIFIED ASPHALT

A. This item shall consist of furnishing and placing a uniformly coated mix of crushed stone and asphalt.

B. The bituminous material shall be Asphalt meeting the requirements of Article 402 of the Standard Specifications. Aggregate shall be crushed stone or crushed gravel meeting the requirements of Article 904 of the Standard Specifications and shall be free of any asphalt materials.

C. The asphalt and aggregate shall be mixed in a pugmill with a calibrated feeder bin. The completed mixture shall have particles satisfactorily coated.

The grade and percentage of bituminous material shall be determined by the engineer. The right is reserved to make, at any time during the progress of the work, such changes in the proportions of bitumen and aggregate as the engineer may consider necessary or desirable within the limits of the specifications.

D. The engineer or his authorized representative shall have access at any time to all parts of the plant in order to verify weights or proportions and character of materials used in preparation of the mixture. The manufacturer shall afford such facilities as may be required for making inspections at the plant and for collecting and forwarding samples of the bituminous mixture to the department.

E. The bituminous mixture shall be delivered and placed to the required grade with a spreading and finish machine meeting the requirements of Section 409 of the Standard Specifications.

F. The bituminous mixture shall be compacted following placement to the satisfaction of the engineer with a double steel drum vibratory roller meeting the requirements of Section 409 of the Standard specifications.

3.05 BITUMINOUS SURFACE TREATMENT (TYPE 6, 7)

A. Bituminous Surface Treatment shall include the following:

1. Removal of existing oil and chip surface over the trench width for utility pipe installation
2. Placement of 9" of aggregate base course in the utility trench
3. Base course preparation conforming to all applicable requirements of Section 302 of the "STD SPECS."
4. Provide trench width emulsified asphalt to 3” depth per Section 304 of this Specification

B. Application Rates. The following approximate application rates should be utilized:

1. Bituminous material: Prime coat - 0.68 gal/SY
2. Bituminous material: Seal coat - 0.46 gal/SY; Cover coat – 0.68 gal/SY
3. Seal coat aggregate: 22 lbs/SY
4. Cover coat aggregate: 32 lbs/SY

3.06 BITUMINOUS CONCRETE BINDER AND SURFACE COURSE

A. HMA binder and surface course shall comply with "STD. SPECS." Article 402 and shall be 4 inches thick (2½" binder, 1½" surface) with an 8" layer of aggregate base course.

3.07 P.C. CONCRETE PAVEMENT

A. P.C. Concrete pavement shall comply with "STD. SPEC." Section 502 and shall be at least 8" thick. In cases where the existing pavement was thicker, it shall be replaced with the same thickness.

3.08 P.C. CONCRETE CURB AND GUTTER

A. P.C. Concrete curb and gutter shall comply with "STD. SPEC." Section 605.

B. Concrete curbs and gutters shall be constructed in accordance with existing lines, grades and cross sections, and details indicated on the Drawings.

3.09 P.C. CONCRETE DRIVEWAY PAVEMENT

A. P.C. Concrete driveway pavement shall comply with "STD. SPEC." Section 502 and shall be at least 6" thick. In cases where the existing driveway pavement was thicker, it shall be replaced with the same thickness.

B. P.C. Concrete driveways shall have a broom finish at right angle to the direction of traffic.

3.10 P.C. CONCRETE SIDEWALK

A. P.C. Concrete sidewalk shall comply with "STD SPEC." Section 604.03 and shall be a minimum of 4" thick. In cases where the existing sidewalk was thicker, it shall be replaced with the same thickness. Sidewalk placed at driveways shall be 6 in. thick, or the same depth of the existing driveway, whichever is greater.

B. P.C. Concrete sidewalks shall have a broom finish at right angle to the direction of traffic.

3.11 GRAVEL DRIVES AND ROADS

A. Use crushed stone as defined in Section 904 of "STD. SPECS."

B. Aggregate surface course shall conform to the requirements of Section 303 of the "STD. SPECS."

C. Match existing grades and cross sections; however, the aggregate surface shall be a minimum of 8” thick.

3.12 ROADWAY CONSTRUCTION EQUIPMENT

A. Utilize roadway construction equipment conforming to the requirement of "STD. SPECS." Sections 409, 508 and 702.

-End of Section-

SECTION 02610
UTILITY AND SITE PIPING AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Installation of water main piping.

2. Related work specified elsewhere

a. Material and Equipment: Section 01600
b. Pipe System Testing: Section 01666
c. Trenching, Backfilling, and Compaction: Section 02221

1.02 REFERENCE STANDARDS

A. Indiana Administrative Code 327 IAC 8.

1.03 SUBMITTALS

A. Shop Drawings and Product Data

1. For information only, submit copies of manufacturer's product literature on pipe and pipe fittings. Include installation data and joint information.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01600. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials, coatings, linings and structural integrity. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Pipe handled on skidways must not be allowed to roll against pipe already on the ground. Store pipe as recommended by the manufacturer. Any cracks, pipe fractures, or chipped ends shall be removed from the site. Damaged pipe and fittings shall be replaced.

1.05 QUALITY ASSURANCE

A. The CONTRACTOR, shall comply with the requirements of the laws, ordinances, and rules of the OWNER and the State of Indiana in every way.

B. All Work shall be completed in a conscientious manner. The ENGINEER shall have the authority to direct the removal and replacement of any item which, in his opinion, does not represent an orderly and reasonably neat or workmanlike appearance, provided such items can be

properly installed by usual methods in such Work. Such removal and replacement shall be made when directed in writing by ENGINEER at the CONTRACTOR's expense and without additional cost to the OWNER.

C. The Drawings and Specifications are intended to include all details for the Work specified; however, the CONTRACTOR shall be responsible for all details which may be necessary to properly complete the Work. The CONTRACTOR shall assume full responsibility for additional cost which may result from unauthorized deviations from specifications.

D. Allowable Tolerances

1. Variance from established line and grade shall not be greater than one thirty-second (l/32) of an inch per inch of pipe diameter and not to exceed one-half (1/2) inch, provided that any such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (l/64) of an inch per inch of pipe diameter, or one-half (l/2) inch maximum.

PART 2 - PRODUCTS

2.01 PVC WATERMAIN

A. Dimension Ratio (DR) 18 or less

1. Pipe shall conform to AWWA C900 and rated for 150 psi.

2. Pipe shall meet the requirements of ASTM D1784 for PVC compounds.

B. Joints for PVC Pressure Pipe

1. DR 18 or less

a. All joints shall meet the requirements of ASTM D3139 for push-on joints.
b. Each length of pipe shall have an elastomeric gasket and shall be fitted to the next section of pipe with the use of a pipe lubricant as specified by the pipe manufacturer.

2.02 POLYETHYLENE PIPE (HDPE)

A. Materials used for the manufacture of polyethylene pipe shall be made from a PE 3608 high density polyethylene resin compound meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.

B. HDPE pipe shall comply with AWWA C906-99.

C. Pipe shall be pressure rated at 160 psi with a minimum dimension ration equal to 11 (DR 11).

D. Pipe shall be joined by means of heat fusion.

E. HDPE pipe shall be installed only by the horizontal directional boring method with fluid assistance in accordance with the current best industry practice.

2.03 POLYETHYLENE PRESSURE PIPE AND TUBING

A. Polyethylene pressure pipe and tubing, ½-inch through 3-inch, shall conform to AWWA C901 and the following requirements:

1. Line shall be the size indicated on the drawings and shall be polyethylene tubing.

2. Line shall be made from material having standard CTS PE code designation PE 3406.

3. Line shall have a minimum pressure class of 160 psi with a dimension ratio (DR) of DR-9.

4. Direct bury #10 THNN wire with polyethylene pipe for tracing and location service lines.

2.04 DUCTILE IRON PIPE

A. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.

B. Use cement mortar lining complying with ANSI A-21.4 or AWWA C104.

C. Ductile iron pipe shall meet the requirements of ANSI Specification A21.51 (AWWA Standard C151). Design and manufacture pipe for a working pressure of 150 psi plus 100 psi surge and a safety factor of 2. The depth of cover shall be as indicated on the Construction Details and specified in this Section. Minimum pressure class shall be as follows:

Size Range	Pressure Class
3”-12”	350
14”-20”	250
24”	200
30”-64”	150

D. Pipe with rubber gasket slip joints shall be furnished and installed with at least two (2) serrated brass wedges in each joint to effect conductivity of electricity across the joint for thawing purposes. The wedges shall be of sufficient size and number to carry a minimum of four hundred (400) amperes of direct current and voltage drop not to exceed one-tenth (1/10) of one (1) volt per joint, and there shall be no perceptive temperature rise and no evidence of smoking, arcing or fuming.

E. Joints

1. Use mechanical joints of the stuffing-box type complying with ANSI A-21.11 as modified by ANSI A-21.51 for ductile iron pipe, with push-on joints complying with ANSI A-21.11 for cast iron, and ANSI A-21.51 for ductile iron, or:

2. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.

2.05 FITTINGS AND SPECIALS

A. Fittings: All fittings shall be ductile iron, mechanical joint to suit pipe size and material in required tees, bends, elbows, reducers, wyes, dead ends, inline valves and other configurations required unless otherwise shown on the drawings. No PVC fittings are permitted.

B. Mechanical joint restraints shall be installed for all tees, bends, and plugs on all water lines larger than two inches. Mechanical joint restraints shall be installed on all fire hydrants and post hydrants. Concrete blocking shall not be used as thrust restraint.

C. Use ductile iron fittings and specials suitable for 150 psi pressure rating unless otherwise specified.

1. For use with mechanical joint pipe, comply with ANSI/AWWA C110-98.

2. Use cement mortar lining complying with ANSI A-21.4, standard thickness.

2.06 VALVES

A. Gate valves:

1. Use gate valves designed for a working pressure of not less than 150 psi.

2. Provide connections as required for the piping in which they are installed.

3. Provide a clear waterway equal to the full nominal diameter of the valve, openable by turning counter clockwise (left).

4. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.

5. Valves smaller than 3":

a. Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland, and nut, with non-rising stem.
b. Buried valves: Install in suitable precast concrete hand hole with cover marked "WATER"

6. Valves 3" and larger:

a. Design in accordance with AWWA C500, standard, bronze trimmed, non-rising stem, solid wedge disc valves with resilient seat.
b. Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
c. Provide two (2) tee handle socket-operating wrenches of suitable size.

7. Approved manufacturers of gate valves are:

Mueller (A-2370-20), U.S. Pipe (Hydro Gate Resilient) or approved equal.

B. Check valves:

1. Use check valves for a designed working pressure of not less than 150 psi, as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.

2. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure, and to close tightly to prevent return flow when discharge pressure exceeds inlet pressure.

3. Distinctly cast on the body of each valve:
a. Manufacturer's name, initials, or trademark by which he can be identified readily;
b. Valve size:
c. Working pressure;
d. Direction of flow.

4. Valves 2" and smaller: Provide all bronze

5. Valves larger than 2":

a. Provide ductile iron body; bronze mounted, with flanged ends, of the non-slam type;
b. Provide class 125 flanges complying with ANSI B-16.1.

6. Check valves shall be as manufactured by APCO, Val-Matic, or approved equal.

C. Air Valves:

1. The valve shall be flanged, globe body, fully bronze mounted, external pilot-operated, with free floating piston operated without springs, diaphragm or levers, single seat bore equal to size of valve.

2. The minimum travel of the piston shall be equal to 25% of the diameter of the seat and for true alignment (to correct lateral thrust and stem binding) the piston shall be guided above and below the seat a distance equal to no less than 75% of the diameter of the seat. The piston shall be cushioned and so designed as to insure positive closure.

3. The valve shall be packed with leather (or other soft material) to insure tight closure and prevent metal-to-metal friction and seating; furnished with indicator rod, to show position of the piston and pet-cocks for attachment to the valve body for receiving gauges for testing purposes.

4. The pilot valve shall be easily accessible; so arranged to allow for its removal from the main valve while the main valve is under pressure.

5. The design shall be such that repairs and dismantling internally of main valve may be made without its removal from the line.

6. An external strainer with blow-off will be provided to protect the pilot and speed control valves.

7. The 125-pound and 250-pound flanged assemblies shall conform to A.S.A. standards for flange thickness and drilling and wall thickness of body and caps. The valve shall be constructed of first class Grey iron, free from cold shuts, defective or spongy spots and conforming to ASTM Specification A-126, Class B.

8. The bronze parts shall conform to ASTM Specification B-62.

9. Air valves shall be as manufactured by APCO, Val-Matic, or approved equal.

2.07 SERVICE FITTINGS

A. Curb Stops:

1. All curb stops, ¾-inch through 2-inch size, shall be Class 200 plug or ball type valves of extra heavy, all brass construction with inlets and outlets machined and threaded for use with flared or compression joints, and furnished with two (2) coupling nuts, all in accordance with the latest revisions of the American Water Works Assn. Standard, designated C800, shall have a heavy or thick tee-head operator, and a 90^{o} rotation of the plug or ball.

2. Each stop shall be equipped with a standard cast iron, buffalo type, arch pattern curb box.

3. Ball valves shall have Teflon-coated balls and hard or synthetic rubber seat-rings to effect seal.

4. Plug type valves shall have O-rings within the body or plug to effect seal.

5. The following curb stops or approved equals are the only curb stops that will be accepted for use in connection with water service installations:

Brand Name	Catalog Number
Mueller	H-15201 or H-15204
Ford	B-22 or BH-22

B. Corporation Stops:

1. All corporation stops, ¾-inch thru 2-inches in size, shall be Class 200 plug or ball type valves of extra heavy, all brass construction, shall have a flat, thick operation head, a 360^{o} rotation of the operating head, and plug type valves shall have a washer and

adjusting nut on the bottom of the plug, all in accordance with the latest revisions of the AWWA Standard, designated C800.

2. The inlet shall be machined and threaded with standard AWWA Corporation stop threads, the outlet shall be machined and threaded for use with compression joints, and furnished with one (1) coupling nut.

3. The following corporation stops, or approved equals, are the only corporation stops that will be accepted for use in connection with water service installations:

Brand Name	Catalog Number
Mueller	H-15000
Ford	F-600 or FB-600

2.08 TAPPING SLEEVES

A. Provide full-size mechanical joint sleeve type coupling for existing water mains, finished with outlet flanged to American 125 standard (ASA series 15):

1. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.09 VALVE BOXES

A. Valve Boxes:

1. All valve boxes, referred to in these standards, shall be cast iron, screw type boxes with the word “WATER” cast in the lid.

2. The valve boxes shall be five and one-quarter (5 ¼) inch shaft size and three piece type with a round base.

3. The curb boxes shall be three (3) inch, two piece type, and the lid shall be held in place with a standard brass pentagon head screw.

4. Valve and curb boxes shall be manufactured in the USA.

B. Valves 2-1/2” and smaller:

1. Use cast iron box with the word “WATER” cast into the cover.

2. Provide risers on pipeline to place valve within box depth.

2.10 FLUSHING HYDRANTS

A. Flushing hydrants used in the construction of the water main shall be the Eclipse No. 2 Post Hydrant as manufactured by John C. Kupferle Foundry Company or approved equal. The post hydrant shall be non-freezing, self draining type with a 5-foot depth of bury. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating

the hydrant. The inlet shall be 4" MJ and the outlet shall be 2-1/2" NST. Hydrants shall be set in four cubic feet of crushed stone to allow for proper drainage of the hydrant. Hydrant color shall be shrub green.

2.11 METERS, METER YOKE AND METER BOX

A. CONTRACTOR is to supply meters, mobile meter data collector, meter yoke, and meter box unless otherwise noted.

B. Approved manufacturers:

LID – FORD C-4 w/STANDARD BOLT or approved equal
METER BOX – SONOCO SONO-LOC 21" I.D. or approved equal
RESIDENTIAL METER – Neptune model T-10 with R900 meter reading module
MASTER METER – 4" Neptune TRU/FLOW Compound meter with R900 meter reading module. A Neptune strainer shall be installed immediately upstream of the master meter.
MOBILE METER DATA COLLECTOR – Neptune MRX920

2.12 BACKFLOW PREVENTION

A. Backflow prevention shall be as approved by the City of Rochester Water Department and by the Indiana Department of Environmental Management in accordance with 327 IAC 8-10.

B. Provide reduced pressure principle backflow preventer in each new connection to existing water distribution system, except pressure drop at design flow shall not exceed 70 kPa (10 psi). Reduced pressure principle backflow prevention assembly shall conform to AWWA C511, latest edition. Backflow prevention assembly shall be 4" Watts Series 994 OSY or approved equal.

C. Installation of backflow prevention assemblies on water service lines shall be accomplished by personnel licensed by the State of Indiana. Name and address of the installer and OWNER shall be provided.

D. Installation shall not begin without permission issued by the Approving Authority (City of Rochester, IN Water Department). All backflow prevention assemblies shall be installed in a manner that provides easy access for testing, maintaining, repairing and replacing the assembly. The recipient of the construction permit shall be responsible for installing the backflow prevention assembly in a manner prescribed by the approved installation plans. Failure to install the backflow prevention assembly in a manner approved by the Approving Authority shall be justification for refusing permanent water service.

E. Backflow prevention assembly shall be installed in accordance with the manufacturer's instructions and installation plans approved by the Approving Authority. The lowest point of the assembly shall be at least 12-inches but not more than 30 inches above the concrete pad or high water level, whichever is highest. Piping connected to the assembly shall not be used for electrical grounding. Piping connected to the assembly shall be thoroughly flushed and disinfected before installing the assembly. The assembly installation shall be protected from vandalism and freezing. Adequate support, excluding water lines, shall be provided under assembly valves for assemblies that are 3-inches or larger. Adjustable pipe stand supports shall be constructed of min. 2-inches diameter pipe and shall have a floor flange for fastening stand to concrete slab. Pipe stands shall be fastened to concrete slab using concrete expansion anchors.

All test cocks shall be in place with shut-off valves. The assembly must be completely testable. Approved assemblies are ordered as an assembly with valves attached and tested at the factory in that configuration. Do not install an assembly with valves purchased separately. It is acceptable practice for the factory to ship assembly valves in separate containers on the larger assemblies. These valves, however, are part of the assembly configuration. Access doors must be installed on the test cock side of the assembly. Assemblies must be installed horizontally. Assembly enclosures shall be affixed to a 6-inches thick concrete pad of 3,000 psi mix concrete with at least one (1) layer of welded wire mesh. Pad shall be pitched to drain at a slope of 1% towards drain port end of valve enclosure. Enclosure must set flush with pad surface. Pad shall extend a minimum 6-inches beyond the enclosure on all sides. For 4-inches and smaller assemblies a 4-inches thick pad may be used. One enclosure or building exterior door key must be provided to the Approving Authority, upon request. Enclosure doors must be easy to remove and reinstall without binding. Backflow prevention assemblies must be installed in a heated insulated enclosure, (WattsBox; Hot Box; or equivalent).

F. The installer is responsible for insuring the installation is in accordance with the City approved installation plans. Failure to do this may result in the denial of water service, occupancy of building, and Assembly Permit pending compliance with approved installation plans. Upon completion of installation, the installer must notify the Approving Authority. The assembly shall be inspected by the Approving Authority to verify conformance to approved installation plans. The installer shall then verify proper operation of the assembly through a test accomplished by a Certified Assembly Testing Technician. Test results shall be documented and a copy sent to the Approving Authority before the installation is accepted.

2.13 BOLTS AND NUTS

A. All underground installed bolts, T-bolts and nuts shall be stainless steel, ASTM F 593 Type 316 for all watermain fittings including mechanical joints, hydrants, valves, tees, bends, taps, etc. No other types of bolts or nuts will be allowed unless approved in writing by the Engineer. Anti-seize compound shall be used on all bolting operations.

2.14 AUTOMATIC WATER DISTRIBUTION FLUSHING EQUIPMENT

A. General: The equipment furnished under this Section shall be automatic water distribution flushing equipment designed to be permanently installed on water distribution lines. The primary purpose of this equipment shall be to automatically flush the desired amounts of water from water distribution systems.

B. Performance: The equipment shall be connected to a water distribution line as required by the plans or standard installation detail. The self-contained unit is designed for automatic flushing of the water distribution line through the opening of a control valve that is an integral part of the unit. This equipment shall be capable of being programmed to activate up to 16 times daily on the days desired (on a continually rotating 14-day cycle in one-minute increments, up to 24 hours per program). All programming shall be accomplished by means of a handheld programmer powered by a 9-volt battery and an internal programming pod powered by a 9-volt battery.

C. Acceptable Manufacturers: Automatic water distribution flushing equipment to be supplied under this specification shall be Hydro-Guard® as manufactured by Environmental Enhancement & Technologies USA Inc. or approved equal

D. Automatic Water Distribution Flushing System Components: The automatic water distribution flushing system is comprised of the self-contained automatic flushing unit, freeze protection and a handheld programmer and an internal programming pod with a 9-volt battery power source.

E. Automatic Flushing Unit: The automatic flushing unit shall be a single unit consisting of the major components described below:

1. Integral Piping and Control Valve: The piping and control valve components shall include the following:

a. The unit's internal control valve shall be capable of being activated by a 9-volt battery.

b. The control valve shall be a globe valve type design capable of passing sand and other debris up to 3/4" in diameter without obstructing the valve's throat.

c. The unit's standard internal piping shall be schedule 80 PVC.

d. The unit's internal piping and control valve shall have an operational rating of 200 psi.

e. Internal piping and control valve shall be capable of being removed from the housing by means of a quick-disconnect, permitting easy maintenance and repairs.

f. The control valve shall be constructed of a non-corrosive glass-reinforced nylon, or equal, and shall be fitted with stainless steel hardware. The valve shall offer slow-opening and slow-closing performance and be of the type that can be easily rebuilt.

g. The unit shall be supplied with a standard 2" male NPT water supply connection.

2. Housing

a. The components shall be designed to direct the flow of pressurized water leaving the water distribution system into a receiver pipe leading away from the unit. The discharged water shall be directed downward.

b. The self-contained unit shall be supplied with a below-grade bottom-vented base in a length suitable for locating the device's valve and electronic components below the local frost depth to prevent freezing. The configuration will also provide stability and anti-buoyancy capabilities.

c. The unit's above-grade components shall be constructed of a non-corrosive maintenance-free material and shall be permanently colored light green to blend with typical residential and commercial environments. The material shall be specifically designed for direct

exposure to the sun and weather and have a minimum life expectancy of 15 years.

d. All mounting brackets and hardware shall be stainless steel.

3. Electrical/Electronic System: The Electrical/Electronic System shall include the following features and capabilities:

a. Be capable of storing instructions via a handheld programmer and capable of operating the unit's internal control valve using a programming pod using a 9-volt battery as a power supply.

b. Offer 16 flushing programs per day.

c. Be provided with a secured, above-ground, waterproof, quick-connection programming port.

d. Have a removable watertight programming pod with bullet-style weather tight connection.

e. Have heavy-duty power cable.

f. Use a waterproof integrated latching solenoid to operate the control valve.

4. Winterization

The unit shall be constructed with a self-draining, double check valve designed to evacuate water remaining within the unit's stand pipe subsequent to but not during the flushing process. The valve, solenoid, and programmer shall be located below frost depth to prevent freezing.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and shall be worked into place without springing or forcing.

B. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition.

1. Carry pipe into position; do not drag.

2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

3. Lower pipe and accessories into trench by means of derrick, ropes, belt, slings, or other equipment approved by the ENGINEER.

4. Do not dump or drop any of the materials of this Section into the trench.

5. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.

6. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings and joints.

7. Take up and relay pipe that has the grade or joint disturbed after laying.

8. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.

9. Securely close open ends of pipe, fittings, and valves when work is not in progress.

10. Where any part of the coating or lining is damaged, repair to the approval of the ENGINEER, at the CONTRACTOR's expense.

11. Segments of HDPE pipe having cuts or gouges in excess of 10% of the wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion jointing method.

C. Thoroughly clean interior of pipe and accessories before lowering the pipe into trench. Keep clean during laying operations by plugging or other methods approved by the Superintendent of the waterworks.

D. Before installation, inspect each piece of pipe and each fitting for defects:

1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements, and without additional cost to the OWNER.

E. The CONTRACTOR shall cut all pipe and drill all holes that may be necessary. Cut sections of pipe shall be reamed or filed to remove all burrs. The pipe interior and joints shall be thoroughly cleaned before being installed and kept clean during construction.

F. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe is prohibited.

G. Pipe embedment and backfilling shall closely follow the installation and jointing of pipe in the trench, to prevent floating of the pipe by water which may enter the trench, and to prevent longitudinal movement caused by thermal expansion or contraction of the pipe. Not more than 50 feet of pipe shall be exposed at any time ahead of the backfilling in any section of trench, unless otherwise indicated.

H. Water pipe to have a minimum of 4 feet of cover for water pipe 12 inches in diameter and larger; and a minimum of 5 feet of cover for water pipe smaller than 12" in diameter.

I. All water mains that cross beneath a water body shall be installed with a minimum of 5-feet of cover below the channel. Valves shall be located at an accessible location (flood proof) on each side of the crossing. The upstream valve shall be installed in a manhole structure with permanent taps made on each side of the valve in the manhole structure to allow insertion of a leakage meter and to allow for sampling purposes. An air release valve shall be installed on the crossing side opposite from the water supply.

J. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

K. Sleeves:

1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.

2. Fill annular space between walls and sleeves with rich cement mortar.

3. Fill annular space between pipe and sleeves with mastic.

3.02 SEPARATION OF SEWER AND POTABLE WATER LINES

A. Horizontal Separation

1. Existing and proposed water and sewer lines shall be separated at least 10 feet horizontally.

B. Vertical Separation

1. Whenever sewer and water lines cross or run parallel within 10 feet, they shall be vertically separated with the water line at least 18 inches above the top of the sewer lines. This vertical separation shall be maintained for that portion of the sewer line located 10 feet either side of the water line.

C. Conflicts

1. Where water lines cross under gravity flow sewer lines, provide ductile iron pressure pipe with no joint located within 36 inches of the crossing.

   a. Cross water lines in cases above sewage main or inverted siphons at least 24" above the sewer line.
   b. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.

2. Do not place water lines in the same trench with sewer lines or electric wiring.

3.03 JOINING OF HDPE PIPE

A. Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site.

B. Extrusion welding or hot gas welding of HDPE shall not be used.

C. Butt fusion shall be performed only by a certified thermal fusion Contractor. The thermal fusion Contractor's certification shall be submitted to the ENGINEER for review and approval prior to the start of construction.

D. The joining method shall be the butt fusion method and shall be performed in strict accordance with the manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. The thermal fusion Contractor shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been trained within the past twelve months.

E. All welds will be made with a data logger to record temperature, fusion pressure, with a graphic representation of the fusion cycle shall be a part of the quality control records.

F. Bends in PE pipe shall not be within ten (10) pipe diameters from any fitting or valve. The minimum radius of curvature shall be thirty (30) pipe diameters. Bending shall not cause kinking.

G. Polyethylene piping shall not be joined by solvent cements, adhesive or threaded type connections.

3.04 HORIZONTAL DIRECTIONAL BORING

A. Directional boring/drilling installation shall be accomplished where required on the plans to minimize disturbance of existing surface improvements.

B. The CONTRACTOR shall be compensated for the restoration work only within the areas at the connection points, or other locations as may be approved by the ENGINEER. The CONTRACTOR shall be responsible for repairs, without compensation, for any other repair areas, including pit/boring points and areas above the drilled pipe where underground pressure may cause heaving or damage to pavement and ground surfaces.

C. The CONTRACTOR must submit boring/drilling pit locations to the ENGINEER for approval before beginning construction. Boring pits may be located within roadway right-of-way. Any other locations that may be desired by the CONTRACTOR for boring pits or other uses shall be the responsibility of the CONTRACTOR to attain authorization, including private property as may be required.

D. The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe without intermediate pits, at a minimum distance and radius requirements per the manufacturer's specification and recommendations. The guidance system shall be capable of installing pipe within 6-inches of the plan vertical dimensions and 12-inches of the plan horizontal dimensions. The CONTRACTOR shall be required to remove and reinstall pipe, which vary in depth and alignment from these tolerances.

E. Solid copper #10 tracer wire shall be pulled along with the HDPE pipe in order to locate it in the future.

F. Pull back forces shall not exceed the allowable pulling forces for the pipe being installed.

G. The minimum radius of the pipe shall be per the manufacturer's specification and recommendations.

H. Drilling fluid shall be a mixture of water and bentonite clay. Disposal of excess fluid and spoils shall be the responsibility of the CONTRACTOR.

3.05 PLUGS

A. Installed piping systems shall be temporarily plugged at the end of each day's work, or other interruption to progress on a given line. Plugging shall be adequate to prevent entry of small animals into the pipe or the entrance or insertion of deleterious materials.

B. Standard plugs shall be inserted into all dead-end pipes, tees, or crosses; spigot ends shall be capped; flanged and mechanical joint ends shall have blind flanges of metal.

C. Plugs installed for pressure testing shall be blind flanges fully secured and blocked to withstand the test pressure.

D. Where plugging is required because of contract division or phasing for later connection, the ends of such lines shall be equipped with a permanent type plug or blind flange. Installation or removal of such plugging shall be considered incidental to the work.

3.06 PIPE JOINTS

A. PVC pipe, mechanical joints and push-on type joints: Install in accordance with AWWA C900. Make connections between different types of pipes and accessories with transition fittings. Rubber gaskets: handle, lubricate where necessary, and install in strict accordance with the recommendations of the manufacturer.

B. Mechanical Joints

1. Pipe with mechanical joints shall be laid according to the manufacturer's specifications. Socket and gasket shall be clean and gasket shall be properly centered before joint is made.

C. Push-On Type Joints

1. Any foreign matter in the gasket seat shall be removed, the rubber gasket wiped clean, flexed and placed in the socket. A thin film of lubricant shall be applied to the inside surface of the gasket which will come in contact with entering plain end pipe. Joint assembly shall then be completed by forcing the plain end of the entering pipe past the gasket until it makes contact with the bottom of the socket.

3.07 SETTING VALVES AND VALVE BOXES

A. General:

1. Center valve boxes on the valves, setting plumb.

2. Tamp earth fill around each valve box to a distance of four feet on all sides, or to the undisturbed trench face if less than four feet.

3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:

1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.

2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways or as shown on the Construction Details.

3.08 RESTRAINING

A. General:

1. Provide MJ restraining gland on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally, and on water lines 3" in diameter or larger. Provide MJ restraining gland for PVC pipe as manufactured by EBAA Iron, Series 2000PV; or approved equal.

2. All MJ fittings shall be restrained with Mega Lugs per the Detail Restraint Tables, or per design criteria, whichever is greater. Where two (2) or more fittings are together, the joints shall be restrained in accordance with the fitting that yields the greatest length of restrained pipe.

3. The length of restrained pipe from horizontal bends, elbows, dead ends, and in-line valves shall be the length of the restrained pipe along each side of these fittings/valves or per the design criteria, whichever is greater. The length of restrained pipe from tees and wyes shall be the length of the restrained pipe along the branch of the pipe only or per the design criteria, whichever is greater. Pipe on both sides of the branch shall have a minimum length of ten (10) feet. The length of restrained pipe from the reducers shall be the length of the pipe restrained on the large end only per the design criteria, whichever is greater.

3.09 FLUSHING HYDRANT LOCATIONS

A. Flushing hydrants are to be located as shown on the plans within the ROW away from the edge of road and in a location so as to create minimal impact to maintenance of ROW efforts.

3.10 TRACER WIRE FOR PVC AND HDPE PIPE

A. Tracer wire shall be laid with all PVC, HDPE watermain and HDPE water services and shall be insulated, #10 solid copper core and rated for underground service. The tracer wire loops shall be connected to all manual flushing hydrants at a rear flange bolt using an aluminum angle iron hydrant tracer wire bracket. All spliced or repaired wire connections in the tracer wire system shall be made using a Wing Nut Wire Connector (for two to four number ten wires), and made waterproof using an approved buried service wire enclosure.

3.11 DETECTABLE UNDERGROUND MARKING TAPE

A. Non-metallic buried piping shall have detectable underground marking tape installed in the pipe trench. The marking tape shall be installed in accordance with the manufacturer's instructions. The tape shall be buried between 6 and 12 inches of the finished surface.

B. The buried marking tape shall be detectable with an electronic or magnetic type pipe locator. The marking tape shall be labeled "Caution – Buried Water Line Below," or equal as approved by the ENGINEER. Color and printing shall be permanent and unaffected by moisture or soil.

3.12 WATER LINE MARKER

A. Fiberglass utility marking posts labeled 'WARNING WATER PIPELINE' with '811 Call Before You Dig' reference shall be installed directly over the water main at regular 500' intervals after final site restoration has been completed. Markers shall be blue fiberglass with printing/decals on both sides. Printing/decals shall have blue lettering on a white background. Markers shall be 4" wide by 72" long as manufactured by Rhino Marking and Protection Systems or approved equal.

3.13 TESTING AND INSPECTING

A. Test Restrictions

1. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section.
2. Test pressure shall not exceed pipe or thrust-restraint design pressures.
3. The hydrostatic test shall be of at least a 2-hour duration.
4. Test pressure shall not vary by more than $\pm$5 psi for the duration of the test.
5. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of the double-disc gate valve. For tests at these pressures, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.
6. The test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

B. Pressurization

1. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each valved section of pipe shall be slowly filled with water, and the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage) shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

C. Air Removal

1. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place as required by the specifications.

D. Examinations

1. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

E. Leakage Defined

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. A drop in pressure in a test section shall not measure leakage over a period of time.

F. Allowable Leakage

1. No pipe installation will be accepted if the leakage rate is greater than that determined by the following formula:

$$\text{In inch-pound units} \qquad \frac{SD(P)^{1/2}}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

TABLE II: Allowable Leakage Per 1,000 Feet Of Pipeline at 125 PSI Test Pressure

Size	Leakage	Size	Leakage
4”	0.34	14”	1.18
6”	0.50	16”	1.34
8”	0.67	18”	1.51
10”	0.84	20”	1.68
12”	1.01	24”	2.01
		30”	2.52

Above table based on Mechanical or Push-On joint with 18-foot nominal lengths. For pipe with 20-foot nominal lengths, multiply above leakage by 0.9.

a. When flushing hydrants are in the test section, the test shall be made against the main valve in the hydrant.

G. Disinfection:

1. Before acceptance of the potable water system, disinfect each unit of the completed water supply, distribution, and service line in accordance with AWWA C651.

2. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.

3. Furnish two copies of a certificate of Disinfection from an independent laboratory to the ENGINEER.

4. The method of chlorination shall be in accordance with AWWA C651, Section 5 unless approved otherwise by the ENGINEER

- End of Section -

SECTION 02685
POTABLE WATER WELL ABANDONMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Identified potable water wells will be permanently abandoned in accordance with 312 Indiana Administrative Code (IAC) Title 312:13-10-2 (Final Rule Concerning the Regulation of Water Well Drilling).

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS

A. The contractor must retain a licensed Indiana Water Well Drilling contractor to properly abandon the water well. The following steps will be completed to abandon the potable water well.

1. The well pump and ancillary pump equipment will be disconnected and removed from the well.

2. The well will be chlorinated as per 312 IAC 13-9-1.

3. The well will be plugged from the bottom to 2 feet below ground surface in accordance with 312 IAC 13-9-1 using medium or coarse grade bentonite from the bottom of the well to ground surface.

4. The well casing will be cut at 2 feet below grade.

5. A 10-inch diameter cement plug will be constructed over the borehole and the cement plug with covered with a natural clay material to ground surface.

6. The surface surrounding the well will be restored to match existing conditions.

- End of Section -

SECTION 02750
WATER SERVICE CONNECTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work specified herein:

1. Connection of new potable water service to existing internal potable plumbing.
2. Reconnection of existing well system to one external plumbing fixture such as a spigot or yard hydrant.

1.02 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this Section.

1.03 SUMMARY

A. The CONTRACTOR shall comply with the requirements of the laws of the State of Indiana, applicable ordinances, and Indiana Plumbing Code.

PART 2 - PRODUCTS - NOT USED

PART 3 – SUPPLEMENTAL INFORMATION

3.01 INDIVIDUAL SERVICE CONNECTION INFORMATION

A. The following table provides information, where known, on the general requirements for each address related to the installation of the new potable water service and the connection of the existing pressure tank/well system discharge to an outdoor water spigot or hydrant. This table is provided for information purposes only. Pipe type, size and length required for reconnection, where indicated, is subject to change and verification by the installing contractor.

Street No.	Street Name	Drawing Sheet No.	Description of Service Connection Modifications needed for potable water service entry into home	Description of Well/Pressure Tank Modifications needed to provide or maintain service to outdoor spigot
3586	N Old US Hwy 31	26	Bring new service into home at same location as existing well service. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the	Install approximately 8 LF of 3/4" copper to connect existing pressure tank discharge to two existing spigots. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

			discharge side of the pressure tank. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	
3597	N Old US Hwy 31	26	Bring new service into home at same location as existing well service. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" PVC.	Install approximately 70 LF of 3/4" PVC along the floor joist from the pressure tank located in the SE corner of the basement to the spigot located on the NE end of the home. Connect existing spigots on SE and NE end to pressure tank discharge. Basement is unfinished and piping can be run in the floor joist. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
3618	N Old US Hwy 31	26	Bring new service into home in the north east corner at same location as existing well service. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" PVC.	Existing yard hydrant to remain in service and connected to the well/pressure tank system. A new external spigot connected to the well/pressure tank system will be installed on the north side of the house. Install approximately 5LF of 3/4" PVC for new spigot.
3719	N Old US Hwy 31	27	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing with approximately 50LF of water service piping. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Connect existing spigots and hydrants to pressure tank discharge. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

3791	N Old US Hwy 31	27	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing. Connect spigot on SW corner of home to potable system for use with owner's hot tub. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Connect existing spigots east wall and NW wall to pressure tank discharge with approximately 10 LF of water service piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
3796	N Old US Hwy 31	28	Bring new service into home at same location as existing well service as shown in the drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank. Abandon the existing pressure tank. Existing piping is 3/4" PVC.	Abandon the existing well and pressure tank.
3842	N Old US Hwy 31	28	Bring new service into home at same location as existing well service as shown in the drawings. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank. Existing piping is 3/4" PVC.	Tentatively abandon the existing well and pressure tank. Alternatively, connect existing spigot on south side of the house to pressure tank discharge with approximately 8 LF of water service piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
3868	N Old US Hwy 31	29		Tentatively abandon well and pressure tank system.

3980	N Old US Hwy 31	29	Bring new service into home at same location as existing well service as shown in the drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank.	Connect existing spigot to pressure tank discharge. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
3998	N Old US Hwy 31	29	Bring new service into home at same location as existing well service as shown in the drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing on the discharge side of the pressure tank.	Connect existing spigot and yard hydrant to pressure tank discharge. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
4008	N Old US Hwy 31	29	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing by running service up to the floor joist and installing approximately 20' of service piping to connect to existing water softener. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	Both existing spigots are on the same line from the pressure tank. Cut pipe and cap pipe going to the home's internal plumbing to separate the potable and non-potable systems. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
4016	N Old US Hwy 31	30	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing	Connect the line from the pressure tank to the external plumbing in the garage. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

			on the discharge side of the pressure tank. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" galvanized.	
4217/4079	N Old US Hwy 31	30 & 31	Two services are required. One at 4217 Old US 31 will be installed at the location shown on the drawings. Stub the service up through the floor. Install water. Install water shutoff valve and water meter on new service. AirVAC will complete connection to their potable water system. The second service will be installed at 4079 Old US 31 in the location shown on the drawings. AirVAC will extend the service across their property and into the facility.	No outdoor spigot connection required. The property will replumb the facility.
4163	N Old US Hwy 31	32	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing. Ensure no cross connection between pressure tank discharge and the internal potable water service.	Repipe from the discharge of the pressure tank to the spigot located on north wall. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
4366	N Old US Hwy 31	32	Bring new service into facility at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Stub the service up through the floor and cap. The facility will replumb the building.	No outdoor spigot connection required. The property will replumb the facility.
4403	N Old US Hwy 31	33	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing at water softener. Ensure no cross	Two spigots will be capped in place. Two spigots one by pressure tank and one by garage will be left in place and attached to pressure tank discharge. Approximately 21LF from pressure tank to garage spigot. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

			connection between pressure tank discharge and the internal potable water service.	
1387	E 350 N	34	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing with approximately 8 LF of service connection piping. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	The west and north wall spigots may not be able to be separated from the potable system so they will need to be capped. Discharge from pressure tank will service barn, existing yard hydrant and south spigot. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
972	E 375 N	35		
1082	E 375 N	35	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Tentatively abandon the existing well and pressure tank. Alternatively, connect existing spigots on the front and back of the house to pressure tank discharge with approximately 40 LF of water service piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
908	E 375 N	36	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Bring new service into garage at location shown on drawings. Install water shutoff valve on new service inside garage. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing.	Connect existing spigots to pressure tank discharge. Install approximately 300LF of 3/4" HDPE water service to a new yard hydrant north of the house. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.

			Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	
948	E 375 N	36	Bring new service into home at location shown on drawings. Install water shutoff valve on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing with approximately 24LF of water service piping. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Existing spigots are on their own dedicated line. Replumb the discharge from the pressure tank to the spigot line. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.
966	E 375 N	36		
750	E 425 N	37	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Front spigot can be connected to the discharge of the pressure tank. Connect the north spigot to the pressure tank discharge with approximately 29 LF of piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
781	E 425 N	37	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing with approximately 8' of 3/4" copper. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	The discharge from the pressure tank feeds the spigot in the garage. The discharge from the pressure tank then goes under the floor. Cut and cap the section of pipe going into and out of the floor to separate the systems.

782	E 425 N	37	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing at the water softener. The line from the pressure tank has a T in it just before the water softening unit. One leg of the T runs into the water softener and the other continues on to both the garage and spigots. Ensure no cross connection between pressure tank discharge and the internal potable water service.	Existing spigot and garage plumbing are on dedicated line. Reconnect line to pressure tank discharge. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
581	E 425 N	38	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	Install approximately 75 LF of water service piping to spigot on south east side of house.
682	E 425 N	38	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing with approximately 25LF of water service piping. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Existing spigot can be separated from the potable system and replumbed to the discharge of the pressure tank with approximately 26LF of water service piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
719	E 425 N	38		

528	E 425 N	39	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the home's internal plumbing with approximately 15LF of water service piping. Ensure no cross connection between pressure tank discharge and the home's internal potable water service.	Existing spigot can be separated from the potable system and replumbed to the discharge of the pressure tank. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
537	E 425 N	39	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the inlet side of the home's water softener using 10' of 3/4" copper. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	Existing spigots are on their own line ahead of the softener and will just need to be disconnected from the potable water system. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
557	E 425 N	39	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Ensure no cross connection between pressure tank discharge and the home's internal potable water service. Existing piping is 3/4" copper.	The existing spigot is tied into the discharge off the pressure tank. Ensure no cross connection between non potable discharge from pressure tank and potable water service.
501	E 425 N	40	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing. Ensure no cross connection between well system/pressure tank discharge and the home's	Connect existing spigots on the front and back of the house to pressure tank discharge with approximately 10 LF of water service piping. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

			internal potable water service.	
519	E 425 N	40	Bring new service into home at location shown on drawings. Install water shutoff valve and water meter on new service inside home. Disconnect interior plumbing from pressure tank discharge. Connect new incoming potable water service to the internal plumbing. Ensure no cross connection between well system/pressure tank discharge and the home's internal potable water service.	Existing west wall spigot can be replumbed to pressure tank discharge. The spigot in the garage is already on a line from the well. Ensure no cross connection between non potable discharge from pressure tank and potable water service.

-End of Section-

SECTION 03100
CONCRETE FORMWORK

PART 1 – GENERAL

1.01 GENERAL

A. Work specified herein and elsewhere

1. Work under this section includes:

a. General formwork
b. Forms and coatings
c. Form ties and accessories

2. Related work specified elsewhere:

a. Materials for built-in items of other work
b. Concrete Reinforcements: Section 03200
c. Concrete: Section 03310

1.02 RESPONSIBILITY

A. The CONTRACTOR shall be solely responsible for the ability of formwork to produce members of the size, shape, and exterior finish required, for the structural adequacy of the forms to carry construction loads without excessive deflection, and for the safe use of forms in connection with completion of the concrete work. The CONTRACTOR shall be responsible for any injury or damage arising from inadequate forms or from premature removal of formwork.

1.03 SUBMITTALS

A. Samples and certifications shall be submitted as directed by the ENGINEER.

1.04 REFERENCED STANDARDS

A. ACI 318, “Building Code Requirements in Reinforced Concrete”

B. ACI 347, “Guide to Formwork for Concrete”

C. PS 1, “Construction and Industrial Plywood”

D. ACI 301, “Specifications for Structural Concrete for Buildings”

1.05 QUALITY ASSURANCE

A. Design, construct and erect concrete formwork in accordance with ACI 301 and ACI 347.

B. Design, construct and erect reshoring system to result in loadings which to do not exceed the design live loads. Do not use unshored structure for support until it has reached design strength.

PART 2 – PRODUCTS

2.01 FORMWORK

A. Form Tie

1. Form ties shall be a watersealing type, adequate to maintain the position and shape of the forms, and which can be removed or broken off sufficiently below the surface to allow patching.

B. Plywood Forms and Liners

1. Plywood forms and liners shall be PS 1, minimum grade B-B High Density Overlay Concrete Form Panels, Class 1.

C. Lumber

1. Formwork lumber shall be straight and clean. All nails shall be withdrawn and surfaces in contact with concrete shall be thoroughly cleaned before reuse.

D. Metal Forms

1. Metal forms shall be fabricated from carbon steel sheets conforming to ASTM A569.

E. Column Forms

1. Forms for round columns shall be either fibre tube forms or fiberglass reinforced plastic forms. Fibre tube forms shall be Alton Sleek/Tubes, Sonotube, or equal. Fiberglass forms shall be as manufactured by Ceco Corp., MGF Concrete Forms Co., or equal.

PART 3 – EXECUTION

3.01 PREPARATIONS

A. Fastening Devices for Other Work

1. Coordinate with other trade and properly place and locate in position all necessary dowels, bolts, anchors, anchor slots, inserts, sleeves, openings, hangers, metal ties and other fastening devices required for attachment and support of adjacent work. Securely anchor all embedded items.

3.02 FORMWORK REQUIREMENTS

A. General

1. Formwork shall comply with ACI 347 and to shape, lines, and dimensions of the members as indicated on the Drawings. Joints in forms shall be horizontal or vertical.

Forms shall be properly braced or tied to maintain position and shape under all dead and live loads and to prevent leakage. Forms shall be assembled so their removal will not damage the concrete. Tolerances for formed surfaces shall in compliance with ACI 301.

2. Lumber formwork may be used for surfaces which will not be exposed to view. Use plywood or metal forms for exposed surfaces.

3. Provide temporary openings at the base of forms greater than 4 feet high, if necessary, to facilitate cleaning and inspection immediately before depositing concrete.

4. All external corners of concrete exposed to view shall be chamfered by using ¾ inch by ¾ inch by 45 degree wood stripping, except as otherwise indicated on the Drawings.

B. Grade A Forms

1. Unless otherwise indicated, Grade A forms shall be used for all exposed concrete.

2. Grade A forms shall consist of wood made of dressed lumber or plywood, with or without a form liner of a type approved by the ENGINEER or shall consist of steel forms lined with 3/16 inch thick tempered hardboard or ¼ inch thick plywood.

3. Full-sized sheets shall be used wherever possible. The edges of all sheets shall be straightened to insure tight, close fitting joints. Bulges or depressions more than 1/8 inch in 4 feet will not be permitted. Open joints which would permit leakage shall be sufficient cause for rejection of forms. Other tolerances shall be as allowed by ACI 347.

C. Grade B Forms

1. Use lumber, plywood or metal forms. All joints shall be solidly backed, aligned, and make leakproof.

2. Unless otherwise indicated, Grade B forms are intended for use where concrete will not be exposed to view, such as below grade, below normal liquid levels in water-retaining, structures, or inside manholes, boxes, vaults, etc.

D. Surface Treatment of Formwork

1. The inside surface of lumber forms shall be soaked with clean water prior to placing concrete. All other forms shall be treated with an approved form oil or lacquer. If oil is used, all excess oil shall be wiped off.

2. Forms for exposed aggregate concrete shall be treated in compliance with the surface-set retarder manufacturer's instructions.

E. Inspection of Formwork

1. Concrete shall not be placed until the forms have been inspected by the ENGINEER to assure surfaces are in conformance with the Drawings and Specifications. The inspection of formwork by the ENGINEER does not relate to the structural adequacy or the safety of the formwork.

2. Construction live loads shall not be placed on concrete until the concrete has attained its full 28-day compressive strength.

3. Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50° F for 48-hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

-End of Section-

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Provision of all reinforcement.

2. Related work specified elsewhere:

a. Concrete Formwork: Section 03100
b. Concrete: Section 03310

1.02 SUBMITTALS

A. Certifications for reinforcement shall be submitted as directed by the ENGINEER.

B. Shop Drawings

1. Submit reinforcement steel shop drawings prepared in accordance with ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures. Drawings shall indicate bending diagrams, shapes, dimensions, clearances, splicing and laps, accessories, and installation notes.

1.03 REFERENCED STANDARDS

A. ACI 301, “Specifications for Structural Concrete Buildings”

B. ACI 315, “Details and Detailing of Concrete Reinforcement”

C. ACI 318, “Building Code Requirements for Reinforced Concrete”

D. ASTM A185, “Welded Steel Wire Fabric for Concrete Reinforcement”

E. ASTM A615, “Deformed and Plain Billet – Steel Bars for Concrete Reinforcement”

F. CRSI, “Manual of Standard Practice for Reinforced Concrete Construction”

PART 2 - PRODUCTS

2.01 REINFORCEMENT

A. Reinforcement Bars

1. Reinforcement bars shall be ASTM A615, Grade 60 deformed bars, except as otherwise indicated.

B. Smooth Dowels

1. Smooth dowels shall be ASTM A615, Grade 60 plain bars.

C. Threaded Dowels

1. Threaded dowels shall be ASTM A36.

D. Welded Wire Fabric

1. Welded wire fabric shall conform to ASTM A185. Where welded wire fabric is shown but not sized on Drawings, use 6" x 6" x W2.9 x W2.9 WWF.

E. Accessories

1. Accessories for proper installation of reinforcement shall conform to CRSI "Manual of Standard Practice for Reinforced Concrete Construction". Bar supports at exposed surfaces shall be Class C-Plastic Protected.

F. Reinforcement Fabrication

1. Reinforcement fabrication shall conform to ACI 315 and ACI 318, and approved shop drawings.

PART 3 - EXECUTION

3.01 PREPARATIONS

A. Fastening Devices for Other Work

1. Coordinate with other trades and properly place and locate in position all necessary reinforcement, dowels, bolts, anchors, anchor slots, inserts, hangers, metal ties, and other fastening devices required for attachment and support to adjacent work. Securely anchor all fixtures and embedded items.

3.02 REINFORCEMENT

A. General

1. The placement of reinforcing steel shall conform to "Placing Reinforcing Bars", as published by the Concrete Reinforcing Steel Institute except as noted.

2. Reinforcement shall be inspected and approved by the ENGINEER before enclosing forms are erected and shall be rechecked immediately prior to depositing concrete.

B. Splices, Laps, and Dowels

1. Provide continuous reinforcement or dowels through construction joints. The use of inserts in lieu of dowels shall be subject to the ENGINEER's approval. One half of reinforcement shall be discontinued across control joints unless otherwise indicated. All reinforcement shall be discontinued across expansion joints, except for sleeved or greased dowels, if indicated.

2. Splice laps shall be as indicated on the Drawings. Dowels shall be of the same size as the largest bar to which they lap, unless otherwise indicated.

C. Fabric Reinforcement for Slabs

1. Fabric reinforcement for slabs shall be overlapped at splices not less than the spacing of the cross wires plus 2 inches. Fabric shall extend to within 4 inches of concrete edges.

2. Unless otherwise shown, place reinforcement 2 to 3 inches below the top of the finished slab. Mesh shall either be sandwiched between two layers of fresh concrete or supported on mesh supports. Supports that may puncture the vapor barrier, if any, shall not be used.

D. Reinforcement for Formed Concrete

1. Secure steel reinforcement to maintain proper position during concrete placement. Concrete protection for reinforcement shall conform to ACI 318, except as otherwise indicated on the Drawings. The distance from the center of reinforcing bars to the opposite face of all structural slabs, walls, columns, or beams shall conform to ACI 318. The distance may be increased provided the required cover is maintained.

-End of Section-

SECTION 03310
CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

A. The extent of concrete work is as shown on the Drawings, and shall include the finishing, transporting, and placing of all concrete, joint fillers, miscellaneous hardware, waterstops, and all other items necessary for completion of the Work as defined on the Drawings.

1.02 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the Work specified in this section.

B. All Work shall be performed in accordance with the "American Concrete Institute (ACI)", except as amended herein.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Trenching, Backfilling, and Compaction: Section 02221.

1.04 QUALITY ASSURANCE

A. In this Work the CONTRACTOR shall comply with the requirements of the laws, ordinances, and rules of the OWNER and the State of Indiana in every way.

B. All Work shall be completed in a conscientious manner. The ENGINEER shall have the authority to reject any work which, in his opinion, does not present an orderly and reasonably neat appearance, provided that such item can be properly installed in such orderly way by usual methods.

C. The Drawings and Specifications are intended to include all details for the Work specified. However, the CONTRACTOR shall be responsible for all details which may be necessary to properly complete the Work. The CONTRACTOR shall assume full responsibility for additional costs which may result from unauthorized deviations from Specifications.

D. Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

1. ACI 301 "Specifications for Structural Concrete for Buildings."

2. ACI 311 "Recommended Practice for Concrete Inspection."

3. ACI 318 "Building Code Requirements for Reinforced Concrete."

4. ACI 347 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."

5. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

6. Comply with applicable building code requirements which are more stringent than the above.

E. The CONTRACTOR is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes. Correct deficient concrete as directed by the ENGINEER.

F. Concrete Testing Service

1. The CONTRACTOR shall, at his own expense, employ a testing laboratory acceptable to ENGINEER to perform material evaluation tests and to design concrete mixes.

2. Materials and installed work may require testing and retesting as directed by the ENGINEER at anytime during the progress of the Work. Allow free access to material stockpiles and facilities at all times. Tests, not specifically indicated to be done at the OWNER'S expense, including the retesting of rejected materials and installed work, shall be done at the CONTRACTOR'S expense.

G. Tests for Concrete Materials

1. Test aggregates by method of sampling and testing of ASTM C 33. For portland cement, sample the cement and determine the properties by the methods of test of ASTM C 150.

2. Submit written reports to the ENGINEER for each material sampled and tested, prior to the start of the Work. Provide the project identification name and number, date of report, name of CONTRACTOR, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.

1.05 SUBMITTALS

A. For information only, submit copies of manufacturer's product data with application and installation instruction for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, chemical floor hardeners, dry-shake finish materials, and others as requested by the ENGINEER.

B. Submit samples of materials as specified by the ENGINEER, including names, sources and descriptions.

C. Submit copies of laboratory test reports for concrete materials and mix design test for approval.

1.06 PRODUCT DELIVERY, STORAGE, HANDLING

A. Store cement in weather tight enclosures and protect against dampness, contamination, and warehouse set.

B. Aggregates

1. Stock pile aggregates to prevent excessive segregation or contamination with other materials or other sizes of aggregates.

2. Use only one supply source for each aggregate stock pile.

C. Admixtures

1. Store admixtures to prevent contamination, evaporation or damage.

2. Protect liquid admixtures from freezing or harmful temperature ranges.

3. Agitate emulsions prior to use.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Allowable Concrete Temperatures

1. Cold weather: Maximum and minimum temperatures shall be as specified in ASTM C 94 or as required herein.

2. Hot weather: Maximum temperature of the concrete shall not exceed 90° F (32° C).

B. Do not place concrete during rain, sleet, or snow unless protection is provided.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: Provide ASTM C 150, Type l portland cement, unless otherwise acceptable to ENGINEER. Use only one brand of cement throughout the Project, unless otherwise specified by the ENGINEER.

B. Normal Weight Aggregates

1. Provide aggregates in accordance with ASTM C 33, and as herein specified. Provide aggregates from a single source for all exposed concrete.

2. Local aggregates not complying with ASTM C 33, but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the ENGINEER.

3. Fine aggregate shall be clean, sharp, natural sand, free from loam, clay, lumps, or other deleterious substances.

4. Dune sand, bank-run sand, and manufactured sand are not acceptable.

5. Coarse aggregate shall be clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

   a. Crushed stone, processed from natural rock or stone.

   b. Washed gravel, either natural or crushed. Use of pit or bank-run gravel is not permitted.

   c. Blast-furnace slag, crushed and processed from air-cooled, iron blast-furnace slag weighing not less than 70 lbs. per cu. ft. in the dry, compacted state when determined in compliance with ASTM C 29.

6. The maximum aggregate size shall not be larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. These limitations may be waived if, in the judgement of the ENGINEER, workability and methods of consolidation are such that concrete can be placed without honeycomb or voids.

C. Water: All water used for concrete mixes shall be clean, fresh, and drinkable.

D. Air-Entraining Admixture: Use Type l Portland Cement with an approved air-entraining admixture conforming to ASTM C 260.

E. Water-Reducing Admixtures: The CONTRACTOR may use water-reducing admixtures subject to approval by the ENGINEER, and at no additional compensation. The ENGINEER may require use of water-reducing for specific uses, such as in extensive wall pours to assure elimination of cold joints, in which case also no additional compensation will be allowed. Water-reducing admixtures shall conform to ASTM C 494, Type A.

F. Set-Control Admixtures

1. Set-control admixtures shall conform to ASTM C 494 as follows:

   a. Type B, retarding.
   b. Type C, accelerating.
   c. Type D, water-reducing and retarding.
   d. Type E, water-reducing and accelerating.

2. Calcium chloride will not be permitted in concrete, unless otherwise authorized in writing by the ENGINEER.

G. Waterstops

1. Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as shown on Drawings. Size to suit joints.

2. Provide either rubber or PVC waterstops, at CONTRACTOR'S option, with rubber units complying with Corps of Engineers CRD-C513 and PVC units complying with CRD-C572.

H. Moisture Barrier: Provide moisture barrier cover over prepared base material where shown on the Drawings. Use only materials which are resistant to decay when tested in accordance with ASTM E 154. Use polyethylene sheet not less than 9 mils thick.

I. Membrane Curing Compound

1. Membrane curing compound shall conform to ASTM C309, Type 1 or Type 2.

2. Type 2 compound shall be used for P.C.C. pavement only. All permanently exposed exterior slabs shall receive clear acrylic curing and sealing compound.

2.02 PROPORTIONING AND DESIGN OF MIXES

A. General

1. Prepare design mixes for each type of concrete. Use an independent testing facility acceptable to the ENGINEER for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

2. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for each class of concrete required, complying with ACI 211.1.

3. Submit written reports to the ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until mixes have been reviewed by the ENGINEER.

B. Laboratory Trial Batches

1. When laboratory trial batches are used to select concrete proportions, prepare test specimens in accordance with ASTM C 192 and conduct strength tests in accordance with ASTM C 39, specified in ACI 301.

2. Establish a curve showing relationship between water/cement ratio (or cement content) and compressive strength, with at least 3 points representing batches which produce strengths above and below that required. Use not less than 3 specimens tested at 28-days, or an earlier age when acceptable to the ENGINEER to establish each point on the curve.

C. Field Experience Method

1. When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301.

2. Strength data for establishing standard deviation will be considered suitable if the concrete production facility has certified records consisting of at least 30 consecutive tests in one group or the statistical average for two groups totaling 30 or more tests, representing similar materials and project conditions.

3. If standard deviation exceeds 600 psi or if no suitable records are available, select proportion to produce an average strength of at least 1200 psi greater than the required compressive strength of concrete.

4. After sufficient experience and test data become available from the job, using ACI 214 methods of evaluation, the standard deviations may be reduced when the probable frequency of an average of 3 consecutive tests below required compressive strength will not exceed 1 in 100.

D. Mix Design

1. Approximate design mixes to provide concrete with the following minimum properties. Where items are indicated as INDOT compliant, STD. SPEC. Section 702 shall govern.

   a. 4000 psi 28-day compressive strength. 565 lbs. cement per cu. yd. concrete (6.O sacks). W/C ratio, 0.57.

   b. 3500 psi 28-day compressive strength. 540 lbs. cement per cu. yd. concrete (5.75 sacks). W/C ratio, 0.60.

   c. 3000 psi (28-day compressive strength. 500 lbs. cement per cu. yd. concrete (5.25 sacks). W/C ratio, 0.68.

   d. 2500 psi 28-day compressive strength. 450 lbs. cement per cu. yd. concrete (4.75 sacks). W/C ratio, 0.75.

2. Mix design adjustments may be requested by the CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the OWNER, and as accepted by the ENGINEER. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by the ENGINEER before using in the Work.

3. The strength of all structural concrete shall be as designated on the Drawings. Fill concrete or plain concrete used for pipe thrust blocks or pipe bedding shall be 2500 psi concrete and will be cast on the soil with no forming required.

E. Admixtures

1. Use air-entraining admixture in exterior exposed concrete, unless otherwise shown or specified. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the following limits:

   a. Concrete structures and slabs exposed to freezing and thawing or subject to hydraulic pressure:

      (1) 4% for maximum 2" aggregate
      (2) 6% for maximum 3/4" aggregate
      (3) 7% for maximum l/2" aggregate

   b. Other concrete: 2% to 4% air.

2. Use admixtures for water-reducing and set-control in strict compliance with the manufacturer's directions.

3. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control.

F. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement as follows:

1. Ramps and Sloping Surfaces: not more than 3".

2. Reinforced Foundation Systems: not less than l" and not more than 3".

3. All Other Concrete: not less than l" and not more than 4".

2.03 CONCRETE MIXING

A. Job-Site Mixing

1. Mix materials for concrete in an acceptable drum-type batch machine mixer. For mixers of one cu. yd. or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after all ingredients are in the mixer, before any part of the batch is released. For mixers of capacity larger than one cu. yd., increase the minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd. or fraction thereof.

2. Provide a batch ticket for each batch discharged and used in the Work, indicating the project identification name and number, date, mix type, mix time, quantity and amount of water introduced.

B. Ready-Mix Concrete

1. Comply with the requirements of ASTM C 94, and as herein specified. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.

2. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

3. When the air temperature is between 85° and 90°F, reduce the mixing and delivery time from 1½ hours to 75 minutes, and when the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 JOINTS

A. Construction Joints

1. Locate and install construction joints, which are not shown on the Drawings, so as not to impair the strength and appearance of the structure.

2. Provide keyways at least 1½" deep in all construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

3. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.

4. Provide waterstops in construction joints as shown on the Drawings. Install waterstops to form a continuous diaphragm in each joint. Make provisions to support and protect waterstops during the progress of the Work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Protect waterstop material from damage where it protrudes from any point.

B. Isolation (Expansion) Joints for slab-on-Grade: Construct isolation joints in slabs-on-ground at all points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Set and build into the Work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

3.03 CONCRETE PLACEMENT

A. Pre-Placement Inspection

1. Before placing concrete, inspect and complete the formwork installations, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required.

2. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

B. General

1. Comply with ACI 304, and as herein specified.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or places of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to re-handling or flowing.

C. Placing Concrete in Forms

1. Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions.

3. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6" into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

D. Placing Concrete Slabs

1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

4. Maintain reinforcing in the proper position during concrete placement operations.

E. Cold Weather Placing

1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

2. When air temperature has fallen to or is expected to fall below 40°F., uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50°F, and not more than 80°F. at point of placement.

3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

4. Do not use calcium chloride, salt and other materials containing anti-freeze agents or chemical accelerators unless otherwise accepted in writing by the ENGINEER.

F. Hot Weather Placing

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

4. Wet forms thoroughly before placing concrete.

5. Do not use retarding admixtures unless otherwise accepted in mix designs.

G. Concreting Under Water: No concrete shall be placed under water without written approval by the ENGINEER and in accordance with procedures approved by the ENGINEER.

3.04 FINISH OF FORMED SURFACES

A. Rough Form Finish (RfFm-Fn): Provide rough form finish to formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise shown or specified. This is the concrete surface having the texture imparted by the form facing material used, with tie holes, and defective areas repaired and patched and fins and other projections exceeding l/4" in height rubbed down or chipped off.

B. Smooth Form Finish (SmFm-Fn): Provide smooth form finish to formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to the concrete, or a covering material applied directly to the concrete, or a covering material bonded to the concrete, such as waterproofing, dampproofing, painting or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.

3.05 MONOLITHIC SLAB FINISHES

A. Float finish (Flt-Fn)

1. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise shown on Drawings or in schedules.

B. Trowel Finish (Tr-Fn)

1. Apply trowel finish to monolithic slab surfaces that are to be exposed-to-view, unless otherwise shown on the Drawings, and slab surfaces that are to be covered with resilient flooring, paint or other thin film finish coating system.

2. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding l/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

3. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.

4. Provide waterstops in construction joints as shown on the Drawings. Install waterstops to form a continuous diaphragm in each joint. Make provisions to support and protect waterstops during the progress of the Work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Protect waterstop material from damage where it protrudes from any point.

C. Isolation (Expansion) Joints for slab-on-Grade: Construct isolation joints in slabs-on-ground at all points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

3.06 CONCRETE CURING AND PROTECTION

A. General

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.

3. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods

1. Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as herein specified.

2. Provide moisture curing by any of the following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

3. Provide moisture-cover curing by covering concrete surfaces with a moisture-retaining cover, placed in the widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

4. Provide membrane curing as follows:

a. Apply membrane-forming curing compound to damp concrete surfaces as soon as water film has disappeared. Apply uniformly in 2-coat continuous operation by power-spray equipment in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

b. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the ENGINEER.

C. Curing Unformed Surfaces

1. Initially cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by moist curing.

2. Final cure unformed surfaces, unless otherwise specified, by methods specified above, as applicable.

3. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.07 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete the Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment.

3.08 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas

1. Repair and patch defective areas with cement mortar immediately after removal of forms, but only when acceptable to ENGINEER.

2. Cut out honeycomb, rock pockets, voids over 1/2" diameter, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to ENGINEER.

3. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color of surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strikeoff slightly higher than surrounding surface.

B. Repair of Formed Surfaces

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets and holes left by tie rods and bolts; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning.

2. Repair concealed formed surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete.

C. Repair of Unformed Surfaces

1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

2. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

3. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen (14) days.

4. Correct low areas in unformed surfaces during or immediately after, completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to ENGINEER.

5. Repair defective areas, except random cracks and single holes not exceeding l" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete, and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of same materials to provide concrete of the same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

6. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and brush with neat cement grout coating. Place dry-pack before cement grout takes its initial set. Mix dry-pack, consisting of one part portland cement to 2 l/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas Continuously moist for not less than 72 hours.

3.09 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. CONTRACTOR will employ a testing laboratory to perform quality control tests and to submit test reports.

B. Sampling and testing for quality control during the placement of concrete may include the following, as directed by the ENGINEER:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

3. Air Content: ASTM C 173, volumetric method for lightweight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

4. Concrete Temperature: Test hourly when air temperature is 40° F and below, and when 80°F and above; and each time a set compression test specimen is made.

5. Compression Test Specimen: ASTM C 31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinder for laboratory cured test specimens, except when field-cure test specimens are required.

6. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yd. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

7. When the frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

8. When the total quantity of a given class of concrete is less than 50 cu. yds., the strength test may be waived by the ENGINEER if, in his judgement, adequate evidence of satisfactory strength is provided.

9. When the strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

C. Test results will be reported in writing to the ENGINEER and the CONTRACTOR on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate the specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER. The testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. CONTRACTOR shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

3.10 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

-End of Section-

SECTION 11360
BOOSTER PUMP STATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. The contractor shall furnish and install one (1) factory built, factory delivered, above ground water booster pump station, with all the necessary internal piping, pumps, motors, valves, controls, chemical feed equipment, standby power equipment and other necessary appurtenances installed on a fabricated steel base and enclosed in a structure as shown on the plans and as specified herein. The enclosure shall be designed to provide resistance to rusting, operational reliability through environmental control, and easy access to housed components. It is the supplier's responsibility to include all necessary appurtenances to provide for a complete, automatic, and smooth operating pump station. Water booster pump station shall be the Hydro Pac model manufactured by Precision Systems or approved equal.

B. The water booster station shall be complete when delivered and will not require internal contractor construction except to install the utilities through the service conduits provided for that purpose.

C. The principal items of equipment shall include, but not be limited to, the following:

1. Booster pump and motors
2. Station piping and valves
3. Pump control system
4. Variable frequency drives
5. Chemical feed system
6. Environmental accessories
7. Engine generator set
8. Automatic transfer switch
9. Structural enclosure
10. Fabricated steel base skid

1.02 BASIS OF CONTRACTORS BID

A. The pump station shall be of the type manufactured by Precision Systems, Calumet City, IL. The equipment specified has been deemed most suitable for the application. The contractor is required to base their submitted bid on the specified equipment. A not to exceed budget price has been furnished by the supplier to protect the owner.

B. Alternative pump station manufacturers will be considered only if one or more bidding contractor(s) pre-submit all materials required to review the alternative design, two (2) weeks prior to bid date. A minimum of six (6) complete equipment submittals shall be provided for review and approval. Costs associated with the review of alternative equipment shall be the responsibility of the submitting contractor.

C. If an alternate is to be proposed, the contractor shall furnish a complete change order proposal to the owner within ten days of the contract award. The proposal must include the following data for

evaluation:

1. A complete specification for the proposed standby power system.

2. A statement of full conformance to the bid specification signed by an officer of the manufacturer. All deviations must be clearly identified in the statement of conformance.

3. A general arrangement drawing showing overall dimensions, equipment layout and service couplings.

4. Complete submittal data for all major components (standby power generator, automatic transfer switch, single piece enclosure, steel base structure, louvers, and environmental components, etc).

5. An electrical schematic showing power wiring.

6. Installation list of 20 locations including contact names and phone numbers of customers having in service the proposed design with single piece enclosure for a minimum of 5 years. List shall include five references with at least 20 years of continuous service to verify equipment longevity and reliability.

D. It is the sole discretion of the owner/engineer to determine if the data submitted shows the pump station to be equal to the system specified. Any acceptable alternates will be identified by addendum. Price deducts for acceptance of alternative equipment from specified equipment will be passed to the owner and thus identified on bid form.

PART 2 – PRODUCTS

2.01 PUMP EQUIPMENT

A. Furnish and install three (3) vertical multi-stage diffuser pumps which shall be capable of continuous operation while operating in accordance with the operating condition defined in Table 1 (located at the end of this specification section).

B. The pump end shall be of the vertical multi-stage design with the motor mounted directly to the top of the pump. The pump models shall be furnished as shown on the plans and installed in accordance with the recommendations of the manufacturer.

C. The pump shall be capable of meeting the flow and head conditions stated in Table 1. The pump shall be capable of operating continuously at temperatures from -4°F to 250°F and working pressures of 230 PSI.

D. The pump suction/discharge chamber, motor stool and pump shaft coupling shall be constructed of cast iron. The impellers, pump shaft, diffuser chambers, outer discharge sleeve and impeller seal rings or seal ring retainers shall be constructed of stainless steel. The impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement. Shaft journal bearings shall be Tungsten Carbide and Aluminum Oxide Ceramic. Pumps shall be equipped with a mechanical shaft seal assembly with Tungsten Carbide/Carbon or Tungsten Carbide seal faces mounted in stainless steel seal components.

E. The pump motor shall be sized to ensure the pump is non-overloading when operating on the specified pump curve. The motor shall be of the horsepower, voltage, phase and cycle as shown in Table 1. Motor design shall be: Totally Enclosed Fan Cooled – TEFC with a NEMA C face design operating at a nominal 3450 RPM with a minimum service factor of 1.15. Lower motor bearings shall be adequately sized to ensure long motor life.

2.02 - STATION PIPING

A. PIPING

1. Piping shall be steel and conform to material specification ASTM A-53(CW) for nominal pipe size four (4) inch and smaller and ASTM A-53(ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively.

2. Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 and Class 300 flanges.

3. The piping sizes shall be as shown on the drawing.

4. Size 10 inch and below - Schedule 40

5. Size 12 inch and above - Standard weight (.375" wall)

6. Suction and discharge connections shall extend through the base structure for exterior connection of field piping. The diameters of the suction and discharge connections shall be as noted on the engineering drawing. Dimensional information of the concrete pad shall be as noted on the engineering drawing.

7. The suction and discharge headers shall be of welded steel construction. The suction and discharge pipes as they exit through the structure shall be through a 12 in. diameter grout sleeve. Gasketed transitions and/or mechanical couplings through the structure shall not be acceptable. All external piping connections shall be made with compression type couplings supplied by the installing contractor.

8. All transmission piping (including valves) shall be epoxy coated in two applications to 8-10 mils DFT with Tnemec Series 66 Hi-Build Epoxiline in accordance with the manufacturer’s recommendations.

9. Cast iron fittings shall be 150# ANSI flanged.

B. CHECK VALVES

1. Each pump discharge shall be fitted with a uni-directional check valve. The check valve size(s) and location(s) shall be as shown on the plan drawings.

2. Each check valve shall be wafer style silent type with semi-steel bodies, bronze seat, bronze

plug and stainless steel spring. The valve plug must be center guided at both ends with a thru integral shaft and spring loaded for guaranteed silent shut-off operation.

3. The spring must be helical or conical. The seat and plug shall be hand replaceable in the field for ease of maintenance. The flow area thru the body shall be 3% greater than the cross section area of the equivalent pipe size.

4. Check valve must be capable of silent operation when installed in vertical or horizontal position - flow up or flow down.

5. All materials of construction shall be certified in writing to conform to A.S.T.M. specifications.

C. ISOLATION VALVES

1. Each pump suction and discharge shall be fitted with an isolation valve. Valve size(s) and location(s) shall be as shown on the plan drawings. The isolation valve(s) shall be resilient seated butterfly type as described below.

2. The isolation valve shall be a lug style and meet ANSI Class 125/150 flange standards. Resilient seat ensures bubble-tight shutoff to 250 psi. The valve shall have bronze upper and lower inboard bearings. The valve body shall be cast iron; aluminum bronze disc; 416 stainless steel stem; EPDM seat; cast-in top plate for actuator mounting. The disc shall be aluminum bronze and the stem shall be stainless steel. The diameter of the valve shall be as noted on the engineering drawing.

3. Latch lock levers shall provide automatic, positive latching in the open, closed, or eight intermediate positions. These valves shall allow locking in any position with a standard padlock. Infinite position levers shall allow manual throttling and locking in any position from open to close.

D. PIPE SUPPORTS

1. Pipe supports shall be of rectangular tube or steel pipe shall be installed at all locations deemed necessary for adequate support of the manifolds.

2. Pipe supports shall be continuously welded at both ends.

3. Where support is deemed necessary on a component which may require removal, adjustable saddle brackets shall be used.

E. COMPRESSION COUPLINGS

1. Where servicing of internal components may be necessary, compression couplings shall be provided to prevent binding and facilitate removal of associated equipment. In lieu of compression couplings, a Uni-flange or flanged coupling adapter may be used.

F. FLEXIBLE CONNECTOR

1. The inlet side of each booster pump shall include an elastomer connector to help isolate vibration and noise in the piping system. The elastomer connector shall be of single sphere

design, constructed of neoprene and nylon with bias-ply tire reinforcing cord to provide a 225 psi working pressure rating to a minimum of 120 F. The elastomer connector shall pass through the plate steel flanges designed to grip the connector so the connector seals without gaskets when the flange bolts are drawn up. A control joint limiting pipe connector movement shall be supplied with each pipe connector

G. PRESSURE TESTING

1. Upon completion of the station piping, the pressure piping and all its associated hydraulic components shall be hydrostatically tested at a minimum pressure of 120 psi. The test duration shall be 20 minutes minimum at which time all joints will be checked for leakage.

2. The test results shall be noted on the manufacturer's standard test certificate and signed off on by the project manager, test technician, and quality control manager. Test results are to be included in the operation and maintenance data.

H. PRESSURE GAUGES

1. Pressure gauges shall be glycerine filled with a built-in pressure snubber and have a 4-1/2" minimum diameter face and turret style, black phenolic case with clear glass face. The movement shall be stainless steel. Gauge connection shall be 1/4" NPT bottom mount.

2. Inlet gauge graduations shall be 0-60 psi, 10 psi figure intervals, with graduating marks every 1 psi. Outlet gauge graduations shall be 0-100 psi, 10 psi figure intervals, with graduating marks every 1 psi.

3. Gauges are to be panel mounted off of the pipeline with flexible connections to the gauge port. Tap locations in the pipeline shall be complete with hard mounted brass or bronze isolation and vent valve for gauge calibration or removal.

4. The pressure gauges shall be Model 212.34 as manufactured by WIKA, Inc.

2.03 - HYDRO-PNEUMATIC STORAGE TANK

A. The booster station shall include one (1) diaphragm type hydro-pneumatic ASME coded storage tank. The storage tank volume will be a minimum of 80 gallons with a maximum working pressure of 125 psi.

B. The hydro-pneumatic storage tank shall feature deep drawn steel upper and lower domes with side shell construction specifically designed for diaphragm type storage tanks. Storage tank welding shall be carefully done to eliminate rough spots and sharp edges. The storage tank base shall be designed so as to permit free airflow to prevent moisture from accumulating beneath the storage tank. The hydro-pneumatic storage tank internals shall include two (2) separate pieces. The first piece shall be a heavy-duty butyl diaphragm that effectively separates the air chamber from the water chamber. The shape of the diaphragm shall conform exactly to the shell configuration and shall be of seamless construction meeting FDA requirements for potable water. The second piece shall be a polypropylene liner that conforms exactly to the lower dome and acts as the water receptacle. Water shall never touch steel. The polypropylene liner shall be 100% non-corrosive and will not be bonded to the steel shell wall or lower dome. A mechanical clamping ring shall permanently affix the diaphragm and the liner

to the shell groove. The polypropylene liner shall be tested and accepted by the National Sanitation Foundation. Storage tanks without either or both diaphragm and liner will not be accepted.

2.04 - PUMP CONTROL SYSTEM

A. GENERAL

1. The control equipment shall be a Precision Systems duplex control system with a NEMA Type 12 metallic enclosure. The pump controller, control switches, pilot lights and elapsed time meters shall be mounted on the enclosure observable and operable without accessing the high voltage interior of the enclosure.

2. Thermal magnetic circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits for the environmental systems within the station. Circuit breakers shall be operable without accessing the high voltage interior of the enclosure. A minimum of one (1) spare circuit breaker shall be provided.

3. Non-resettable six digit elapsed time meters shall be provided for each pump to monitor the cumulative operating time of the pump.

4. Pilot lights shall be provided to indicate:

    a. Pump Running (3) “Green”
    b. Pump/VFD Fail (3) “Red”

5. Pump starting shall be staged to prevent overload due to simultaneous pump starting.

6. The control system shall be supplied with a lightning and surge arrestor wired into each of the three legs of the three phase service.

7. A red alarm strobe shall be provided mounted on the exterior of the enclosure for indication of the following alarm conditions:

    a. Pump fail
    b. Utility power fail
    c. Generator fail
    d. Smoke/Fire alarm

8. Dry contacts shall be provided for the following alarm criteria:

    a. Low suction pressure
    b. Low discharge pressure
    c. High discharge pressure
    d. Pump fail
    e. Utility power fail
    f. Generator fail
    g. Smoke/Fire alarm

9. Terminal blocks shall be provided in the pump control panel for connection of external alarm criteria into pump panel to provide a central interface point for telemetry system.

10. All switches shall be labeled and a coded wiring diagram shall be provided.

11. Within the pump control panel, in a separate integral panel, thermal magnetic circuit breakers for branch disconnect service and short circuit protection for all environmental systems noted in this specification as well as any other auxiliary circuits within the station such as generator heater, louvers, telemetry system, etc., shall be provided. Circuit breakers shall be operable without accessing the high voltage interior of the control panel. Individual breakers within the panel shall be properly identified by the pump station manufacturer.

B. CONTROLLER

1. A programmable pump controller (PPC) shall be furnished for monitoring and automatically controlling the booster pumps in a pump-up mode of operation in response to the local system discharge pressure and preconfigured user-adjustable setpoints.

2. The PPC shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The controller shall be specifically designed for water and wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or down mode control of from 1 (one) to 4 (four) pumps. "One of a kind" systems using custom software with a generic programmable logic controller and operator interface will not be acceptable.

3. The PPC shall be designed to operate on a 20.4-28.8 VDC power source. The operating program shall be resident in non-volatile FLASH memory. The controller shall be capable of operating up to four (4) pumps, plus high and low (analog and digital) alarms. The on and off adjustments of each pump and alarm setpoint shall be full-range adjustable through the touchscreen. The controller display shall show the current operating status of each control stage.The PPC shall include operator adjustable on-delay timing logic to provide staggered pump starting following a power failure condition. Operator adjustable off-delay timing for each control stage shall allow for smooth transition between stages.The PPC shall incorporate an integrated SD memory card slot which shall be capable of providing removable storage of historical data. Data to include pump run times, alarm history, and flow data. The data shall be presented in a CSV file format, which can easily be imported into Microsoft Excel for manipulation and use by operating personnel.

4. The PPC shall incorporate an integral, user friendly, color, QVGA, LCD, touchscreen operator interface. The interface shall allow adjustment and viewing of all system parameters and statuses. The controller, when panel mounted, shall be NEMA 4X rated and suitable for front door mounting in locations requiring wash-down.

5. The level signal and pump status information shall be displayed simultaneously on the main (home) screen of the controller. The level shall be presented as a vertical bargraph, as well as a large numerical read-out displaying units and tenths as a minimum. The bargraph portion of the display shall have a minimum resolution of 100 vertical pixels to provide for high-resolution viewing of the current level.

6. The controller shall have a built in process simulation capability allowing the operator to verify system operation by forcing the level up or down via pushbutton arrows located next to the process bargraph display. The simulated value will be displayed on a separate bargraph located adjacent to the actual process bargraph. The actual process level will always be visible during a manual simulation procedure. To prevent accidentally leaving the unit in simulation mode, the controller shall automatically restore monitored process display within 1 (one) minute of operator inactivity or immediately upon operator initiated cancellation.

7. From a dedicated Setpoints button on the home screen, the operator can navigate to adjust all stage on/off setpoints as well as high and low alarm setpoints. Stage on/off and alarm setpoints shall be easily adjustable via individual up and down buttons located next to the associated setpoint display column(s).

8. The controller shall provide current and historical alarm information. Active alarms shall be indicated on the main display by a red flashing indicator/button and shall (optionally) activate separate outputs for external visual and audible alarm indication/annunciation. From the home screen, a touch of the Alarm button shall display the number of active alarms and provide the ability to view historical alarm data. The alarm historian shall be capable of storing up to 1000 alarms. All alarms shall be time and date stamped as to their occurrence, acknowledgement, and return to normal status.

9. The controller shall display recorded analog data in a graphical (trend) format. The analog data available for viewing shall include the last seven days of level and influent flow (volumetric or flowmeter analog input) data in 2 hour increments. Unit shall also display the last 365 days of individual pump (flow) performance data. This data shall be accessible from the main display of the controller by pressing the Trend button.

10. From the main screen of the controller, a Menu button shall be provided to grant access to higher level configuration parameters including the following:

    a. Adjustment of the full-scale range indicated on the display
    b. Time and date
    c. Analog input calibration
    d. Configuration of dynamic digital inputs and outputs
    e. Telemetry port configuration
    f. Security parameters
    g. Side-by-side comparison of all pump data

        i. Pump 1, 2, 3; Run Time (each pump)
        ii. Pump 1, 2, 3; Number of Starts (each pump)
        iii. Pump 1, 2, 3; Run Time (each combination)
        iv. Pump 1, 2, 3; Number of Starts (each combination)

11. The PPC shall monitor a 4-20 mA analog input representing the process variable. The analog input circuitry shall provide galvanic isolation from the main board to the field device. Simple pushbutton calibration of level shall be easily accessible. Zero value can be offset to allow display of a pressure or level range that does not start at zero. The display ranges shall be field-configurable. This signal shall also be available for telemetry transmission.

12. The PPC shall include the ability to dynamically configure up to 16 digital inputs. Each input

can be used in providing control and monitoring of any of 32 possible functions. All control algorithms shall automatically reconfigure based upon current digital input mapping. Each discrete input shall provide galvanic isolation from the main board to the field device. A separate screen shall be provided which indicates current digital input configuration and status. All discrete inputs shall be available for telemetry transmission. The following input functions shall be available for mapping to any of the 16 physical digital input points:

- Pump 1 Run
- Pump 1 In Auto
- Pump 2 Run
- Pump 2 In Auto
- Pump 3 Run
- Pump 3 In Auto
- 3-phase Power Fail
- Control Power Fail
- Alarm Silence
- Door Switch
- Acknowledge
- Rain Gauge
- Generator Running
- Generator Alarm
- ATS Position
- Pump Inhibit
- Pump 1 Fail
- Pump 2 Fail
- Pump 3 Fail

13. The PPC shall include the ability to dynamically configure up to 10 relay outputs. Each output can provide control based upon any of 20 possible functions. All control algorithms shall automatically reconfigure based upon current output mapping. A separate screen shall be provided which indicates current output configuration and status. All output status shall be available for telemetry transmission. The following output functions shall be available for mapping to any of the 10 physical relay output points:

- Pump 1 Required
- Pump 2 Required
- Pump 3 Required
- Visual Alarm
- Audible Alarm
- High Level Alarm
- Low Level Alarm
- Power Fail
- Pump 1 Running
- Pump 2 Running
- Pump 3 Running
- Pump 1 Alarm
- Pump 2 Alarm
- Pump 3 Alarm

14. The PPC shall be protected from unauthorized changes via built-in system security. There shall be 3 levels of security provided. For each level, the unit shall support a different 4 digit access code (PIN) which shall allow an authorized operator to manipulate controller settings based upon their security level. The first level shall allow viewing of all controller data. In addition to the features of the first level, the second level of security allows viewing and modification of all controller data (including setpoints) with the exception of equipment runtimes, flow totals, and pump starts. The third level of security allows all the functions of the previous two levels with the additional ability to modify equipment runtimes, flow totals, and pump starts and the ability to assert a controller reset function.

15. The PPC shall provide 2 (two) 4-20 mA output signals for interface to external equipment including VFDs, Chart Recorders or other analog devices. Analog outputs can be configured to provide representation of scaled process variable for retransmission, or as a process control output for interface to VFDs, Valves, or other controlled device.

16. The PPC shall be capable of monitoring inputs from float or pressure switches representing high and low (Level/Pressure). The controller shall annunciate these inputs as alarms and optionally use them to provide back-up control in the event of primary (analog) sensor failure. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

17. The PPC shall have built-in operator adjustable alternation sequences allowing for equal wear of the pumps and to account for variations in pump equipment size and availability. The following alternation sequences shall be supported:

    Fixed
    First On First Off (FOFO)
    Jockey

18. The PPC shall incorporate built-in pump failure detection logic. In the event any pump has been called into operation and the pump run signal is not received within an operator-adjustable time period, a pump failure condition shall be executed. The failed pump shall be disabled, an alarm shall be displayed, and the next available pump (based on the selected alternation sequence) shall be requested to start. The pump shall remain in a failed state until the alarm condition has been cleared and the failure has been reset.

19. The controller shall include integral intrusion detection logic that will monitor an external sensor (motion, door switch, etc…) and allow authorized access to the station via entry of proper security code PIN or assertion of the door acknowledge input. The intrusion system, upon detection of entry, will allow a configurable amount of time for an operator to enter the proper code (or assert the input) before determining an intrusion. Additionally, the controller shall allow a configurable amount of time for re-securing the site before automatically re-arming.

20. The PPC shall include a volumetric station flow and pump performance monitoring capability allowing station flow measurement without the use of an in-line flowmeter. In addition to flow measurement, the controller shall provide pump performance related information. Pump station flow and pump performance data shall be visible locally and available for telemetry transmission to a master station. The following information is to be provided:

    a. Average Station Influent Flow Rate (GPM)
    b. Maximum Station Influent Rate (GPM)
    c. Current Day Total Effluent Flow (KGal)
    d. Previous 7-day's Total Effluent Flow (KGal)
    e. Maximum Daily Effluent Flow (KGal)
    f. Total Station Effluent Flow (KGal)
    g. Average Flow Rate; Pump 1, 2, 3; Over last 365 days (GPM; each pump)
    h. Average Flow Rate; Pump 1, 2, 3; Over last 3 cycles (GPM; each pump)
    i. Total Flow; Pump 1, 2, 3; (KGal; each pump)
    j. Total Flow; Pumps 1, 2 (KGal; combined)
    k. Total Flow; Pumps 1, 3 (KGal; combined)
    l. Total Flow; Pumps 2, 3 (KGal; combined)
    m. Total Flow; Pumps 1, 2, 3 (KGal; combined)
    n. Pump 1, 2, 3 Low Flow; Alarm Setpoint (each pump)

21. The PPC shall have 2 (two) RS-232 / RS-485 serial communication ports that shall be available for telemetry communication. The RS-232 / RS-485 serial ports shall support open communication standards including, as a minimum, MODBUS RTU or ASCII, Allen-Bradley DF1 half-duplex slave mode. Unit shall support communication data rates of 300 to 115,200 baud rates. An optional, integral Ethernet communication port shall be available. With the Ethernet option, MODBUS TCP shall be supported.

22. The PPC shall be constructed for application in harsh industrial environments. Unit shall have an operating temperature range of 0 to +50 Deg C, and be able to operate in environments with 5-95% humidity (non-condensing). Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions.

23. The PPC shall provide for all connections to be made via plug-in terminal blocks with a minimal rating of 10 Amps, 300 Volts and capable of accepting wire sizes of 26-12 AWG.

24. It is the intention of this specification that a standard controller/transceiver be provided, with all of the control and communications features described, as a fully-integrated assembly. The controller shall be a QCI Inc, Model PS1500ct.

C. PRESSURE MONITORING

1. The station suction and discharge pressure shall be sensed through the application of a pressure transducer mounted in each line. Each transducer shall be a 2-wire type to operate from a supply voltage of 16-24 VDC and produce a 4-20mADC instrumentation signal in direct proportion to the measured level excursion over a factory-calibrated range of zero to 100 PSI.

2. A stable, hybrid, operational amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The transducer shall incorporate laser-trimmed, temperature compensated, high quality components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range.

3. The transducer shall include easily accessible offset and span adjustments. Fine and coarse adjustments for both span and offset shall be provided, using 25-turn potentiometers. Span shall be adjustable from 100% down to 15% of the sensor range. Offset adjustments shall be up to 75% of range and shall be non-interactive with span.

4. The transducer shall be housed in a NEMA 4X enclosure suitable for pipe line mounting and plumbed with a 4-1/2" reference pressure gauge, shutoff and bleed needle valves having 1/4" female external bulkhead pressure connections in the bottom of the enclosure.

2.05 - VARIABLE FREQUENCY DRIVES

A. GENERAL

1. The pump station manufacturer shall furnish complete variable frequency drives as specified herein for the pumps. All standard features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure.

2. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump control.

3. An advanced sine wave approximation and voltage vector control shall be used to allow

operation at rated motor shaft output at nominal speed with no derating. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life.

4. The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
5. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be Listed by a nationally recognized testing agency such as UL, CUL, ETL or CSA.

6. The VFD shall have a DC link reactor to minimize power line harmonics. VFDs without a DC link reactor shall provide a 3% impedance line reactor.

7. The VFD amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 220% of rated current for up to 1 second while starting.

8. An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall reduce voltages when lightly loaded and provide a 3% to 10% additional energy savings.

9. Input and output power circuit switching can be done without interlocks or damage to the VFD.

B. PROTECTIVE FEATURES

1. The following protective features shall be part of the drive:

   a. Class 20 I^2t electronic motor overload protection.

   b. Protection against input transients, loss of AC line phase, short circuit, ground fault, over voltage, under voltage, drive over temperature and motor over temperature. The VFD shall display all faults in plain English. Codes are not acceptable.

   c. Protect VFD from sustained power or phase loss. The VFD shall incorporate a 5 second control power loss ride through to eliminate nuisance tripping.

   d. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.

   e. Drive shall have semi-conductor rated input fuses to protect power components.

   f. The drive shall be fitted with output line reactors to limit the rate of output voltage rise over time (dV/dt), reduce motor operating temperature and RFI and EMI. To prevent breakdown of the motor winding insulation, the dV/dt must be below 1500 V/sec per IEC recommendations. The supplier shall include with the quotation the dV/dt values of the drive.

   g. Drive shall catch a rotating motor operating forward or reverse up to full speed.

   h. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

C. INTERFACE FEATURES

1. The following interface features shall be a part of the drive:

   a. Local/Hand, Stop/Reset and Remote/Auto selector switches shall be provided to start and stop the drive and determine the speed reference.

   b. Provide a 24 V DC, 40 mA max, output signal to indicate that the drive is in Remote/Auto mode.

   c. Digital manual speed control. Potentiometers are not acceptable.

   d. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away.

   e. VFDs up to 300 HP shall use the same control panel.

   f. Displays shall be available in 6 languages including English, Spanish and French.

   g. A red FAULT light and a green POWER-ON light shall be provided.

   h. A quick setup menu with preset parameters shall be provided on the drive.

   i. The drive shall be fitted with an RS 485 serial communications port and be supplied with software to display all monitoring, fault, alarm and status signals. The software shall allow parameter changes to be made to the drive's operating and setup settings as well as storage of each controller parameters.

   j. Set point control interface (PID control) shall be standard in the unit.

   k. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.

   l. An elapsed time meter and kWh meter shall be provided.

   m. The following displays shall be accessible from the control panel in actual units: Reference Signal Percent, Output Frequency, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature (% until trip) and Motor Speed in engineering units per application (in percent speed, GPM, CFM,..).

   n. Drive will sense the loss of load and signal a no load fault.

   o. The VFD shall store in memory the last 8 faults and record all operational data.

   p. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

   q. Two programmable relay outputs shall be provided for remote indication of drive status.

r. Two programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-20 mA and 4-20 mA.

s. Two programmable analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input kW.

t. Under fire mode conditions the VFD shall automatically default to a preset speed.

D. ADJUSTMENTS

1. The variable frequency drive shall have the following adjustment capabilities:

a. VFD shall have an adjustable carrier frequency of 2 to 14 kHz through 60 HP and 2 to 4.5 kHz above 60 HP.

b. Three variable-torque V/Hz patterns shall be provided with the ability to select a constant torque start pattern for each of them.

c. Twenty preset speeds shall be provided.

d. Eight acceleration and eight deceleration ramps shall be provided. The shape of these curves shall be adjustable.

e. Four current limit settings shall be provided.

f. If VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit, inverter overload and motor overload.

g. The number of restart attempts shall be selectable from 0 through 10 and the time between attempts shall be adjustable from 0 through 10 seconds.

E. SERVICE CONDITIONS

1. The drive shall be capable of operating under service conditions as defined below:

a. 0 to 95% relative humidity, non-condensing.
b. Elevation to 3,300 feet without derating.
c. AC line voltage variation, -10 to +10% of nominal with full output.
d. No side clearance shall be required for cooling of wall mount units and all power and control wiring shall be done from the bottom.

F. QUALITY ASSURANCE

1. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.

2. All optional features shall be functionally tested at the factory for proper operation.

3. All VFDs shall be Danfoss Aqua Series and shall be provided with not less than a 5 year on-site warranty.

2.06 - ALARM AUTO DIALER

A. GENERAL

1. The pumping station shall include a cellular telephone monitoring system furnished and commissioned by the pump station supplier.

2. The device shall be configured, programmed, and setup using any standard Internet web browser software. All connected equipment can be monitored and configured from anywhere in the world using the world-wide-web. Provide Password protected screens for secure access. Proprietary programming software or skills shall not be required.

3. Communication shall be via WINGS cellular modem. Provide a factory mounted, low profile, secure mount phantom antenna. Inquiry phone calls can be made via a toll free phone number to receive a current status report of all alarms and to acknowledge any current alarms. Device shall have capability of being positioned anywhere in the US at any time without coordination with the local or long distance telephone companies. The device shall not incur long distance telephone charges. No landline phone lines or radio propagation studies shall be required, and the contractor SHALL INCLUDE TWO (2) year of prepaid wireless service in his bid.

4. The device shall be capable of monitoring and analyzing the following:

   a. Power failure alarm
   b. Total station daily flow, Gallons
   c. Pump 1,2 Amp Draw
   d. Pump 1,2 On/Off Cycles
   e. Pump 1,2 Runtimes
   f. Combined pump runtime
   g. Daily time stamps when minimum and maximum inflow occurred
   h. Cellular signal strength
   i. Historical log showing alarm history
   j. Graphing of historical data exportable to Microsoft Word or Excel
   k. Crew on-site notification alert
   l. Low battery back-up alarm
   m. Station enclosure low temperature
   n. Six additional alarm inputs
   o. Two additional relay outputs

5. Alarm notification: Operator programmable using voice call, pager or email.

6. Contact List: Operator programmable, upon alarm activation, the system shall selectively contact the configured recipient list according to the current alarm(s).

7. Power to the monitoring system shall be from 120 VAC, 60 Hz, single-phase power.

a. Fuse protected 12 VDC power supply shall be powered from the 120-volt incoming power and shall include tapered charge type battery circuitry to maximize battery life. The power supply shall be rated at minimum 2.0 Amps @ 12 VDC.

b. Provide 12-volt battery charging power supply and battery backup with a 36-hour minimum operation time.

2.07 - ENGINE GENERATOR SET

A. OPERATING CONDITIONS

1. Engine generator set shall be capable of continuous standby rating at 0.8PF at the conditions and minimum capabilities listed in Table 2. The unit shall be capable of the KW and KVA for motor starting at a maximum sustained voltage dip of 10% listed in Table 2. Table 2 is located at the end of this specification section.

B. ENGINE GENERATOR AND ENGINE EQUIPMENT

1. Performance

a. Generator shall meet or exceed the performance characteristics outlined in Table 3. Table 3 is located at the end of this specification section.

b. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.

c. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.

d. The engine-generator set shall pick up a single step load of 100% nameplate KW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

e. Motor starting capability shall be within the minimums listed in Table 3. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified KVA load at near zero power factor applied to the generator set.

f. The AC generator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.

2. Construction

a. Generator shall meet or exceed the design characteristics outlined in Table 3.

b. The engine generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

c. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

d. The engine shall be a 4-cycle, inner cooled, turbocharged or naturally aspirated, as required by engine manufacturer. Engine shall be certified as capable of developing the minimum horsepower output rating listed in Table 3 at 1800 RPM.

e. Maximum fuel rating and fuel consumption at full load shall be as listed in Table 3.

f. Engine equipment shall include the following:
   i. Electric starter as required by the manufacturer.
   ii. Fuel filter with replaceable element.
   iii. Replaceable dry element air cleaner.
   iv. Positive displacement mechanical full pressure, lubrication oil pump with full flow lubrication oil filters.
   v. Engine speed shall be governed by governor system specified in Table 3 which will automatically control frequency to a maximum rating less than that specified in Table 3 from full load to no load.

g. Engine protective devices to indicate alarm and engine shutdown for the following:

   i. Low coolant temperature alarm.
   ii. Low coolant level shutdown.
   iii. Low lubrication oil pressure alarm and shutdown.
   iv. High coolant temperature alarm and shutdown.
   v. Over speed shutdown.
   vi. Over crank lockout.

h. Engine mounted thermostatically controlled water jacket heaters shall be rated for 120 volts, single phase, 60 hertz at the wattage shown in Table 3.

i. Battery charging alternator with solid state regulator.

j. Engine shall be cooled by engine mounted radiator system including belt driven pusher fan, coolant pump, and thermostat temperature control. The radiator shall be provided with a duct adaptor flange.

k. The engine exhaust muffler shall be of a spiral type and shall be rated for residential silencing. The muffler shall be mounted so that its weight is not supported by the engine and shall utilize flexible stainless steel exhaust connectors. The exhaust piping shall be routed through the side wall of the steel base and be terminated outside the enclosure. Piping outside the enclosure shall be insulated with a minimum 2" thick calcium silicate thermal insulation with aluminum shroud.

l. Provide connections for connecting fuel system to the engine in compliance with applicable codes and regulations.

C. AC GENERATOR

1. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for insulation system noted in Table 3. Actual temperature rise measured by resistance method at full load shall not exceed temperature listed in Table 3.

2. The generator shall be capable of delivering rated output KVA at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

3. A permanent magnet generator (PMG) or shunt exciter shall be included to provide a reliable source of excitation power for optimum motor starting. Exciter type to be determined by the generator manufacturer.

D. GENERATOR SET MICROPROCESSOR CONTROL

1. Control Switches

a. A mode select switch shall be provided and shall initiate the following control modes. When in the Manual position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

b. A red 'Mushroom-head' push button emergency stop switch shall be supplied. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.

c. A reset switch shall be provided. The switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

d. The control panel shall be supplied with a panel lamp switch that will light the entire panel with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time. Pressing and holding this button will test all front panel LED's and meters. The meters will light one bar at a time.

2. Alarm Lamps and Status Display

a. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:

i. Running
ii. Remote Start
iii. Not In Auto
iv. Shutdown
v. Warning

b. The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for function, color, and control action (status, warning, or shutdown). The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.

c. The control shall include a flashing red lamp to indicate that the Off/Manual/Auto switch is not in the Auto position.

d. The generator shall be provided with a user configurable status display screen. This alphanumeric two (2) line twenty (20) character per line display shall display information on and allow user control of the generator via various menus. It shall be controlled by four momentary buttons adjacent to the display. Basic menu descriptions are:

i. The Engine Menu shall display real time information on the current state of the generators engine. Information available for display will include:
a.) Engine coolant temperature
b.) Engine oil pressure
c.) Engine oil temperature
d.) Engine speed
e.) Battery voltage
f.) Governor duty cycle

ii. The Alternator Menu shall display real time information on the current state of the generators alternator. Information available for display will include:

a.) Line-to-line voltage
b.) Line-to-neutral voltage
c.) Amperage for all phases
d.) Total power output
e.) Power output per line

iii. The Adjust Menu will allow user control of the generator. If parameters are adjusted beyond preset factory limitations, their entry will not be accepted. User adjustments include:

a.) Output voltage
b.) Output frequency
c.) Engine start delay
d.) Engine stop delay

iv. The Faults Menu shall display current and up to twenty (20) historical faults

for the engine and alternator. The display will indicate if the fault is active, a fault code, the total engine operation time when the fault occurred, whether the fault was/is a Warning or Shutdown fault, and a brief description of the fault. A partial list of the faults that can be monitored/recorded are:

a.) Pre-low oil pressure (warning)
b.) Low oil pressure (shutdown)
c.) Oil pressure sender failure (warning)
d.) Low coolant temperature (warning)
e.) Pre-high coolant temperature (warning)
f.) High coolant temperature (shutdown)
g.) Engine temperature sender failure (warning)
h.) Low coolant level (warning or shutdown--selectable)
i.) Fail to crank (shutdown)
j.) Over speed (shutdown)
k.) Low battery voltage (warning)
l.) High battery voltage (warning)
m.) Weak battery (warning)
n.) High AC voltage (shutdown)
o.) Low AC voltage (shutdown)
p.) Under frequency (shutdown)
q.) Over current (warning)
r.) Over current (shutdown)
s.) Short circuit (shutdown)
t.) Over load (warning)
u.) Emergency stop (shutdown)

3. Engine Control Functions

a. The control system provided shall include a cycle cranking system for three (3) start cycles which consist of fifteen (15) seconds of cranking followed by fifteen (15) seconds of rest per cycle.

b. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

c. The control system shall be capable of discriminating between failed sender or wiring components, and an actual failure condition for engine speed, oil pressure, and engine temperature. Failure of the sending units or wiring will result in warning alarms.

4. Alternator Control Functions

a. The generator set shall include an automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided.

b. If load current exceeds 110% of rated current of the generator set on any phase for

more than 60 seconds, controls shall shut down and lock out the generator set. The purpose of this control is to prevent thermal damage to the alternator. The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

c. If any phase of the output current achieve short circuit conditions, controls shall shut down and lock out the generator set. The purpose of this control is to prevent thermal damage to the alternator. The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

d. If total load on the generator exceeds the nameplate KW rating of the generator set for more than 5 seconds, load shed controls shall operate a set of dry contacts to shed generator load. The purpose of this control is to prevent thermal damage to the alternator.

e. If AC over voltage exceeds 110% of the rated voltage of the generator set for more than 10 seconds, controls shall shut down and lock out the generator set. Controls shall shut down and lock out the generator set instantaneously if voltage exceeds 130% of rated output. Controls shall also shut down and lock out the generator if under voltage occurs for more than 10 seconds at an output level of less than 85% of rated output. Controls shall respond to only true RMS voltage conditions.

5. Other Control Functions

a. A warning indicator shall be given if the DC control or battery voltage is less than 75% or greater than 115% of normal operating voltage. During engine cranking (starter engaged), the low voltage limit shall be disabled. DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

E. OTHER EQUIPMENT TO BE PROVIDED WITH GENERATOR SET

1. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set.

F. GENERATOR MODEL

1. The standby generator shall be equal or superior to the manufacturer and model specified in Table 3.

2.08 - AUTOMATIC TRANSFER SWITCH

A. GENERAL

1. The complete microprocessor controlled automatic transfer switch shall be designed and manufactured by the manufacturer of the engine generator set. It shall be UL 1008 listed and be approved by the Canadian Standards Association. The manufacturer shall furnish schematic and wiring diagrams for the automatic transfer switch and a typical interconnection wiring diagram for the entire standby system. Test reports certified by the manufacturer shall

be provided to the engineer for the entire engine/generator/transfer switch system.

B. RATINGS

1. The transfer switch shall be rated for 125 amps and 600 Volts AC minimum. The transfer switch shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 90% (non-condensing), and altitudes up to 10,000 feet.

C. CONSTRUCTION

1. The transfer switch shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.

2. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.

3. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

4. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.

5. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with line voltage components.

6. Transfer switches designated on the drawings as 4-pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Equipment using add-on accessory overlapping contacts are not acceptable.

7. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

D. CONNECTIONS

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.

2. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the generator set.

E. OPERATOR CONTROLS

1. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of the enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities:

   a. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2), and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.

   b. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.

   c. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and re-transfer and immediately proceed with its next logical operation.

   d. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.

   e. "RESET/LAMP TEST" pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.

   f. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via the service tool or an operator display panel.

F. INTERNAL CONTROLS

1. The transfer switch internal control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions are not acceptable.

2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:

   a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).

   b. Monitoring all phases of the emergency service (source 2) for under voltage

conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).

3. All transfer switch sensing shall be configurable from a windows 95 or NT PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.

4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.

5. The transfer switch shall incorporate adjustable time delays for generator start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown)(adjustable in a range from 0-30 minutes).

6. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the following voltage and RFI/EMI standards.

7. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

8. The transfer switch shall be provided with a battery charger for the generator set starting batteries. The battery charger shall be a float type charger rated 2 amps. The battery charger shall include an ammeter for display of charging current and shall have fused AC inputs and DC outputs.

G. CONTROL INTERFACE

1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.

2. Provide one set of form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250VAC.

3. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, load connected to source 2.

H. ENCLOSURE

1. Enclosures shall be UL listed. The enclosure shall provide NEC wire bend space. The cabinet door shall be key-locking.

2. Transfer switches shall be mounted in an enclosure of the types as designated on the

drawings. Separate enclosures shall be the NEMA type specified. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

I. OPEN TRANSITION OPERATION

1. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.

2. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:

   a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

   b. The transfer switch shall issue a compatible start command to the generator set.

   c. When the control system senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.

   d. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the loads to the normal service.

   e. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.

   f. The transfer switch shall operate the generator set unloaded for a cool down period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

3. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:

   a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

b. The transfer switch shall issue a compatible start command to the generator set.

c. When the control system senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.

d. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

J. OTHER REQUIREMENTS

1. The transfer switch supplier shall perform a complete operational test on the transfer switch prior to shipping form the factory. A certified test report shall be available on request. Test process shall include calibration of voltage sensors.

2. The manufacturer of the transfer switch shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

3. The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

4. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

5. The transfer switch shall be equal or superior to Model OTPC as manufactured by Cummins N Power.

2.09 - CHEMICAL FEED SKID

A. GENERAL

1. The multiple pump chemical metering skid shall be completely self contained and designed to safely feed metered amounts of sodium hypo chloride. The chemical metering skid shall include (2) chemical metering pumps and accessories to produce a completely redundant system. The metering pump shall be capable of both manual and automatic modes of operation utilizing a 4-20mA signal / pulse contact input. The chemical metering skid shall be completely assembled and tested prior to delivery to the jobsite.

B. CONSTRUCTION

1. The chemical metering skid shall be constructed from solid black UV protected HDPE having a minimum thickness of ½ inch. The skid shall be assembled using thermal plastic welding technology. Bolted or screwed construction is not acceptable. The design of the skid shall include a solid base, back panel and side panels with an open front and top to ensure ease of access to all components. A minimum two-inch lip shall be provided on the base of the skid to offer a spill containment basin, which will contain a ½ inch FNPT drain plug to be provided

for wash down purposes. Pedestals shall be provided to elevate metering pumps and all piping above spill containment basin. The metering pumps shall use unions at the suction and discharge of the pump in order to allow for removal of the pump without disturbing the suction and discharge piping. All wetted components shall be constructed of materials suitable for use with the chemical being pumped. All piping shall be schedule 80 PVC, or suitable with the chemical being pumped. The skid manufacturer shall perform all assembly in a controlled shop environment using precision tools and equipment. All socket-welded connections shall follow the guidelines set by the pipe and fitting manufacturer for proper cleaning, priming, and gluing procedures. A medium bodied solvent cement suitable for use with the applicable chemical shall be used on all applicable joints. All threaded connections shall utilize PTFE tape, or suitable threaded sealant or both. The piping shall be attached to the chemical feed skid with a non-metallic corrosion resistant support system. All supports shall be welded to the chemical feed skid. Bolted, screwed, or strapped construction is not acceptable. All piping and accessory support shall be from the skid base of rear panel. Piping support from above is not acceptable. All inlet / outlet connections shall be clearly marked for installation. The skid system shall be tested at the metering pump manufacturers facility on a computerized calibrated test stand to ensure rated flow, pressure, and hydrostatic conditions are met. Certification of factory testing shall be included in the installation, operation and maintenance manuals. The chemical metering pump manufacturer shall be responsible for all equipment, valves, piping, and accessories within the skid boundary.

C. EQUIPMENT

1. Each chemical metering pump on the skid shall include at minimum: (1) Pentabloc 5-Function Valve, (1) pulsation dampener, (1) diaphragm protected pressure gauge, (1) calibration column (one per skid), and all required piping, ball valves, and supports. Plumbing shall be arranged as to allow each metering pump to inject chemical to two different injection points.

2. The following accessories are to be included on the chemical feed skid system:

   a. (1) Calibration Column shall be provided and installed in the chemical supply piping as close to the metering pumps as possible. The top of the calibration column shall be vented back to the supply container for overflow protection.

   b. (2) Pentabloc 5 Function Valves shall be provided to perform the following functions: pressure relief, back pressure regulation, anti-siphoning, manual venting and visual flow indicator. The 5 function valves shall be PVC with Viton seals and have no metal parts in contact with the chemical.

   c. (2) Pulsation Dampeners shall be provided and sized for a minimum of 90% dampening. Pulsation dampeners must be of the inline design with PVC/Polypropylene housings and Viton Diaphragms. The dampener must include a 2 ½" pressure gauge and gas charging valve. Pulsation dampeners shall be model PDS as manufactured by Lutz-JESCO America Corp.

   d. Piping and Valves shall be solvent welded schedule 80 PVC with Viton o-rings and diaphragms. Diaphragm valves must be true union style.

   e. (2) Diaphragm Protected Pressure Gauges shall be provided for indication of system

pressure. PVC gauges shall be utilized and the isolators shall have a PVC body with Teflon sealing diaphragm and suitable liquid filling.

D. CONNECTION TO FORCE MAIN

1. The chemical feed system shall be connected to the station piping via a 1 inch CC AWWA Tapered Thread.

2. A brass corporation stop, service fitting with hose clamp and reducing fittings with clamps to reduce from 1 inch to the required diameter of the supply lines. The corporation stop shall be Mueller H-10003 (male iron pipe thread) ground key corporation stop. The service fitting shall be Mueller H-12215 (female iron pipe thread).

E. ACCESSORIES

1. Calibration Cylinders shall be provided and installed in the chemical supply piping as close to the metering pumps as possible. The top of the calibration cylinders shall be vented back to the supply container for overflow protection.

2. Pressure Relief Valves shall be provided to eliminate excess pressure in the system. The pressure relief valves shall be PVC with a Teflon diaphragm and have no metal parts in contact with the chemical. The outlet from the pressure relief valve shall be piped back to the suction of the appropriate metering pump.

3. Force Flow Drum Scales capable of determining the amount of solution fed shall be provided for each chemical feed system drum. The contractor shall also provide a wall mounted digital display with 4-20mA output for visual monitoring of each drum. The scale will employ an integral spill containment system as manufactured by the scale manufacturer for capture of any liquid release. One scale will be required for each chemical.

4. Back Pressure Valves shall be installed to provide constant back pressure at the chemical metering pump discharge. The back pressure valves shall be PVC bodied with a vulcanized PTFE-faced diaphragm and have no metal parts in contact with the chemical.

5. A sail switch shall be installed to detect flow. If the switch does not sense flow the chemical feed pumps will be disabled.

6. Piping and Valves shall be solvent welded schedule 80 PVC with Viton o-rings and diaphragms. Diaphragm valves must be true union style.

7. Spare Parts kit shall be provided with each Chemical Feed System per the manufacturers recommendation must contain:

   a. Maintenance kit for each installed chemical feed pump. The kits shall include diaphragm, check valve seats, o-rings, and seals.

   b. Safety kit per system that will include gloves, apron, goggles and respirator.

   c. Spare parts kit containing diaphragms for the pulsation dampeners, PRV, and BPV. Qty one per major component in each system.

8. An eye wash devise shall be provided for the chemical feed area.

9. Each liquid chemical storage tank shall be provided with an overflow and a receiving basin capable of receiving accidental spills or overflows without uncontrolled discharge.

10. A Hach DR 890 testing kit shall be provided and delivered to the Owner.

F. METERING PUMP

1. CONSTRUCTION / OPERATION

a. The chemical metering pumps shall be of the positive displacement, mechanically actuated diaphragm, solenoid type. The pumps shall be mounted on a chemical feed skid system complete with pump, base and accessories as described in the Chemical Feed Skid System Section. All metering pumps shall be the product of a single manufacturer. Parts coming into contact with the liquid shall be selected to ensure optimum corrosion resistance to the liquid being pumped.

b. Type and Range: Each metering pump shall be of the mechanically actuated diaphragm type. Motor driven or hydraulically actuated diaphragm pumps are not acceptable. The pump shall have a maximum capacity of 0.5 gph at a maximum discharge pressure of 150 psig.

c. A low noise DC solenoid shall drive push rod and the attached diaphragm. The armature shall run in a maintenance free PTFE bushing assembly for long life. The maximum power consumption shall be 33 watts. An LED operating light shall indicate each stroke of the pump.

d. The pump shall be designed with an isolating chamber behind the diaphragm to protect the body of the pump in the event of a diaphragm rupture. Any leakage shall be directed to the drain tube.

e. Dial operated manual stroke length adjustment shall provide positive repeatable settings for capacity adjustment over a 5:1 range while the pump is operating. Stroke frequency shall be adjustable over a 100:1 range. The maximum stroke rate shall be 100 strokes per minute. Stroke length shall be manually adjustable to 0%. The maximum stroke length shall be 0.08". Automatic frequency control from a 4-20 mA analog signal shall be available via an external/internal control switch. The impedance for 4-20mA input shall be a minimum of 150 ohms.

f. The metering pump shall have the option of being paced either directly by mounting the pump on a water meter with an internal cable connection or by an external connection via cable to a remote water meter.

g. The metered liquid shall enter the metering head at the bottom and exit at the top through gravity seating double ball check valves. These valves shall be free-seating type with valve seats and shall be guided to accurately control vertical and sideways motion.

h. The pump mechanism shall be sealed from direct contact with the outside atmosphere

and suitable for operation in ambient conditions to 100 degrees F and fluid temperatures to 120 degrees F (depending on head material).

i. Materials of construction for the pump include a PVC pump head and check valves, PTFE ball checks, Viton seals and a Teflon-coated EPDM diaphragm. Pump shall have 1/4" x 7/16" PVC Tubing connections.

j. The pump shall have a low-level indicating light for optional connection to a low-level detection device. Upon indication of low level, the red LED indicator shall illuminate and the pump will stop immediately.

k. A warning signal relay shall be supplied to provide self-diagnostics of the pump. Any failure shall result in the pump being shut down and a signal being sent.

2.10 - STRUCTURAL ASSEMBLY

A. GENERAL

1. The pumping system and standby power system are to be supplied as a complete assembly mounted on a single common base and enclosed within the prefabricated structure single piece enclosure. All necessary wiring between the ATS, generator, and pump control panel are to be completed prior to shipment. Alternatives requiring field assembly or that have not been tested as a complete unit shall not qualify as equal product and shall not be accepted.

2. The equipment enclosure size as shown on the drawings for this project is appropriate for National Standard mandated clearances and for proper clearances above, below and around equipment to provide for safe servicing, removal and reinstallation of that equipment. The drawing for this equipment illustrates centerline and clearance/maintenance dimensions about major equipment items. These dimensions are minimum. Dimensions less than those shown will not be accepted.

B. SOUND ATTENUATED ENCLOSURE

1. The enclosure shall be all welded construction with a minimum 16 Ga Galvannealed steel wall panel with smooth interior walls. Wall will be insulated with a minimum R-11 fiberglass insulation; ceiling shall be R-19. Enclosures using modular panels or assembled with pop-rivets or screws will not be considered equal.

2. Exterior of housing shall be sheathed with ¾" exterior grade plywood and housewrap Exterior finish shall be a mineral filled polypropylene siding material. Panel thickness shall be a minimum 0.090 inches thick with side interlock and nailing flange. Panels shall be capable of withstanding wind loads as noted for the enclosure and impacts of 1.0 ft-lbs/in without damage or deformation.

a. Siding type shall be selected by the owner at time of submittal. The supplier shall provide as a minimum the following texture choices from with which to select: rough sawn cedar shake, hand split shake, hand laid brick, or hand laid stone. Those choices shall be available in multiple color selections which again will be determined by the owner at time of submittal. As a minimum the owner will be provided with up to 3

color samples not less than 12 inches wide for final color determination.

3. The interior wall of the enclosure shall be provided with a minimum 3/8 in. plywood wall covered by a laminated white textured facer panel. Panels shall be water and stain resistant. Fasteners shall be capped with matching screw covers.

4. Access doors shall be minimum 36 in. wide steel door with welded hinge if single leaf. Double leaf doors shall be 60 in. wide. Door shall be equipped with a stainless steel padlockable exterior handle with a safety override on the interior to prevent accidental lock-ins. Door shall be equipped with a weatherproof neoprene door gasket and drip cap. A minimum 10 x 10 window shall be provided in each movable door. Chemical room door shall be fitted with internal panic hardware.

5. Roof shall be 18 Ga. Galvannealed steel. It shall have a short gable style roof with 3 in. overhang. Exterior surface shall be painted to customer's requirements for color, as noted on the drawing, with a 4 to 6 mil DFT polyurethane paint.

6. The complete enclosure shall be designed to withstand a wind load of 130 miles per hour. The roof shall be capable of withstanding a loading of 80 pounds per square foot minimum.

7. Maximum sound additive level shall be 76 dB(A). Non-specified manufacturers will be subject to field verification of sound output per FIELD TESTING section of this specification.

C. STEEL BASE ASSEMBLY

1. The steel base shall be designed to mount and support the components defined in this section. The base will be of sufficient size to allow access for maintenance to these mounted items. The base shall be designed with adequate lifting points for installation as well as anchoring points as detailed on the contract drawings.

2. The steel base shall be designed for the mounting of the single piece enclosure. The enclosure shall be secured to the steel base assembly utilizing stainless steel fasteners and a closed cell neoprene gasket. Design shall be such as to preclude the possibility of moisture entering the housing at the union of the enclosure and steel.

3. The base assembly shall be shot blasted to a commercial finish per SSPC-SP6. The base shall receive a minimum 10 mils epoxy paint similar or superior to Tnemec Series 66. The floor area of the base will receive an additional non-skid coating system.

D. FUEL SYSTEM

1. Properly sized fuel piping within the base shall be supplied by the manufacturer. It shall also include a manual shut-off valve, Y strainer, solenoid control valve, and flexible connection to the engine at a minimum. Connection point for fuel supply shall be provided on the exterior portion of the base as shown on the contract drawings.

E. INTAKE AND EXHAUST LOUVERS

1. The system shall include a complete intake and ducted exhaust louver system designed to

provide an adequate amount of air for both cooling and combustion. The system shall consist of intake and exhaust louvers, motorized operators, and radiator duct discharge assembly.

2. The louvers shall be certified AMCA Standard 500 at a maximum of 0.35" WG while the engine generator set is operating at full load. Louvers shall be 6", multi-blade, minimum 13 gauge extruded aluminum, 6063-T5 alloy, with 5/8th inch aluminum mesh removable bird screen. The louvers shall be the powered type with fixed and adjustable blades motorized to the open position with spring return. The adjustable louver blades shall be furnished with a closed cell gasket to insure minimum air infiltration while closed. The gasket shall be replaceable.

3. The motorized actuator shall be UL labeled. They shall be of the two position design rotating clockwise when power is applied. The actuator shall be rated for 120 volt, single phase, 60 hertz and shall provide a minimum torque rating of 60 lb.-in. Relay logic within environmental panel shall control acuation of the louvers. Louvers shall remain open for a user adjustable period of time after generator operation to allow for cooling within the enclosure.

F. DUCT ASSEMBLY

1. Duct assembly shall be provided between the engine radiator and the exhaust louver. The duct assembly shall be designed to provide a minimum amount of restrictions and a smooth air flow from the radiator to the exhaust louver.

G. ELECTRICAL ASSEMBLY

1. All conduit and wiring shall be done in accordance with the latest edition of the National Electric Code.

2. All conduits within the base shall be supplied by the manufacturer. Unless otherwise indicated, internal conduits shall be thin wall metallic tubing with set screw or compression type connections. Where flexibility is required flexible metallic conduit shall be used.

3. Chemical Room conduits shall be rigid PVC with nonmetallic outlet boxes. Conduit supports shall be nonmetallic or stainless steel.

4. Conduit connections for electrical service lines shall be provided on the exterior portion of the base as shown on the contract drawings. All couplings for field connection of conduits shall be of heavy wall steel construction and shall be continuously welded around their circumference. External conduits shall be rigid galvanized steel with threaded connections.

5. The service pole and metering shall be provided by the installing contractor. A U.L. rated main disconnect switch, conduit and wiring between the power company termination and the standby power system shall be furnished and installed by the installing contractor.

6. A load center for the convenience accessories shall be provided. Load center shall be minimum 20 slot 120/240V 125A main. Single pole, double pole and tandem circuit breakers shall be acceptable types of branch breakers.

H. ENVIRONMENTAL SYSTEMS

1. A dual 40 watt, enclosed wet-location fluorescent light fixture shall be mounted to the ceiling in the quantities shown on the plans. Lighting control shall be switched at the locations shown on the plans. The light switch for the Chemical Room shall also activate the exhaust fan.

2. HVAC

a. Enclosure shall be equipped with a 5 ton HVAC unit with forced air heating, cooling, and dehumidification for the Pump Room. Unit shall be shipped loose for contractor installation on site on side of enclosure. Condensed water will be discharged automatically on the exterior of the station. HVAC unit shall be automatically controlled via thermostat.

b. A 40 pint per day dehumidifier shall be installed in the Chemical Room. The dehumidifier shall be automatically controlled through and integral, adjustable, humidistat.

c. A 240V forced air electric wall heater shall be provided in Chemical Room and Generator Room. The heaters shall be internally thermostatically controlled. The heater in the Generator Room shall be locked out when the generator is running.

d. A louver mounted exhaust fan and intake louver shall be provided in the Chemical Room and Generator Room. Control of each ventilation fan shall be via relay logic in the following manner:

i. Chemical Room - Constant run when light switch on.
ii. Generator Room - Constant run for user adjustable on time after generator operation.

3. Convenience receptacles shall be located throughout each room for operator use. Receptacles shall be 120V 15A GFCI.

PART 3 - START-UP AND TESTING

3.01 - FACTORY TESTING

A. A complete test including all generator, transfer switch and environmental functions will be performed after assembly and before system is shipped to the jobsite. The test shall include simulated power outage and operation test of all components as a completed system related to generator, transfer switch, pump control and level sensing system, and environmental system. Factory test of components prior to final assembly shall not be an acceptable alternate to the complete system check. A copy of this report will be available upon request prior to start-up.

B. Upon completion of the station piping, the pressure piping and all its associated hydraulic components shall be hydrostatically tested at a minimum pressure of 120 psi. The test duration shall be 20 minutes minimum at which time all joints will be checked for leakage.

C. The test results shall be noted on the manufacturer’s standard test certificate and signed off on by the

project manager, test technician, and quality control manager. Test results are to be included in the operation and maintenance data.

3.02 - START-UP

A. The manufacturer shall provide the services of an authorized factory representative to inspect the installation, make any necessary adjustments, and place the equipment into operation. The manufacturer's representative shall instruct the operating personnel in the operation and maintenance of the equipment. The manufacturer's representative shall note any deficiencies on the start up report and inform the appropriate party at the time of start up to remedy the deficiency or make the necessary repairs or adjustments as needed. The manufacturer shall provide one day(s) service to perform the above tasks. A start-up report shall be prepared by the technician during at the job site and will be available in typewritten form to the customer upon request.

3.03 - FIELD TESTING

A. Field verification of sound requirements shall consist of sound readings taken in the dB (A) scale at eight (8) equally spaced points around the unit at a 23 ft. radius. Readings are to be taken while the unit is in its normal operating position under full load conditions. Points are to be averaged for comparison to the specified sound output level. Failure to meet specified sound output levels will be grounds for rejection of the equipment.

B. The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system. Start-up shall include customer operator training at the time of the equipment commissioning.

C. The equipment supplier shall provide one (1) day service to inspect the installation, place the system into operation, and properly train owner's personnel in routine maintenance of the unit. A start-up report shall be prepared by the technician at the job site and will be available in typewritten form to the customer upon request.

3.04 - MANUFACTURED EQUIPMENT

A. These specifications are based on the certain products deemed most suitable for the application involved. The following manufacturer's equipment has been used for the basis of the above specifications:

Pump Station:	Precision Systems
Pumps:	Grundfos
Controls Panel:	Precision Systems/ QCI
VFD:	Danfoss
Telemetry System:	Omni-Site

Chemical Feed System:	Lutz-JESCO America Corporation
Generator:	Cummins
Transfer Switch:	Cummins

B. All equipment specified above shall be supplied by the pump station manufacturer; providing a single source service and warranty facility.

3.05 – WARRANTIES

A. STATION AND PUMP WARRANTY

1. The manufacturer shall warrant the booster station for a period of one year, beginning with date of start up, not to exceed 18 months from date of shipment. Warranty shall cover defective parts only. Labor to remove and install is by others.

2. All products manufactured by Precision Systems are guaranteed to be free from defects in workmanship and materials for a period of one year, beginning with date of start up, not to exceed 18 months from date of shipment, whichever occurs first.

3. This warranty is contingent upon the initial start up of the equipment being performed by Precision Systems or its assigned authorized representative.

4. Defective parts will be replaced or repaired free of charge, if returned to the factory or at the option of Precision Systems, replaced in the field.

5. This guarantee only covers defects which have developed in the service for which the equipment has been designed.

6. Components used by Precision Systems, but manufactured by others are warranted only to the extent of the original manufacturer's guarantee.

7. The repair or replacement of parts normally consumed in service, such as light bulbs, is considered part of routine maintenance and such parts are not eligible for repair or exchange under this warranty.

B. VFD WARRANTY

1. The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

C. GENERATOR AND TRANSFER SWITCH WARRANTY

1. The generator and transfer switch shall be provided with prorated, five (5) years or fifteen hundred (1,500) hour warranty, whichever occurs first from the date of system start-up. Coverage includes replacement parts for the entire coverage period. Labor to replace these parts is also included for the first two (2) years.

2. If replacement of equipment is deemed necessary by the manufacturer, all push pull labor charges for removal of equipment and reinstallation of new equipment shall be covered by the

manufacturer for the first year of operation.

3. This warranty is contingent upon the initial start up of the equipment being performed by the manufacturer or its assigned authorized representative.

4. This guarantee only covers defects which have developed in the service for which the equipment has been designed.

5. The repair or replacement of parts normally consumed in service, such as light bulbs, is considered part of routine maintenance and such parts are not eligible for repair or exchange under this warranty.

D. CHEMICAL FEED SYSTEM WARRANTY

1. Manufacturer shall provide a 24-month warranty for the metering pumps. The warranty shall cover all material and moving parts of the metering pump.

TABLE 1
Pumping Equipment Operating Conditions

Average Design Flow (GPM)	13.3
Peak Design Flow (GPM)	100
Max TDH (min Suction PSI) (FT)	105
Min TDH (max Suction PSI)(FT)	57
Horsepower	5
Max Speed (RPM)	3550
Hydraulic Efficiency (%)	70
Voltage	460
Discharge Size (IN)	2

Manufacturer

Brand Name	Grundfos
Model	CR20-2

TABLE 2
Engine Generator Operating Parameters

Phase	3
Wire	4
Voltage(V)	480
Hertz (Hz)	60
Rating (KW)	40
Rating (KVA)	50
Starting Rating (KW)	54.8
Starting Rating (KVA)	272

TABLE 3
Generator Characteristics

Cylinder Quantity	8
Engine Displacement (in3)	305
Horsepower Output (HP)	57.6
Fuel Type	Natural Gas
Min. Fuel BTU Rating (BTU/cu. Ft.)	1000
Fuel Consumption (GPH)	590
Governor Type	Electronic
Frequency Control	1%
Engine Heater (Watts)	1500
AC Generator Insulation Class	H
AC Generator Temp Rise (C)	105

Manufacturer

Brand Name	Cummins
Model	40GGPB

SECTION 16010
ELECTRICAL - GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the contract, including general and supplementary conditions and general requirements (if any), apply to the work specified herein.

1.02 DESCRIPTION

A. Work Included

1. Furnish and install the complete electrical system detailed on the drawings and as specified in this section, including, but not limited to:

   a. Electrical conduits and wiring.
   b. Boxes.
   c. Grounding of all conduit and equipment.
   d. Connection to equipment installed by other trades.

2. Furnish and install appurtenance or additional materials necessary for a complete electrical system, consistent with the design intent depicted on the drawings.

3. Secure and pay for all permits, inspections, tests, etc., as required by local, state, and federal regulations.

1.03 QUALITY ASSURANCE

A. Codes, Permits, and Inspection:

1. Manufacture, test, and install all work in accordance with applicable publications and standards of the following organizations:

   a. American Society for Testing and Materials (ASTM)
   b. Underwriters' Laboratories, Inc. (UL)
   c. Insulated Cable Project Representatives Association (ICEA)
   d. National Electrical Manufacturers Association (NEMA)
   e. Institute of Electrical and Electronics Engineers (IEEE)
   f. American National Standards Institute (ANSI)
   g. National Fire Protection Association (NFPA)
   h. Environmental Protection Agency (EPA)
   i. State and local electrical codes
   j. National Board of Fire Underwriters
   k. Occupational Safety and Health Administration (OSHA)

2. National Electrical Contractors Association (NECA)

3. Comply with all laws applying to electrical installations in effect in the city, town or state; with regulations of any other governmental body or agency having jurisdiction; with regulations of the national electrical code where such regulations do not conflict with those laws; and with the regulations of the electrical utility company supplying electrical energy to the premises.

4. Electrical subcontractor responsibilities:

   a. Obtain all permits required by the ordinances of city, town, or state.

   b. After completion of the work, furnish to the project representative, for the owner, a certificate of final inspection and approval from the inspection bureau having jurisdiction.

   c. Perform and/or install all work in full compliance with all requirements of the occupational safety and health act of 1970 and all amendments thereto.

1.04 SUBMITTALS

A. Submit the information required for all equipment in accordance with division 1 - general requirements, including:

1. Catalog data: manufacturer's literature and illustrations.
2. Manufacturer's specifications and project representative data.
3. Shop drawings.
4. Equipment supplier's certification (when required).
5. Record drawings of final approved system before final payment is made for this work.

1.05 COORDINATION, INTENT AND DISCREPANCIES

A. Intent

1. The contract drawings and the sections of the specifications are complementary each to the other.

2. Materials and work which are indicated in one shall be as binding as if indicated in both.
3. The drawings are intended to indicate only diagrammatically the extent, general character, and approximate locations of the work included.

4. Exact locations must be coordinated with local conditions and with other trades.

5. Work indicated but having minor details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the owner.

6. Follow architectural, civil, structural and mechanical drawings and this section of the work fitted thereto.

7. All equipment shown on the drawings is intended to be generally representative of the equipment which will be installed under this contract, but it shall not be assumed that the drawings indicate the specific configuration, arrangement or points of connection of the actual equipment which will be purchased.

8. The entire work provided for in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner, according to the accompanying drawings and this specification.

9. The bidder shall include in his bid, all cost required to adapt the actual equipment he intends to purchase to the general layout indicated on the drawings and to provide a complete and operable system.

10. Typical details shown on the drawings shall apply to each and every item of the project where such items are incorporated; details are not repeated in full on all drawings, but the intention that such details shall be applicable in full.

A. Departure from the Contract Drawings

1. Submit details of such departures and the reasons therefore as soon as practical and within 30 days after award of the contract, to the project representative for approval.

2. No departures shall be made without signed approval of the project representative or his authorized agent.

B. Coordination

1. The contractor shall keep himself fully informed as to the size, shape, and location of all openings required for his pipes and apparatus and shall give full information to the other trades so that the openings may be built in advance.

2. It shall be the responsibility of the contractor to pay all costs for sub-letting any work under this section in order to avoid work stoppages due to jurisdictional disputes.

3. The contractor shall confer with all other trades relative to the location of apparatus and equipment and select locations so as not to conflict with work of other trades.

4. Any conflict with other trades shall be referred immediately to the project representative for resolution.

5. If interference occurs, the project representative will determine which work is to be relocated, regardless of which was first installed.

C. Discrepancies

1. If the contractor, in the course of the work, finds any discrepancies between drawings or equipment listed and the physical conditions of the site, or any errors or omissions in dimensions or instructions given by drawings or equipment lists, he shall immediately notify the project representative, in writing, and the project representative shall promptly adjust the same.

2. Any work performed after such discovery, unless authorized by the project representative in writing, shall be at the contractor's risk.

3. The drawings are, in general, made to scale, but all measurements shall be taken from figured dimensions, and not by scaling.

4. Whether or not an error is believed to exist, deviations from the drawings and dimensions given thereon shall be made only after written approval is received from the project representative.

5. The contractor shall be responsible for comparing all drawings and verifying all dimensions before laying out the work.

6. When measurements are affected by existing conditions, the contractor shall take necessary field measurements and refer any differences in dimensions to the project representative.

7. Any and all errors in the work that might have been avoided by such field measurements shall be the responsibility of the contractor.

8. When submitting proposal, give written notice to the project representative of any materials or apparatus in violation of laws, ordinances, rules or regulations of all authorities having jurisdiction, and notice of necessary items of work omitted.

9. If the contractor fails to give such written notice, it shall be assumed that he has included cost of all items in his proposal, and he shall be held responsible for satisfactory functioning and approval of the entire installation without extra compensation.

1.06 NAMEPLATES

A. Furnish and install engraved black laminated phenolic nameplates with white core for all disconnects, control stations, etc., as indicated or required.

B. Secure nameplates to units by screws.

C. Adhesive units are not acceptable.

- End of Section -

SECTION 16050
BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This specification is for basic electrical construction materials: conduit, conductors, outlet boxes, circuit breakers, and methods for their installation.

B. The drawings are diagrammatic, unless detailed dimensioned drawings are included, and show only approximate locations of equipment, fixtures, devices, etc.

C. While the general run of electrical feeders, branch circuits, conduits, etc. is indicated on the drawings, exact routing shall be field determined.

1.02 QUALITY ASSURANCE

A. In general, the workmanship of the electrical installation shall be as described in the N.E.C.A. electrical design guidelines. All methods of construction, details of workmanship, etc. that are not specifically described therein or indicated in the contract documents, shall be subject to the control and approval of the project representative.

B. Equipment and materials shall be of the quality and manufacture indicated in their respective sections of the specifications.

C. Equipment and materials shall be UL listed and labeled for the intended application per NEC Article 100.

1.03 SUBMITTALS TO THE PROJECT REPRESENTATIVE

a. Submit shop drawings for the following equipment, materials, products, etc.:

1. conduit, raceway and tubing.
2. conductors and cable
3. circuit breakers
4. safety switches

PART 2 – PRODUCTS

2.01 MATERIALS

A. Conduit, Raceway and Tubing

1. Rigid heavy wall steel conduit (RSC or RGS) shall be constructed of hot dipped galvanized or electro-galvanized steel. Acceptable manufacturers: Republic, Triangle PWC, Allied, Wheatland.

2. Electrical metallic tubing (EMT) shall be constructed of electro- galvanized steel. Acceptable manufacturers: Republic, Triangle PWC, Allied, Wheatland or equal.

3. Flexible metal conduit shall be constructed of one continuous length of U.L. approved electro-galvanized, spirally wound steel strip with interlocking convolutions and interior surfaces free from burrs and sharp edges. Flexible metal conduit installed in damp and wet locations shall be "liquid-tight" with PVC jacket. Acceptable manufacturers: Alflex, Carlon, Electro-flex or equal.

4. Non-metallic PVC conduit to be direct buried (not encased in concrete) shall be schedule 80, extra heavy wall and UL listed for the use intended. Acceptable manufacturers: Carlon, Rob-Roy, Certainteed or equal.

B. Conductors and Cable

1. All power wiring conductors shall be insulated for 600 volts and shall be standard AWG sizes. Conductors shall be 98 percent copper, stranded, heat and moisture resistant and thermal plastic insulated for all sizes no. 12 AWG and larger. Conductors shall be labeled with U.L. approval and be marked with the manufacturer's name, wire size and insulation type. Insulation for all 600 volt conductors shall be type THHN/THWN, 90-degree rated. All wiring shall be suitable for wet, water-filled applications. Acceptable manufacturers: Okonite, Southwire, Pirelli, Cablec, BIW or equal.

C. Outlet Boxes

1. Standard outlet boxes and covers shall be galvanized steel not less than 1-1/2 inches deep, 4 inches square or octagonal, with knockouts. Acceptable manufacturers: Steel city, Appleton, Raco or equal.

2. Outlet boxes exposed to moisture shall be cadmium cast alloy complete with hubs and gasketed screw-fastened covers. Acceptable manufacturers: Steel City, Appleton, Crouse-Hinds, Raco or equal.

3. In no case shall boxes be sized smaller than as indicated in article 370 of the national electrical code for the conductor sizes installed.

D. Circuit Breakers

1. Circuit breakers shall be molded case, thermal-magnetic type, ratings as noted, with toggle-type operating mechanism, quick-make, quick-break action and positive handle indication.

2. Circuit breakers for furnaces shall have 120-volt shunt trip option to allow breaker to be de-energized by a signal from duct-mounted smoke detector upon detection of smoke in the return air duct.

3. Acceptable manufacturers: Square-D, Cutler-Hammer, General Electric, Siemens or equal.

E. Safety Disconnect Switches

1. Safety disconnect switches shall be general duty rated, non-fusible, 250-volt, 10kaic, 30-amp.

2. Safety disconnect switch enclosure shall be rated NEMA 1, indoor.

3. Acceptable manufacturers: Square-D, Cutler-Hammer, Eaton.

F. Metal Framing Channel

1. Channel for wet or exterior locations shall be roll formed from 12 gauge steel and shall be hot-dip galvanized after fabrication, material standard A570, grade 33 and finish standards A153 and A386.

2. Use fittings of same material as channel. Fittings shall be by same manufacturer.

3. Metal framing shall be B-line Systems, Unistrut, Roll Forming Corp. or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Unless otherwise noted, wiring for all systems indicated in the contract documents shall consist of insulated conductors installed in raceways. Raceways shall be continuous from panel to load. Secure and bond raceways to all boxes and cabinets such that each system of raceways will be electrically continuous throughout.

B. Unless otherwise indicated on the drawings, install all wiring in the following applicable raceway system:

1. Wiring 600 volts or less in interior locations: electrical metallic tubing (EMT).

2. Flexible liquid-tight metallic conduit shall be used to connect to moving or vibrating equipment. Maximum length shall be 6 feet (6').

C. Raceways shall be:

1. Sized as indicated on the drawings. Interior raceways shall be three-quarter inch (¾") minimum. Flexible conduits shall be maximum six feet (6') in length.

2. Cut square, free of burrs due to field cutting or manufacture, and bushed where necessary.

3. Plugged at the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.

4. Installed with a minimum of bends and offsets. All bends shall be made without kinking or destroying the cross section contour of the raceway. Factory made bends shall be used for raceways one-inch (1") trade size and larger.

5. Support adequately by malleable iron pipe clamps or other approved methods. In exterior or wet locations supports shall allow not less than 1/4 inch air space between raceway and wall. Firmly fasten raceway within 3 feet of each, junction box or fitting. Additional supports may be required due to field conditions, strength of supporting members, etc. Furnish and install such supports at no additional cost to owner.

6. Provide a bushing at each conduit termination unless fitting at box where conduit terminates has hubs designed in such a manner to afford equal protection to conductors. Provide standard bushings for conduits one inch (l") and smaller. Provide sealing bushings for all conduits entering from below grade.

D. wiring methods

1. Do not pull conductors into raceways until raceway system, including all bushings and fittings, is completed. Verify that all work of other trades which may cause conductor damage is completed. Use only U.L. approved cable lubricants when necessary. Do not use mechanical means to pull conductors.

2. Conductors shall be the same size from the protective device to the load.

3. All wiring systems shall be properly grounded and continuously polarized throughout.

4. All feeder connections to field equipment shall be made using solder-less, pressure type terminal lugs, as manufactured by Burndy, National, O.Z., T. & B., or equal.

5. Use cast connections for all ground terminations above grade. Cadweld or Thermoweld all ground connections below grade.

6. Conductors shall be continuous from point of origin to load termination without splice.

7. Branch circuit conductors installed in panel boards shall be neatly bound together.

E. Junction and Pull Boxes

1. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junctions or pull boxes required due to field conditions and as required by the national electrical code.

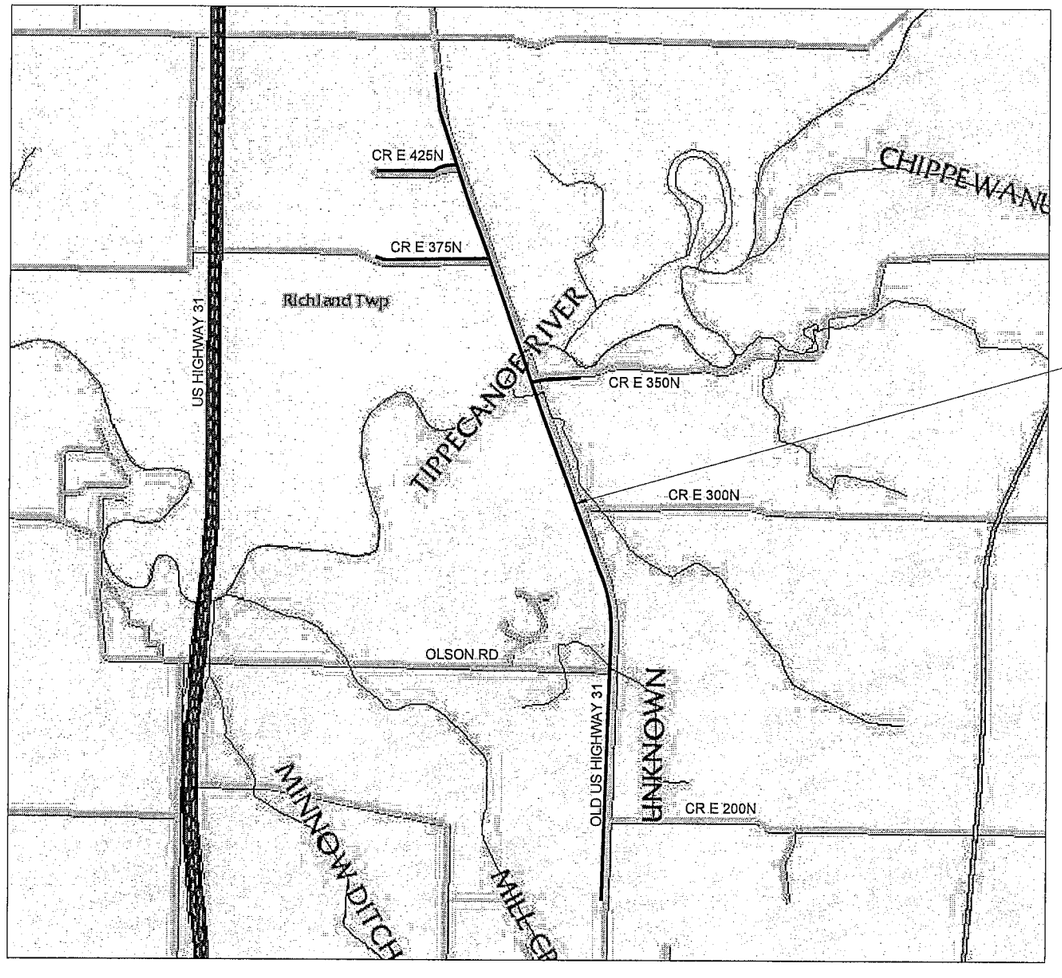
3.02 TESTS

A. Branch circuits shall be tested during installation for continuity and identification and shall pass operational tests to determine that all circuits perform the function for which they are designed.

- End of Section -

CONSTRUCTION PLANS
FOR THE
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31 WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

INDEX OF SHEETS



LOCATION MAP

N.T.S.

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

amec

8901 NORTH INDUSTRIAL RD.
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

COVER SHEET

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

LEGEND

- SHRUB
- DECIDUOUS TREE
- LIGHT POLE
- P — UTILITY POLE W/ AREA LIGHT
- EM — ELECTRIC PANEL OR RISER
- MH — MANHOLE
- S — SANITARY SEWER MANHOLE
- ST — STORM SEWER MANHOLE
- T — TELEPHONE/FIBER OPTIC MANHOLE
- W — WELL
- STORM INLET
- WV — WATER VALVE
- GV — GAS VALVE
- GUY — GUY POLE
- SIGN & POST
- SIGN & DOUBLE POST
- UTILITY POLE
- HYD — WATER HYDRANT
- GM — GAS METER
- G — GAS MARKER
- W — WATER METER
- T — TELEPHONE RISER
- MB — MAILBOX
- —T— UNDERGROUND TELEPHONE LINE
- —CATV— UNDERGROUND CABLE
- —G— UNDERGROUND GAS LINE
- —S— SANITARY SEWER LINE
- —ST— STORM SEWER LINE
- —717— CONTOUR LINE
- —OHL— OVERHEAD LINE (OHL)
- —X—X— FARM FENCE LINE
- —O—O— WOOD FENCE LINE
- BUILDING LINE
- —FV— FIELD LINE
- TREE LINE
- CONCRETE
- GRAVEL
- 10+00 STATIONING
- GUY — GUY WIRE
- CP163 — CONTROL POINT
- 30" TREE STUMP

ABBREVIATIONS

APPROX.	APPROXIMATE	
B.O.C.	BACK OF CURB	
BL	BASELINE	
BM	BENCHMARK	
BLK	BLOCK	
BLDG	BUILDING	
CI	CAST IRON	
CONC	CONCRETE	
COR	CORNER	
CMP	CORRUGATED METAL PIPE	
CF	CUBIC FEET	
CY	CUBIC YARD	
DEPT	DEPARTMENT	
DIA	DIAMETER	
DR	DRIVE	
DIP	DUCTILE IRON PIPE	
ELEV.	ELEVATION	
E.F.	EACH FACE	
E.W.	EACH WAY	
EXIST.	EXISTING	
FP	FENCE POST	
FH	FIRE HYDRANT	
FM	FORCE MAIN	
GALV.	GALVANIZED	
HORIZ.	HORIZONTAL	
INDOT	INDIANA DEPARTMENT OF TRANSPORTATION	
I.D.	INSIDE DIAMETER	
INV.	INVERT	
I.P.	IRON PIPE	
LT.	LEFT	
L.F.	LINEAL FEET	
LP	LIQUID PROPANE	
MKR	MARKER	
MH	MANHOLE	
MJDIP	MECHANICAL JOINT DUCTILE IRON PIPE	
MIN	MINIMUM	
O.C.	ON CENTER	
PKG	PARKING	
PK	P.K. NAIL	
PI	POINT OF INTERSECTION	
PVC	POLYVINYL CHLORIDE	
PP	POWER POLE	
PROP.	PROPOSED	
RR	RAILROAD	
RCP	REINFORCED CONCRETE PIPE	
REQ'D	REQUIRED	
RT.	RIGHT	
R.O.W.	RIGHT OF WAY	
SAN	SANITARY	
SHT.	SHEET	
SQ.	SQUARE	
S.Y.	SQUARE YARD	
STA.	STATION	
STL	STEEL	
ST.	STREET	
TYP	TYPICAL	
USC&GS	UNITED STATES COAST and GEODETIC SURVEY	
VERT	VERTICAL	
VCP	VITRIFIED CLAY PIPE	

GENERAL NOTES - WATER MAIN

1. UTILITIES NOT IN THE VICINITY OF PROPOSED WATER MAIN CONSTRUCTION ARE NOT SHOWN.
2. ALL LOCATIONS OF UTILITIES ARE APPROXIMATE. CONTRACTOR TO VERIFY LOCATION WITH UTILITY COMPANIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL PERFORM EXPLORATORY EXCAVATION, AS REQUIRED, TO VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING UTILITIES. ALL UTILITY COMPANY COORDINATION, RELATED EXPLORATORY EXCAVATIONS, AND ALL UTILITY RELOCATIONS SHALL BE INCIDENTAL TO THE CONTRACT.
3. CONTRACTOR IS RESPONSIBLE FOR LOCATING EXISTING RIGHT-OF-WAY.
4. WHEN EXCAVATING UNDER EXISTING SEWERS, CONTRACTOR SHALL SUPPORT THE EXISTING SEWER UNTIL BACKFILL AND COMPACTION ARE COMPLETE. BACKFILL AT THESE CROSSINGS SHALL CONSIST OF MECHANICALLY COMPACTED SELECT GRANULAR MATERIALS TO THE BASE OF THE PAVEMENT. THE SAME PROCEDURE APPLIES TO THE CROSSING OF ALL OTHER UTILITIES. CONTRACTOR MAY USE FLOWABLE FILL IN LIEU OF SELECT GRANULAR FILL.
5. THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE AGENCIES PRIOR TO BORING AND/OR JACKING UNDER STREETS AND COMPLY WITH ALL REQUIREMENTS OF THE CONTROLLING AGENCY. THESE COSTS SHALL BE INCIDENTAL TO THE CONTRACT.
6. PRIVATE DRIVEWAYS SHALL NOT BE COMPLETELY CLOSED WITHOUT PRIOR NOTIFICATION OF DRIVEWAY OWNER.
7. ALL GRASSED AREAS DISTURBED DURING CONSTRUCTION SHALL BE SEEDED ACCORDING TO THE SPECIFICATIONS, UNLESS SODDING IS SPECIFICALLY INDICATED.
8. FOR CLARITY, THE LIMITS OF SELECT GRANULAR BACKFILL AND GRANULAR CRADLE MATERIAL INSTALLATION HAVE NOT BEEN SHOWN. REFER TO THE SPECIFICATIONS AND STANDARD DETAILS ON THE DRAWINGS FOR BACKFILL AND CRADLE MATERIAL SPECIFICATIONS, INSTALLATION PROCEDURES AND COMPACTION REQUIREMENTS.
9. CONTRACTOR SHALL FOLLOW BACKFILLING AND PAVEMENT REPLACEMENT DETAILS AS SHOWN IN THESE DRAWINGS.
10. WHEN THE PROPOSED CONSTRUCTION IS IN CLOSE PROXIMITY TO EXISTING POWER OR UTILITY POLES, CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANY TO HAVE POLES STABILIZED DURING CONSTRUCTION.
11. CONTRACTOR SHALL REMOVE AND REPLACE SIDEWALKS AND DRIVEWAYS PARTIALLY DAMAGED DURING CONSTRUCTION IN FULL SECTIONS (FROM JOINT TO JOINT).
12. EXISTING SEWERS CURRENTLY USED FOR WASTEWATER AND STORM WATER DRAINAGE ARE SHOWN ON THE DRAWINGS. RECORDS ARE NOT RELIABLE ON THESE SEWERS SO THE LOCATIONS ARE APPROXIMATE AND ALL SEWERS MAY NOT BE SHOWN. THE CONTRACTOR SHALL KEEP THESE SEWERS IN SERVICE DURING ALL PHASES OF CONSTRUCTION, UNLESS OTHERWISE INDICATED. THE CONTRACTOR SHALL ALSO MAINTAIN EXISTING SERVICE CONNECTIONS TO THESE SEWERS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING AND SUBMITTING ALL AS-BUILT DRAWINGS TO THE OWNER AND ENGINEER. UP-TO-DATE AS-BUILT DRAWINGS SHALL BE AVAILABLE FOR ENGINEER'S REVIEW THROUGHOUT THE PROJECT.
14. CONTRACTOR SHALL COORDINATE ALL CITY WATER USAGE WITH CITY'S WATER SUPERINTENDENT. ANY COSTS CHARGED TO THE CONTRACTOR FOR CITY SUPPLIED WATER SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.
15. PRE-CONSTRUCTION PHOTOGRAPHS WILL BE REQUIRED TO ENSURE OWNER THAT CONTRACTOR RESTORES AREAS DISTURBED BY CONSTRUCTION ACTIVITIES TO THEIR ORIGINAL CONDITION. PHOTOGRAPHS WILL BE REQUIRED ON ALL PROPOSED WORK AND SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO THE START OF CONSTRUCTION. THE MINIMUM NUMBER OF PHOTOS REQUIRED SHALL BE DETERMINED BY FIELD CONDITIONS AND AS APPROVED BY THE ENGINEER.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS, METHODS, PROCEDURES, TECHNIQUES, AND SEQUENCES OF CONSTRUCTION, INCLUDING SAFETY ON THE JOB SITE. NEITHER THE PROFESSIONAL ACTIVITIES OF THE ENGINEER OR THE CONSTRUCTION MANAGER AT THE CONSTRUCTION SITE SHALL RELIEVE THE CONTRACTOR OF HIS OBLIGATIONS, DUTIES, AND RESPONSIBILITIES, INCLUDING ANY HEALTH AND SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES(IE; OSHA).
17. REMOVAL AND REPLACEMENT OF MAILBOXES, SIGNAGE, ETC., IF REQUIRED, SHALL BE CONSIDERED INCIDENTAL TO WATER MAIN INSTALLATION.
18. UNLESS OTHERWISE INDICATED, EXISTING SURFACE TOPOGRAPHY AND DRAINAGE SHALL NOT BE ALTERED BY CONSTRUCTION. CONTRACTOR SHALL RESTORE TO ORIGINAL CONDITION ANY DRAINAGE FEATURE DISTURBED BY CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
19. UTILITY PIPES BORED & JACKED IN PLACE. ALL UTILITY PIPES BORED & JACKED IN PLACE SHALL BE IN ACCORDANCE WITH APPLICABLE INDOT STANDARD SPECIFICATIONS AND SECTION 02236-PIPE BORING & JACKING OF THE SPECIFICATIONS. THE COST ASSOCIATED WITH ALL BORE PIT EXCAVATION, BACKFILL, SURFACE RESTORATION AND ANY ADDITIONAL MANHOLES TO FACILITATE BORING & JACKING SHALL BE INCLUDED IN THE CONTRACTOR'S PRICE PER LINEAL FOOT FOR STEEL CASING BORE & JACK.
20. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH INDIANA ADMINISTRATIVE CODE 327 IAC 8, PUBLIC WATER SUPPLY.
21. WATER MAINS SHALL BE LAID WITH A MINIMUM OF FIVE FEET (5') OF COVER, UNLESS OTHERWISE NOTED ON THE DRAWINGS.
22. THE WATER MAIN SHALL BE PRESSURE TESTED (REFER TO SPECIFICATION SECTION 02610). COST OF PRESSURE TESTS SHALL BE INCIDENTAL TO THE UNIT PRICE FOR WATER MAIN.
23. ALL WATER MAINS SHALL BE SEPARATED FROM DRAINS, SANITARY AND STORM SEWERS IN ACCORDANCE WITH SPECIFICATION SECTION 02610.
24. THE WATER MAIN SHALL BE DISINFECTED (SPECIFICATION SECTION 02610) AND SAMPLES TAKEN FOR THE DETERMINATION OF WATER QUALITY IN ACCORDANCE WITH THE CURRENT INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT REQUIREMENTS. COST OF TESTING SHALL BE INCIDENTAL TO THE UNIT PRICE FOR WATER MAIN.
25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MOVING ANY METER PITS IN CONFLICT WITH NEW WATER MAIN. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO CONTRACT. NEW METERS WILL BE SUPPLIED BY THE OWNER AS NEEDED.
26. CONTRACTOR SHALL NOTIFY INDIVIDUAL RESIDENTS A MINIMUM OF 72 HOURS PRIOR TO ANY ANTICIPATED INTERRUPTION OF WATER SERVICE.

GENERAL NOTES - WATER SERVICE

1. FOR ALL SERVICE CONNECTIONS, CONTRACTOR SHALL LOCATE EXISTING WATER SERVICE, PROVIDE AND INSTALL NEW CORPORATION STOP, CURB STOP AND CONNECT NEW WATER SERVICE LINE TO EXISTING SERVICE PIPE (AS REQUIRED).
2. WHERE POSSIBLE, WATER METERS WILL BE INSTALLED INSIDE THE HOME.
3. HOMES WITH CRAWL-SPACES OR NO BASEMENT WILL REQUIRE AN EXTERNAL METER BOX PER THE STANDARD DETAIL SHOWN IN THE DRAWINGS.
4. WATER SERVICE PIPING SHALL BE 1" HDPE UNLESS NOTED OTHERWISE.
5. INTERIOR PLUMBING SHALL BE OF THE SAME TYPE AND SIZE AS EXISTING.
6. A WATER SHUTOFF VALVE WILL BE INSTALLED ON EACH INTERNAL SERVICE CONNECTION.

SPECIAL PROJECT PROCEDURES

1. CONTRACTOR SHALL SUBMIT A PROPOSED SCHEDULE AND WORK SEQUENCE FOR ALL WORK ITEMS ON THE PROJECT PRIOR TO THE START OF CONSTRUCTION.
2. ALL BY-PASS PUMPING REQUIRED TO COMPLETE THE PROPOSED WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT. PRIOR TO THE START OF ANY WORK THAT MAY REQUIRE BY-PASS PUMPING, CONTRACTOR SHALL SUBMIT A BY-PASS PUMPING PLAN FOR ENGINEER'S REVIEW.
3. TRAFFIC CONTROL - ALL TRAFFIC CONTROL INCLUDING SIGNS, BARRICADES, STREET CLOSURES, EMERGENCY ACCESS, PUBLIC NOTIFICATION, ETC. SHALL BE IN ACCORDANCE WITH APPLICABLE INDOT STANDARDS.

PAVEMENT REMOVAL AND REPLACEMENT

1. ALL PAVEMENT REMOVAL AND REPLACEMENT ON CITY STREETS SHALL BE IN ACCORDANCE WITH THE INDOT STANDARD SPECIFICATIONS, CURRENT EDITION.
2. ALL CURB & GUTTER DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED WITH NEW CURB & GUTTER OF SAME TYPE.
3. CONTRACTOR IS REFERRED TO TRENCH AND PAVEMENT DETAILS IN THE DRAWINGS AND THE SPECIFICATIONS, SECTION 02500 FOR PAVEMENT REMOVAL & REPLACEMENT.

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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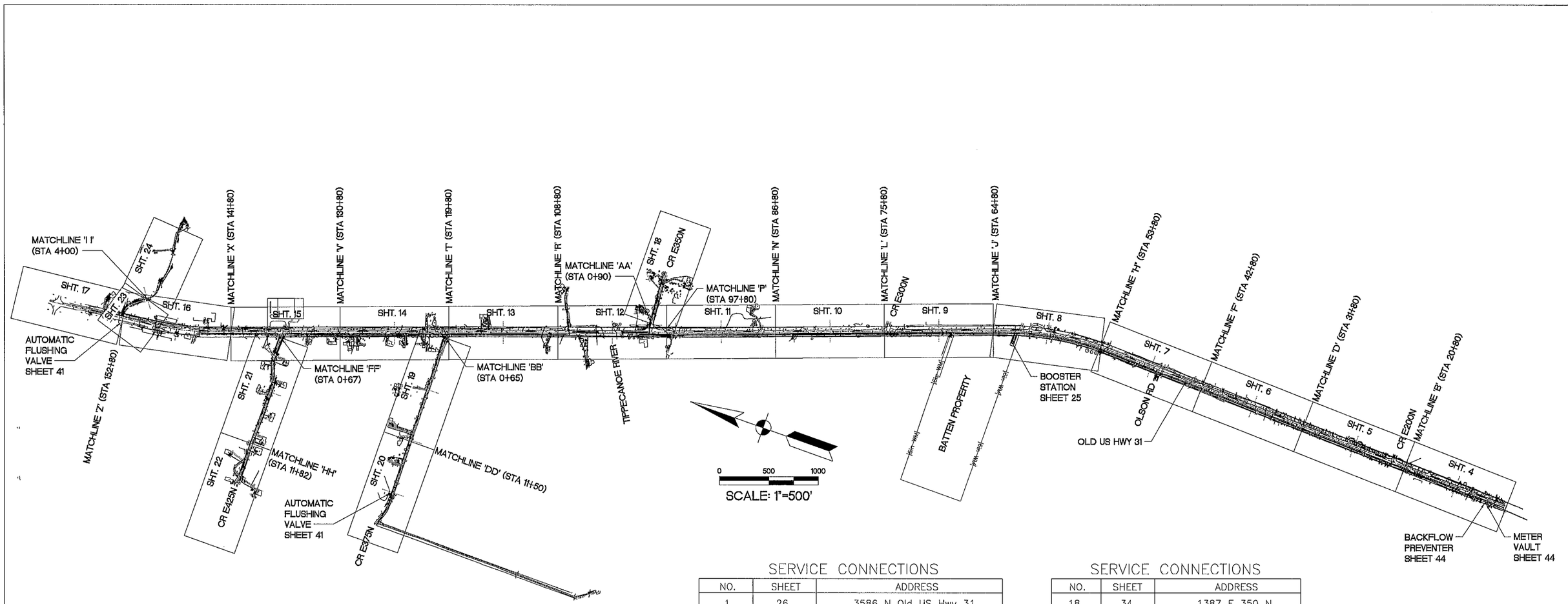
GENERAL NOTES, LEGEND, ABBREVIATIONS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



SERVICE CONNECTIONS

NO.	SHEET	ADDRESS
1	26	3586 N Old US Hwy 31
2	26	3597 N Old US Hwy 31
3	26	3618 N Old US Hwy 31
4	27	3719 N Old US Hwy 31
5	27	3791 N Old US Hwy 31
6	28	3796 N Old US Hwy 31
7	28	3842 N Old US Hwy 317
8	29	3868 N Old US Hwy 31
9	29	3980 N Old US Hwy 31
10	29	3998 N Old US Hwy 31
11	29	4008 N Old US Hwy 31
12	30	4016 N Old US Hwy 31
13	30	4217 N Old US Hwy 31
14	31	4079 N Old US Hwy 31
15	32	4163 N Old US Hwy 31
16	32	4366 N Old US Hwy 31
17	33	4403 N Old US Hwy 31

SERVICE CONNECTIONS

NO.	SHEET	ADDRESS
18	34	1387 E 350 N
19	35	972 E 375 N
20	35	1082 E 375 N
21	36	908 E 375 N
22	36	948 E 375 N
23	36	966 E 375 N
24	37	781 E 425 N
25	37	50 E 425 N
26	37	782 E 425 N
27	38	719 E 425 N
28	38	581 E 425 N
29	38	682 E 425 N
30	39	557 E 425 N
31	39	537 E 425 N
32	39	528 E 425 N
33	40	519 E 425 N33
34	40	501 E 425 N

OPTIONAL SERVICE CONNECTIONS

ADDRESS	343 E 375 N

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
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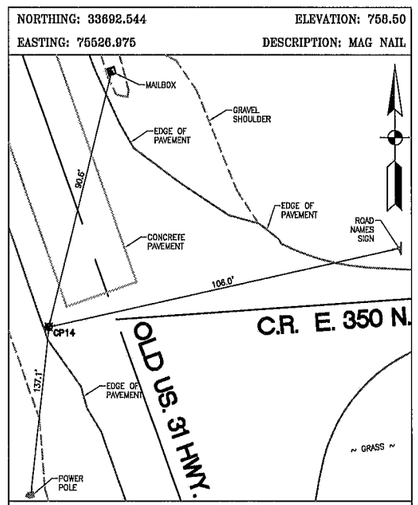
SHEET INDEX DRAWING

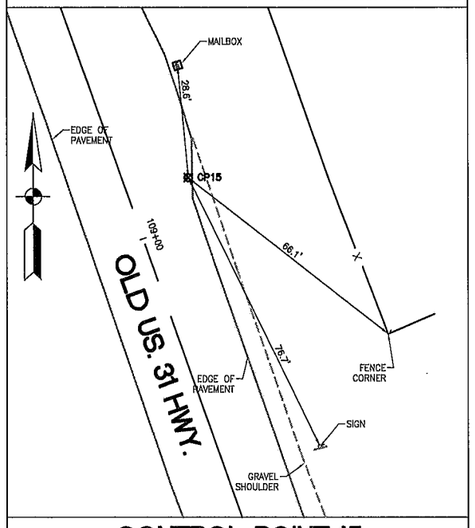
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

NORTHING: 33692.544 ELEVATION: 758.50
EASTING: 75526.975 DESCRIPTION: MAG NAIL



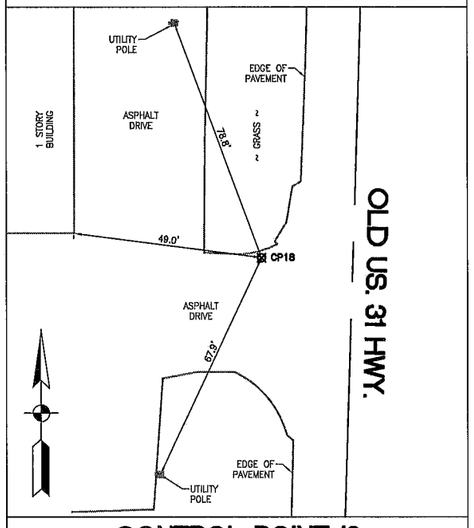
CONTROL POINT 14
NOT TO SCALE

NORTHING: 34596.134 ELEVATION: 759.14
EASTING: 75243.288 DESCRIPTION: MAG NAIL



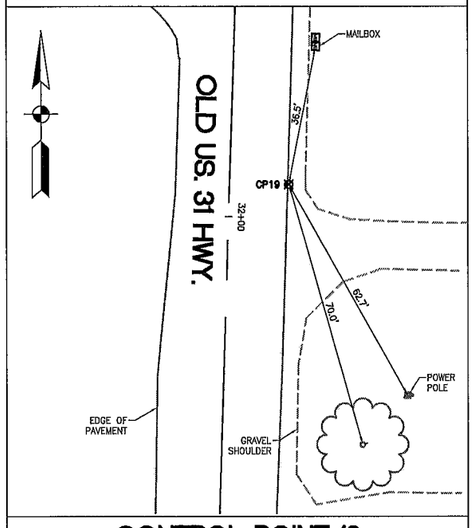
CONTROL POINT 15
NOT TO SCALE

NORTHING: 25832.0380 ELEVATION: 773.12
EASTING: 76806.0260 DESCRIPTION: MAG NAIL



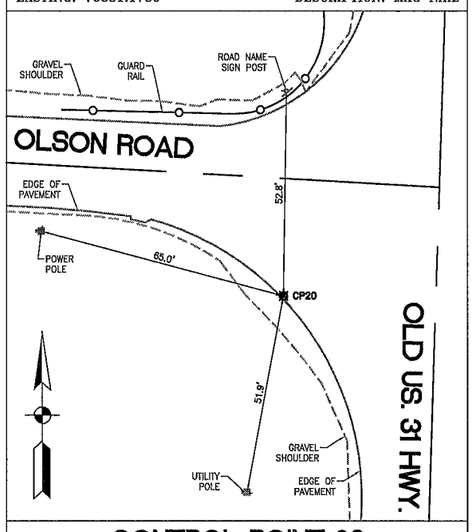
CONTROL POINT 18
NOT TO SCALE

NORTHING: 27176.6640 ELEVATION: 774.64
EASTING: 76888.2510 DESCRIPTION: MAG NAIL



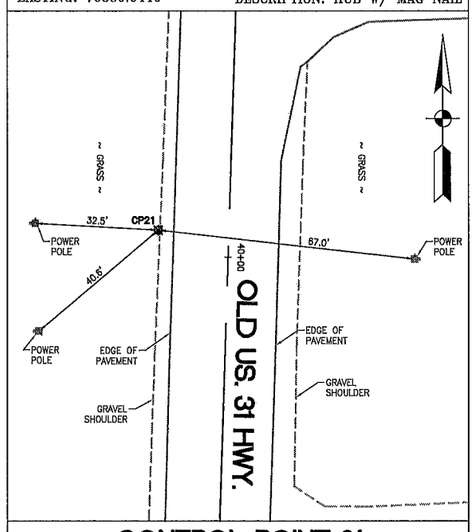
CONTROL POINT 19
NOT TO SCALE

NORTHING: 28679.8060 ELEVATION: 767.74
EASTING: 76881.1780 DESCRIPTION: MAG NAIL



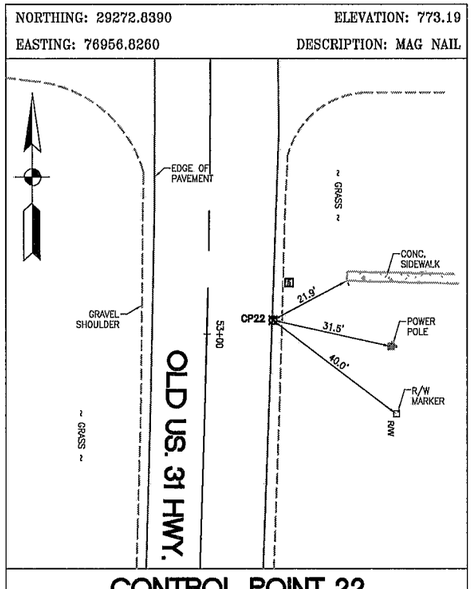
CONTROL POINT 20
NOT TO SCALE

NORTHING: 27976.9150 ELEVATION: 772.35
EASTING: 76880.0440 DESCRIPTION: HUB W/ MAG NAIL



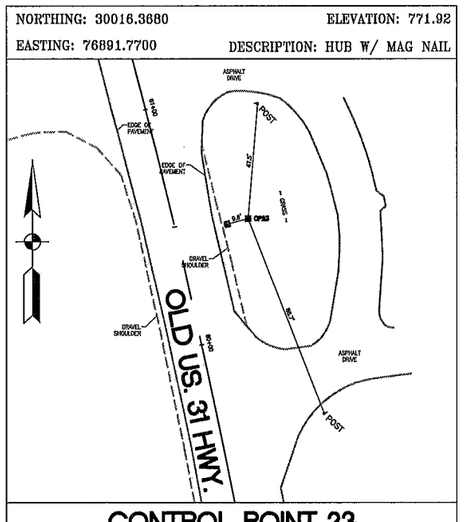
CONTROL POINT 21
NOT TO SCALE

NORTHING: 29272.8390 ELEVATION: 773.19
EASTING: 76956.8260 DESCRIPTION: MAG NAIL



CONTROL POINT 22
NOT TO SCALE

NORTHING: 30016.3680 ELEVATION: 771.92
EASTING: 76891.7700 DESCRIPTION: HUB W/ MAG NAIL



CONTROL POINT 23
NOT TO SCALE

BENCHMARK

DOT BM FULTON L590

IN FULTON COUNTY, ROCHESTER QUAD., IN THE LAND GRANT AREA T.31 N., R. 3 E., 2ND PM; APPROXIMATELY 2 MILES NORTH OF ROCHESTER; AT THE OLD US 31 BRIDGE OVER THE TIPPECANOE RIVER; SET IN THE TOP OF THE SOUTHWEST RETAINING WALL OF THE BRIDGE, 1.3 FEET NORTHWEST OF THE NORTHWEST CORNER OF AN ALUMINUM "I" BEAM GUARD RAIL SUPPORT POST, 0.5 FEET EAST OF THE WEST FACE OF THE CONCRETE RETAINING WALL, LEVEL WITH THE ROAD; A STATE HIGHWAY COMMISSION OF INDIANA SURVEY BENCH MARK TABLET, STAMPED "FULTON L590". ELEVATION=761.122' (NAVD 88)

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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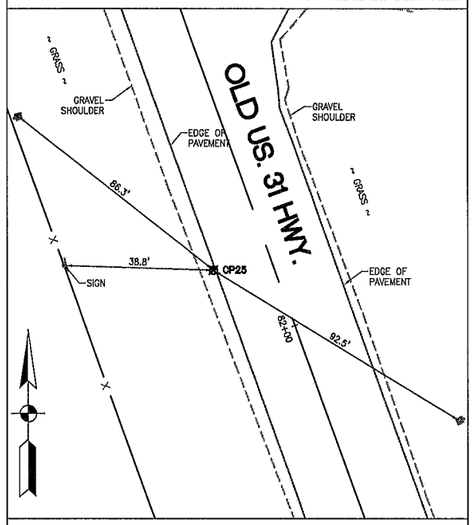
SURVEY CONTROL POINTS

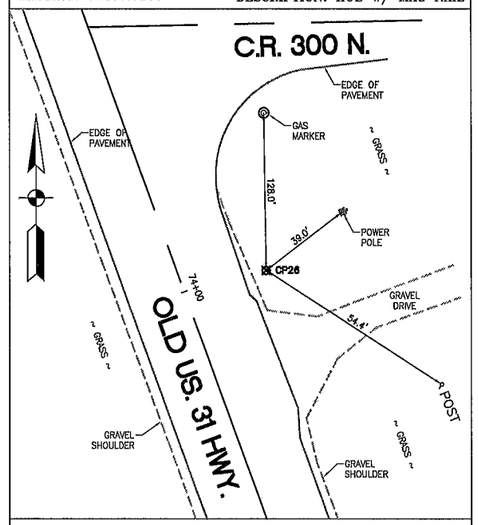
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

NORTHING: 32053.0000 ELEVATION: 768.82
EASTING: 76121.6520 DESCRIPTION: MAG NAIL



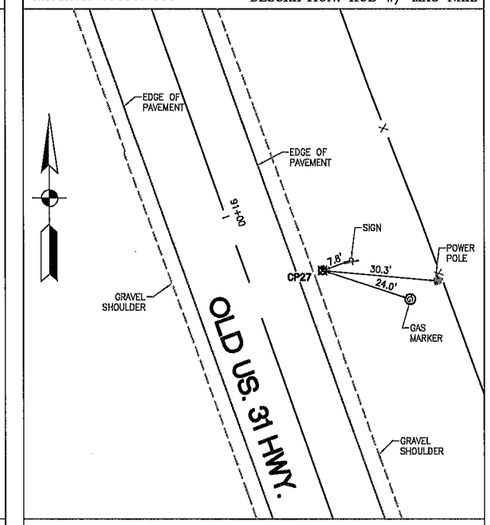
CONTROL POINT 25
NOT TO SCALE

NORTHING: 31292.6280 ELEVATION: 767.43
EASTING: 76437.9180 DESCRIPTION: HUB W/ MAG NAIL



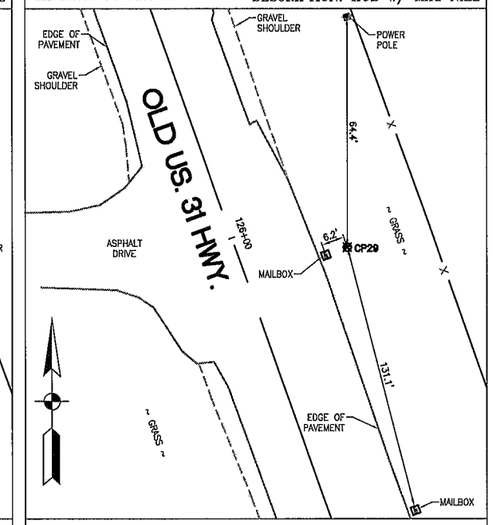
CONTROL POINT 26
NOT TO SCALE

NORTHING: 32870.8910 ELEVATION: 764.78
EASTING: 75860.7930 DESCRIPTION: HUB W/ MAG NAIL



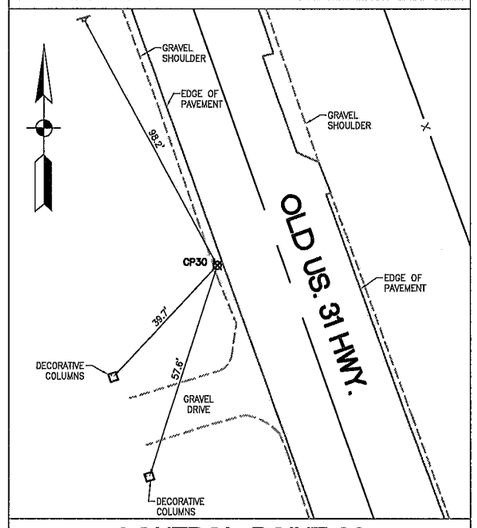
CONTROL POINT 27
NOT TO SCALE

NORTHING: 36179.2460 ELEVATION: 780.63
EASTING: 74691.0500 DESCRIPTION: HUB W/ MAG NAIL



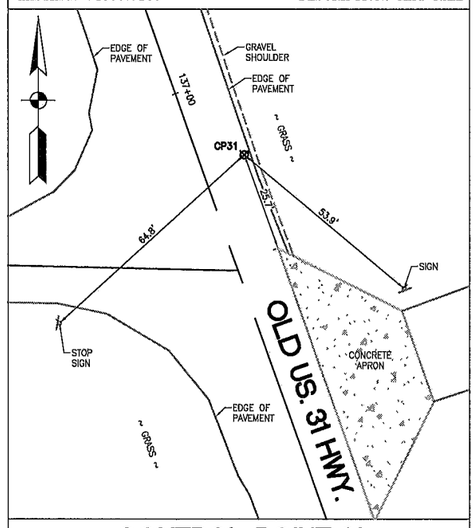
CONTROL POINT 29
NOT TO SCALE

NORTHING: 36698.1480 ELEVATION: 788.98
EASTING: 74459.6340 DESCRIPTION: MAG NAIL



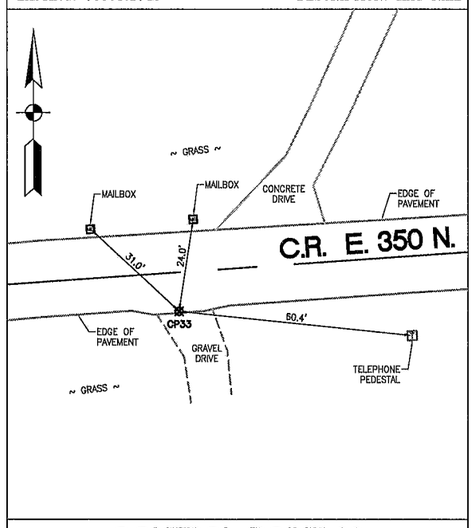
CONTROL POINT 30
NOT TO SCALE

NORTHING: 37202.1640 ELEVATION: 791.66
EASTING: 74309.7130 DESCRIPTION: MAG NAIL



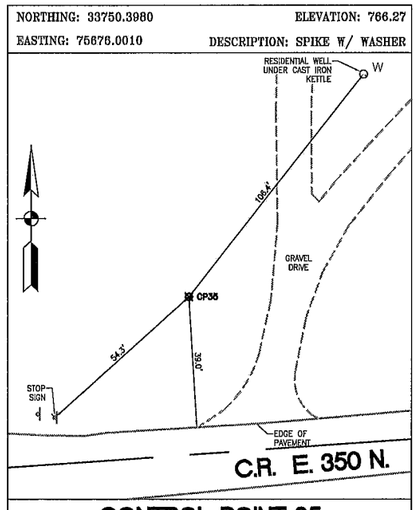
CONTROL POINT 31
NOT TO SCALE

NORTHING: 33714.1380 ELEVATION: 765.76
EASTING: 75968.1740 DESCRIPTION: MAG NAIL



CONTROL POINT 33
NOT TO SCALE

NORTHING: 33750.3980 ELEVATION: 766.27
EASTING: 75676.0010 DESCRIPTION: SPIKE W/ WASHER



CONTROL POINT 35
NOT TO SCALE

BENCHMARK

DOT BM FULTON L590

IN FULTON COUNTY, ROCHESTER QUAD., IN THE LAND GRANT AREA T.31 N., R. 3 E., 2ND PM; APPROXIMATELY 2 MILES NORTH OF ROCHESTER; AT THE OLD US 31 BRIDGE OVER THE TIPPECANOE RIVER; SET IN THE TOP OF THE SOUTHWEST RETAINING WALL OF THE BRIDGE, 1.3 FEET NORTHWEST OF THE NORTHWEST CORNER OF AN ALUMINUM "I" BEAM GUARD RAIL SUPPORT POST, 0.5 FEET EAST OF THE WEST FACE OF THE CONCRETE RETAINING WALL, LEVEL WITH THE ROAD; A STATE HIGHWAY COMMISSION OF INDIANA SURVEY BENCH MARK TABLET, STAMPED "FULTON L590". ELEVATION=761.122' (NAVD 88)

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 08/14/10

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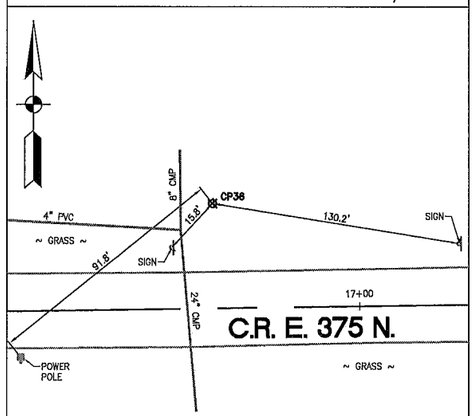
SURVEY CONTROL POINTS

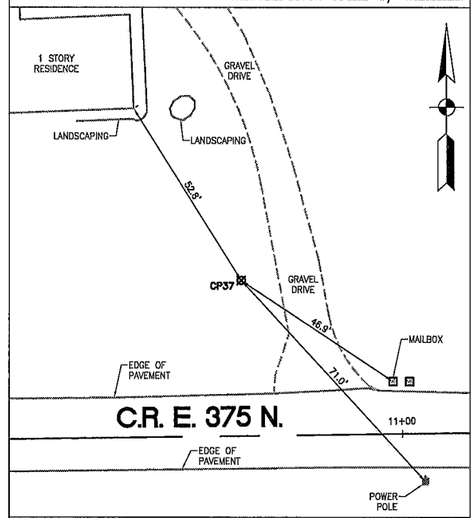
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

NORTHING: 35611.4410 ELEVATION: 765.83
EASTING: 73126.8030 DESCRIPTION: SPIKE W/ WASHER



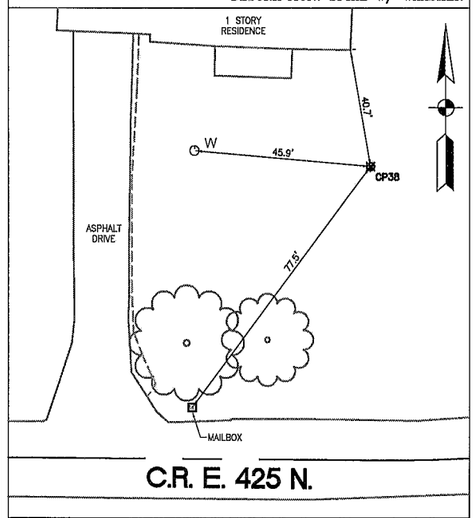
CONTROL POINT 36
NOT TO SCALE

NORTHING: 35633.1900 ELEVATION: 790.73
EASTING: 73723.0630 DESCRIPTION: SPIKE W/ WAASHER



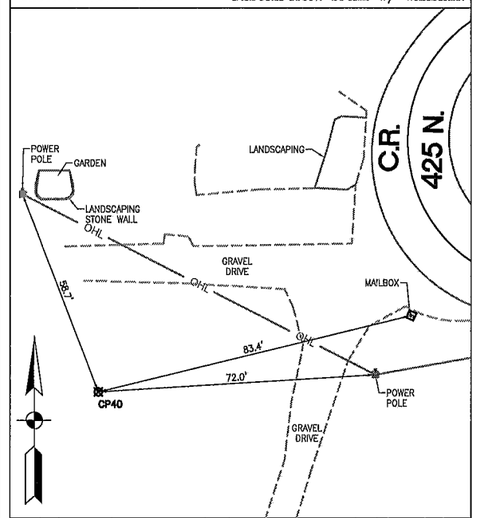
CONTROL POINT 37
NOT TO SCALE

NORTHING: 37165.0170 ELEVATION: 812.41
EASTING: 73725.6000 DESCRIPTION: SPIKE W/ WAASHER



CONTROL POINT 38
NOT TO SCALE

NORTHING: 37068.4360 ELEVATION: 813.86
EASTING: 72722.4680 DESCRIPTION: SPIKE W/ WAASHER



CONTROL POINT 40
NOT TO SCALE

BENCHMARK

DOT BM FULTON L590

IN FULTON COUNTY, ROCHESTER QUAD., IN THE LAND GRANT AREA T.31 N., R. 3 E., 2ND PM; APPROXIMATELY 2 MILES NORTH OF ROCHESTER; AT THE OLD US 31 BRIDGE OVER THE TIPPECANOE RIVER; SET IN THE TOP OF THE SOUTHWEST RETAINING WALL OF THE BRIDGE, 1.3 FEET NORTHWEST OF THE NORTHWEST CORNER OF AN ALUMINUM "I" BEAM GUARD RAIL SUPPORT POST, 0.5 FEET EAST OF THE WEST FACE OF THE CONCRETE RETAINING WALL, LEVEL WITH THE ROAD; A STATE HIGHWAY COMMISSION OF INDIANA SURVEY BENCH MARK TABLET, STAMPED "FULTON L590". ELEVATION=761.122' (NAVD 88)

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

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DATE 06/14/10

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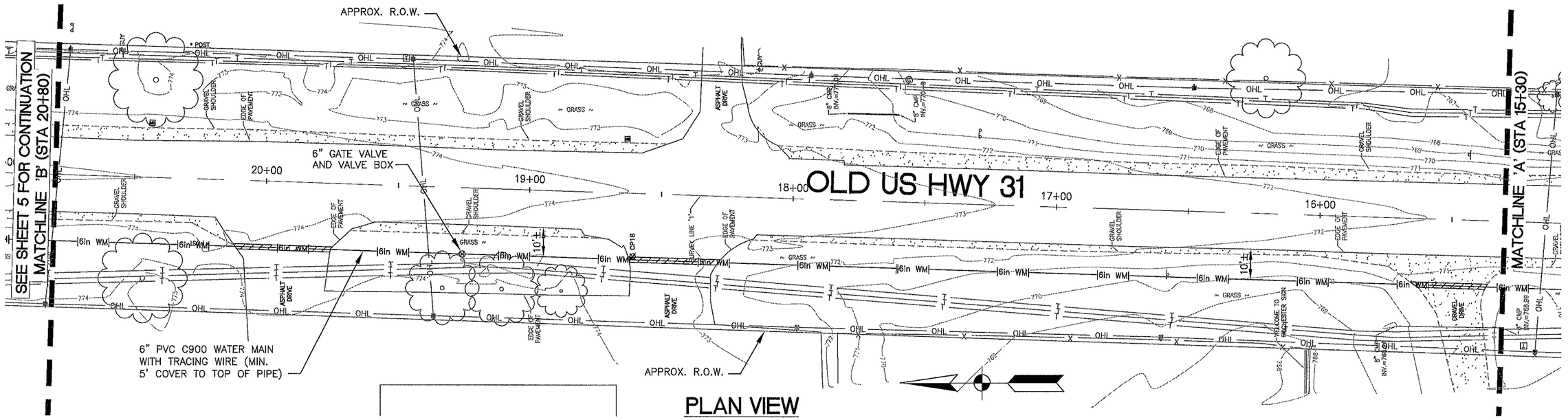
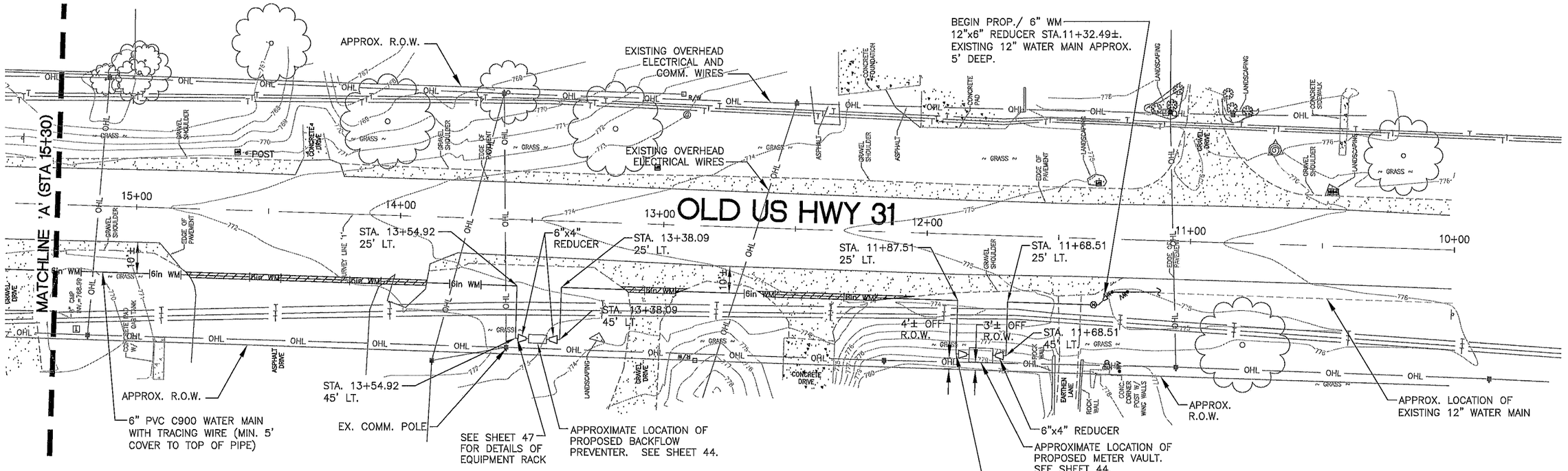
SURVEY CONTROL POINTS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY





REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
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1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
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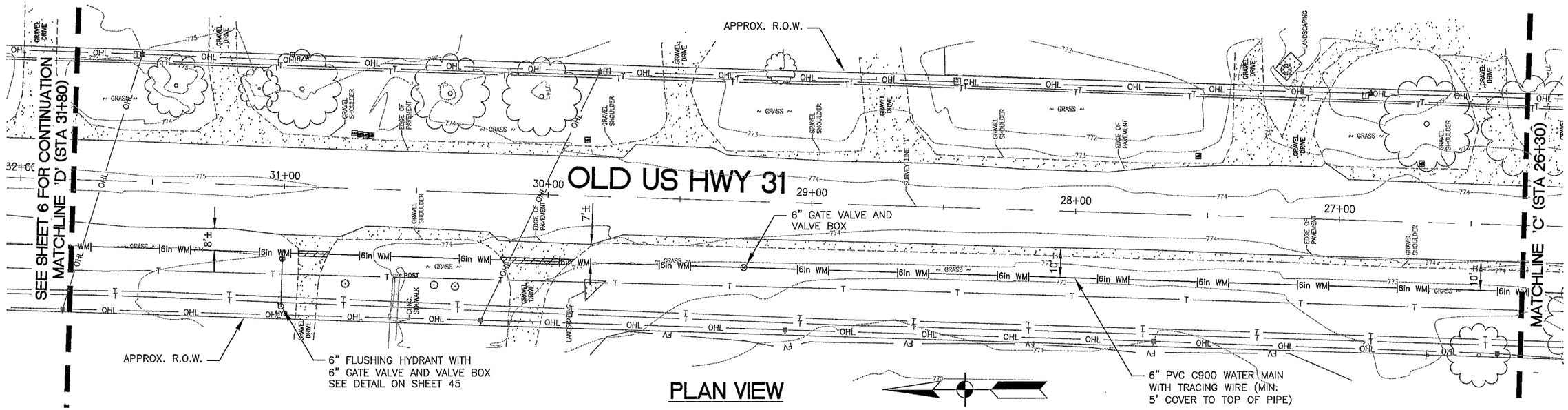
LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

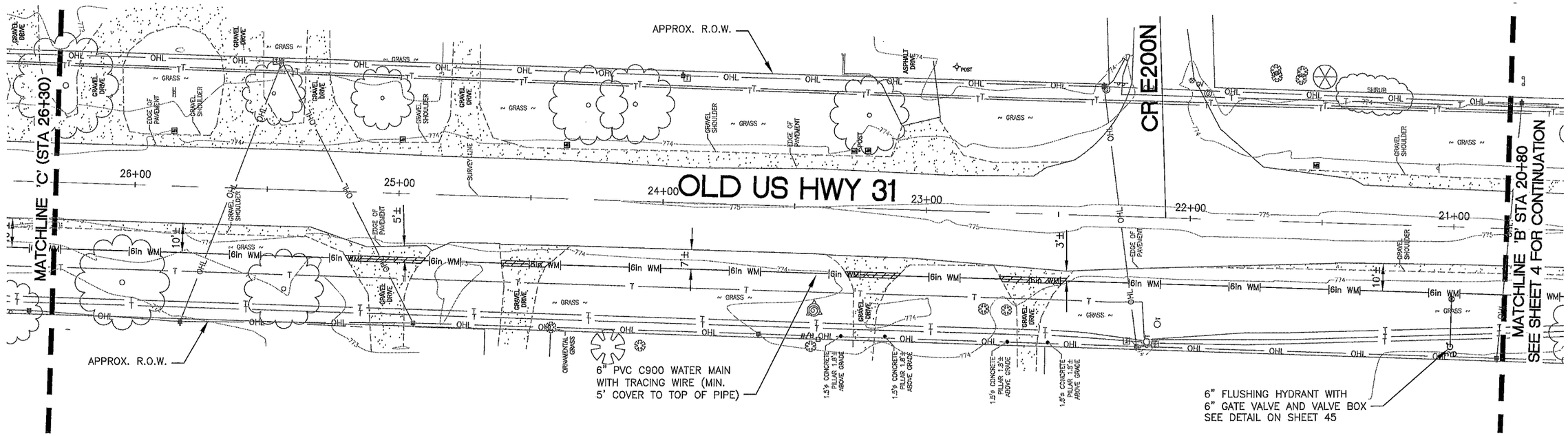
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 10+00 TO STA 20+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

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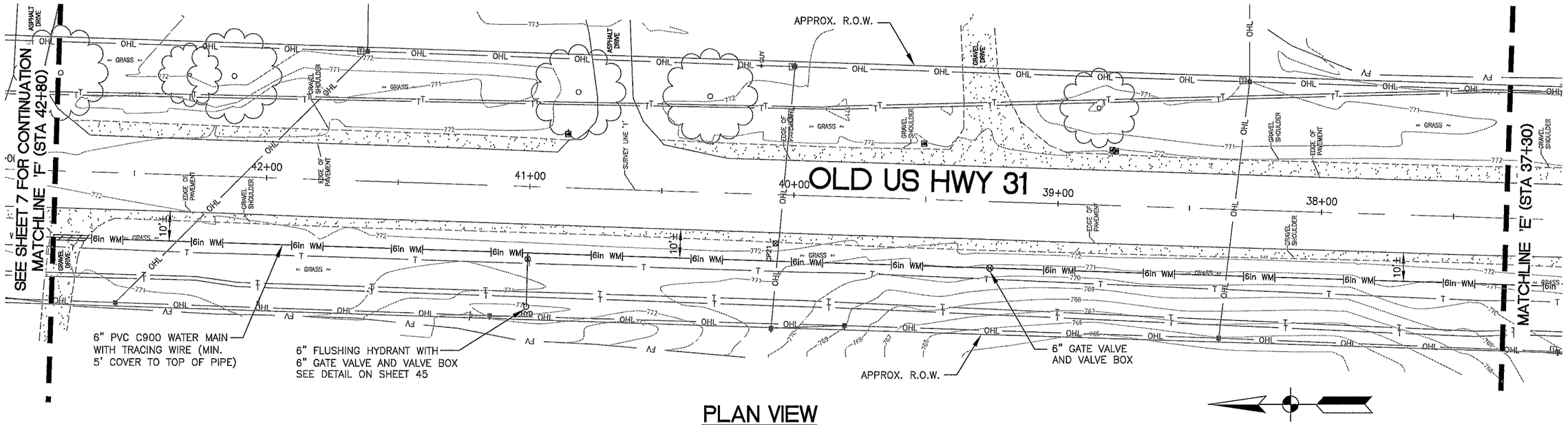
PH (309) 692-4422 FX (309) 692-9364

LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

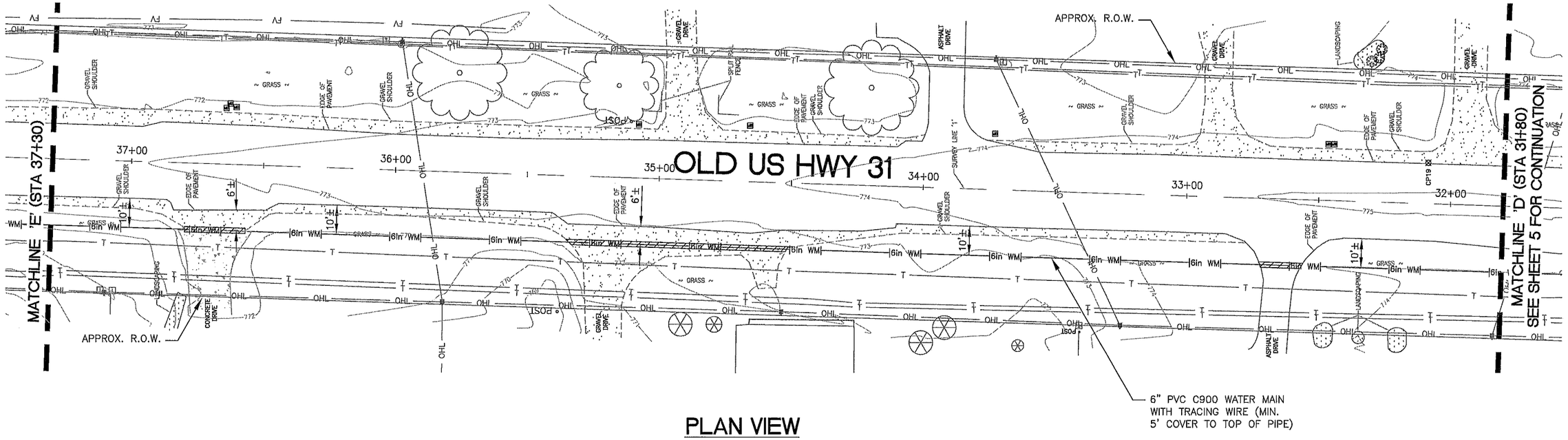
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 20+80 TO STA 31+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
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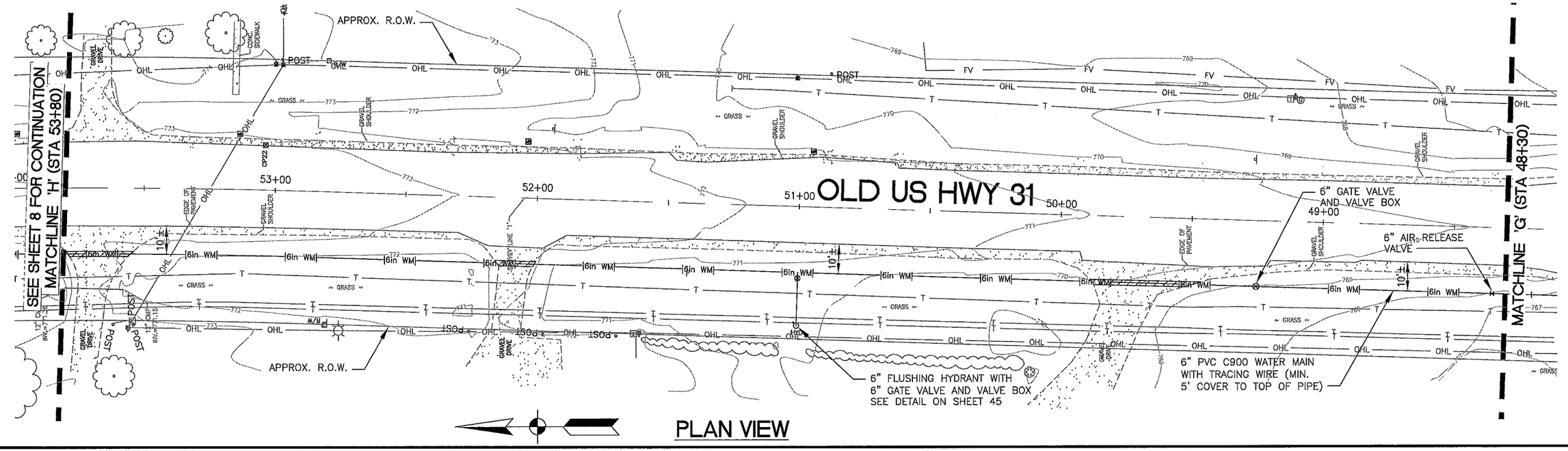
LEGEND
PAVEMENT CUT
GRAVEL, ASPHALT &
CONCRETE

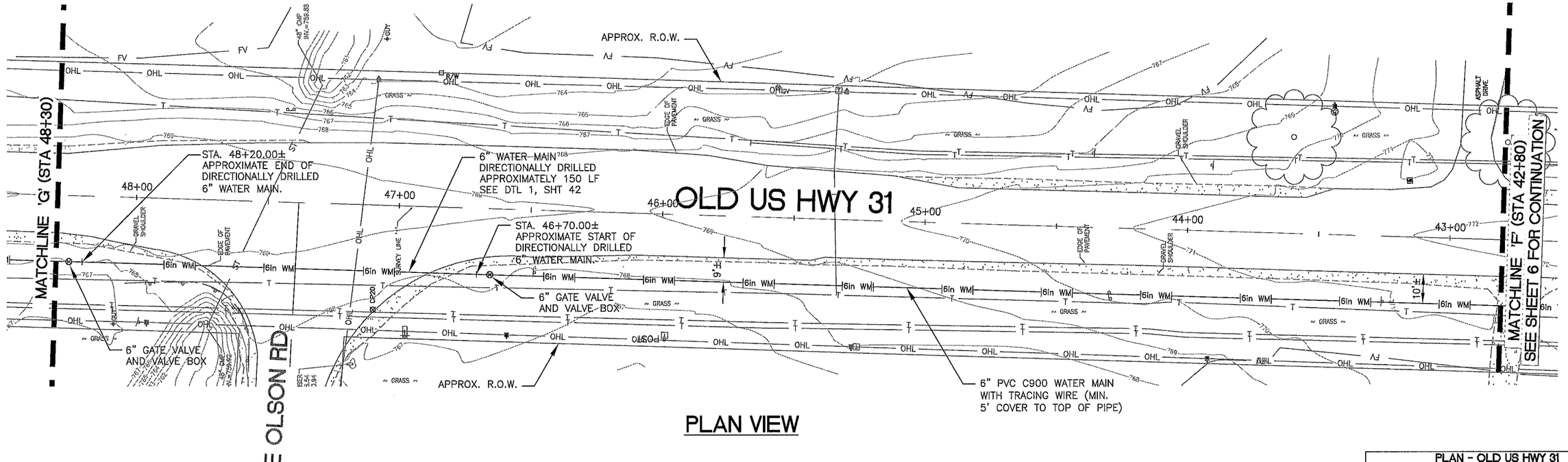
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 31+80 TO STA 42+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

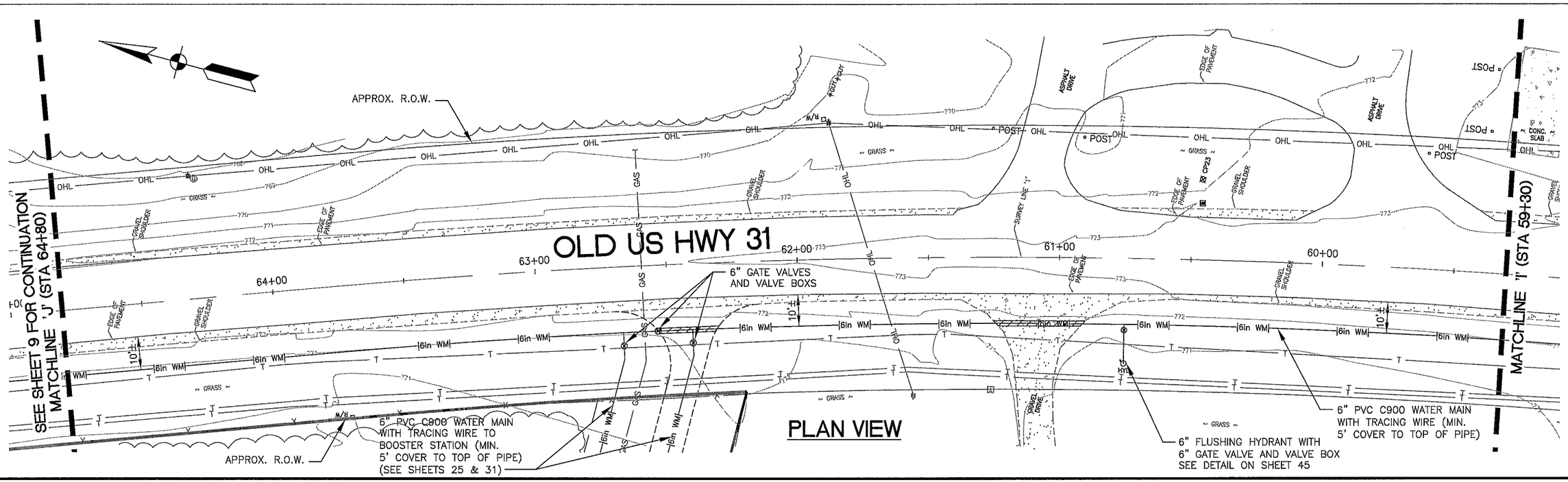
amec
8901 NORTH INDUSTRIAL RD.
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

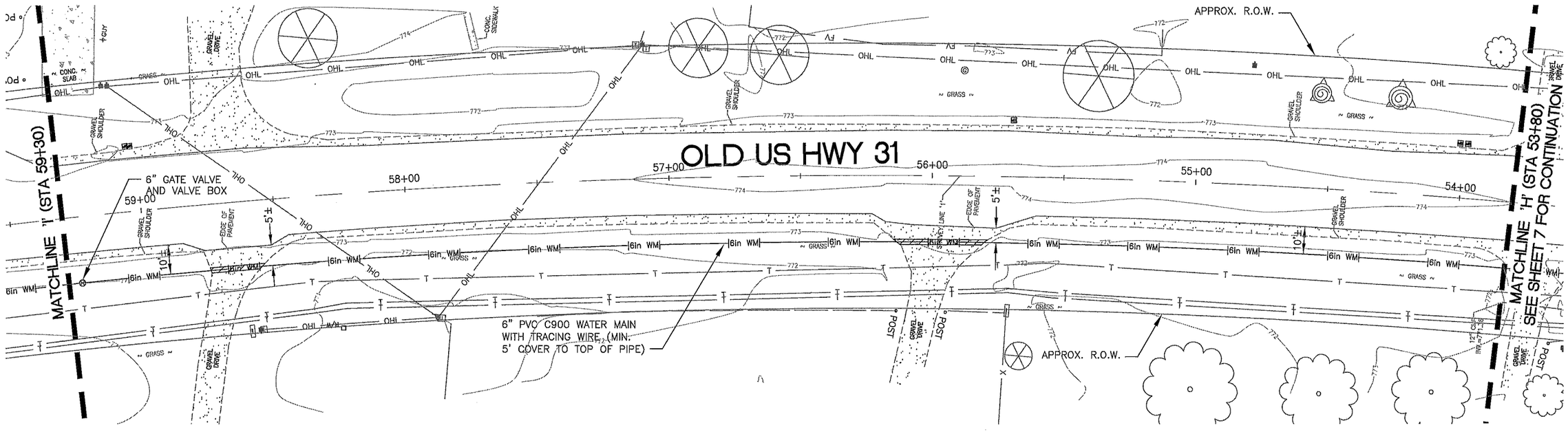
LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 42+80 TO STA 53+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY





REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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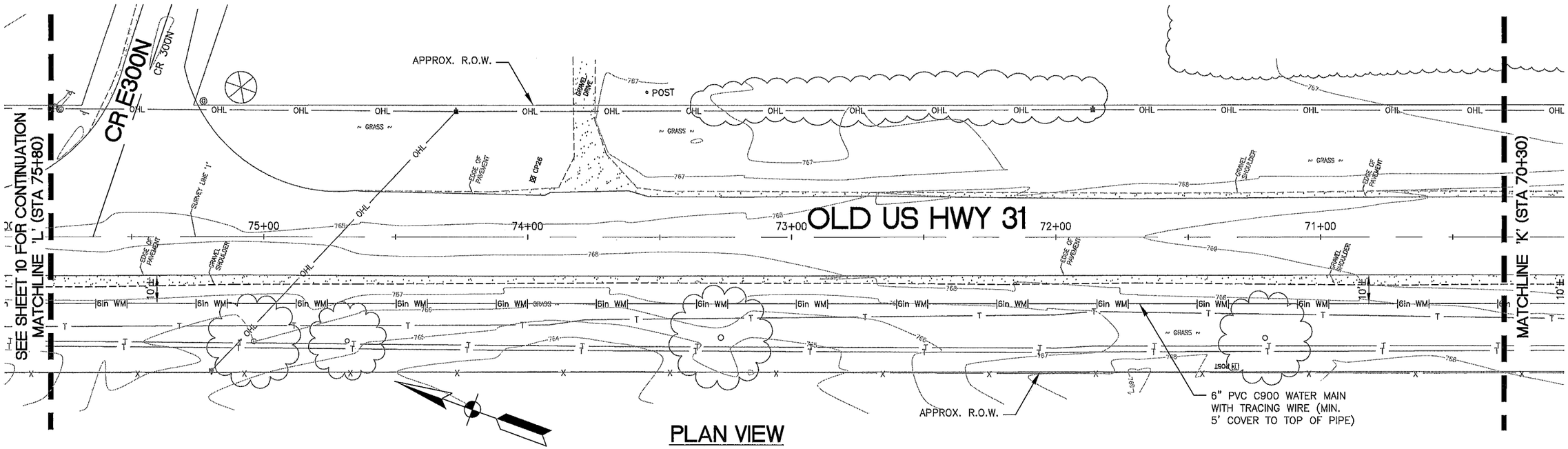
LEGEND
PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

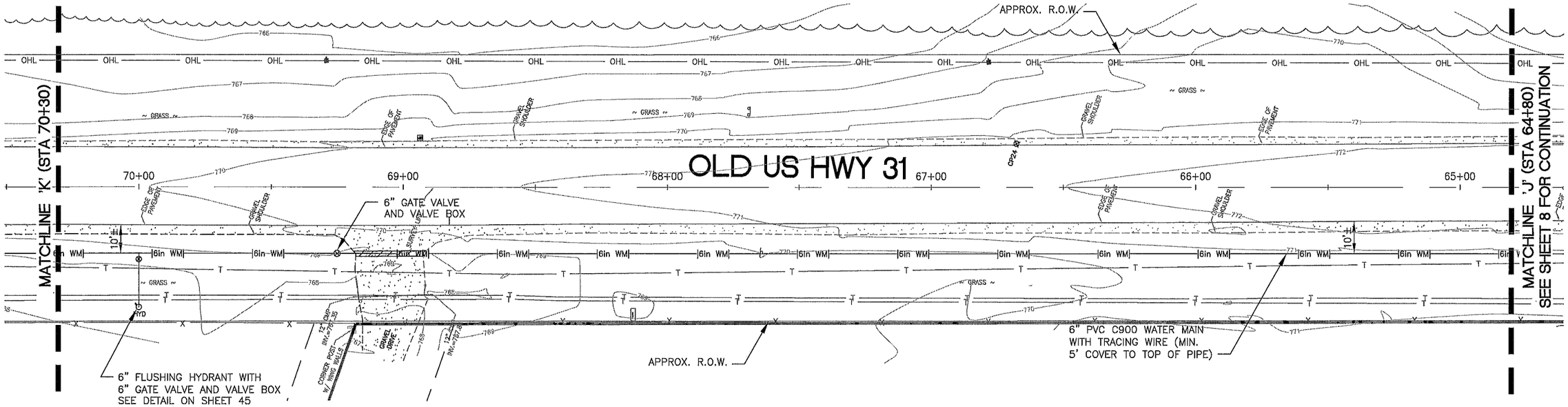
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 53+80 TO STA 64+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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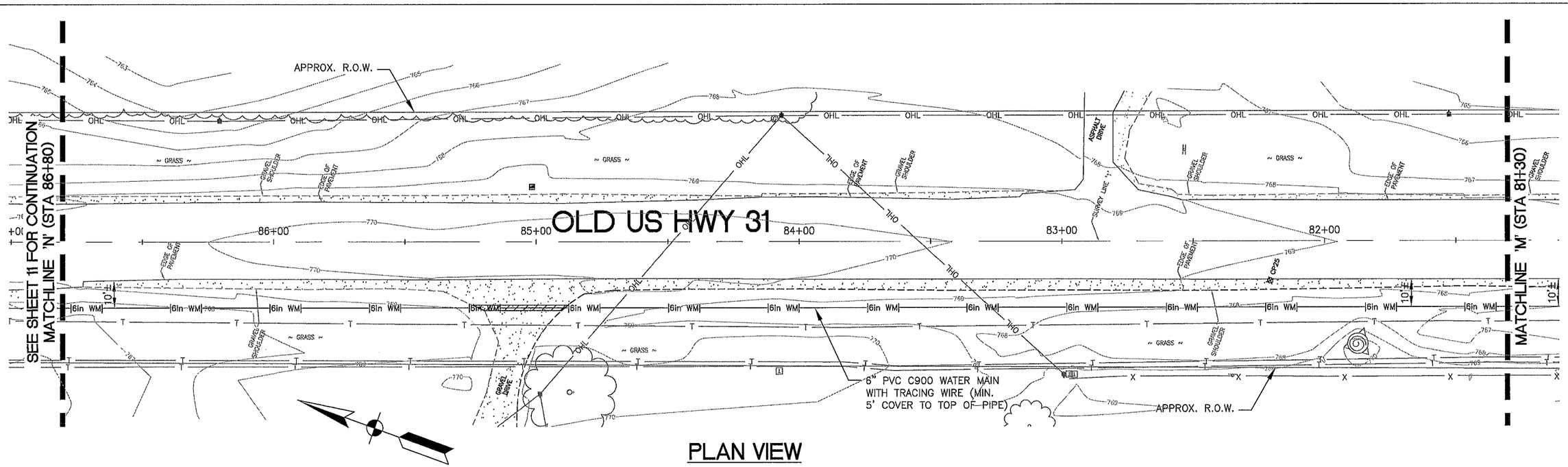
LEGEND
PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

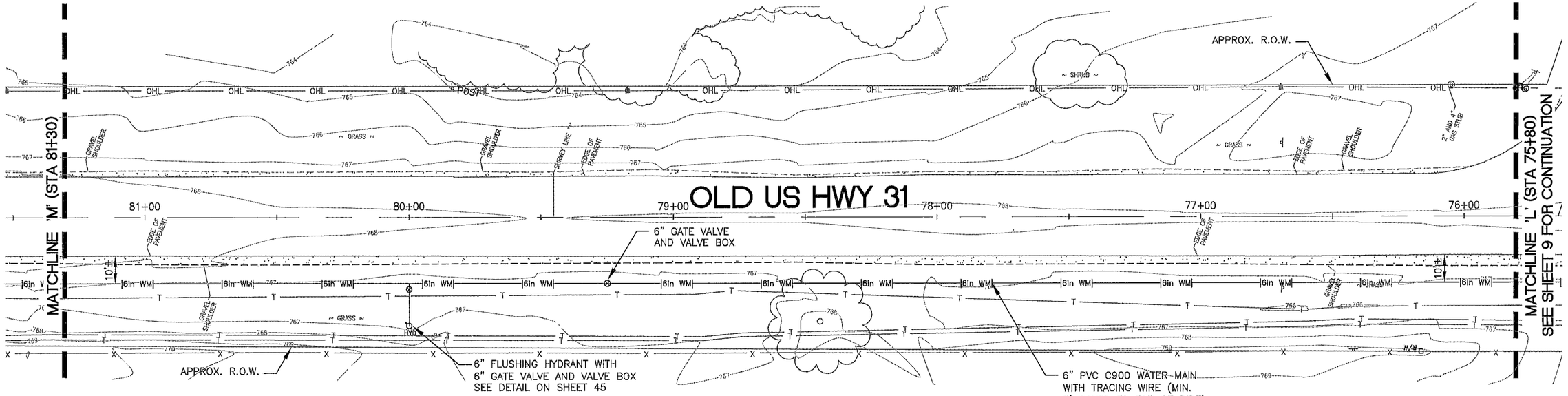
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 64+80 TO STA 75+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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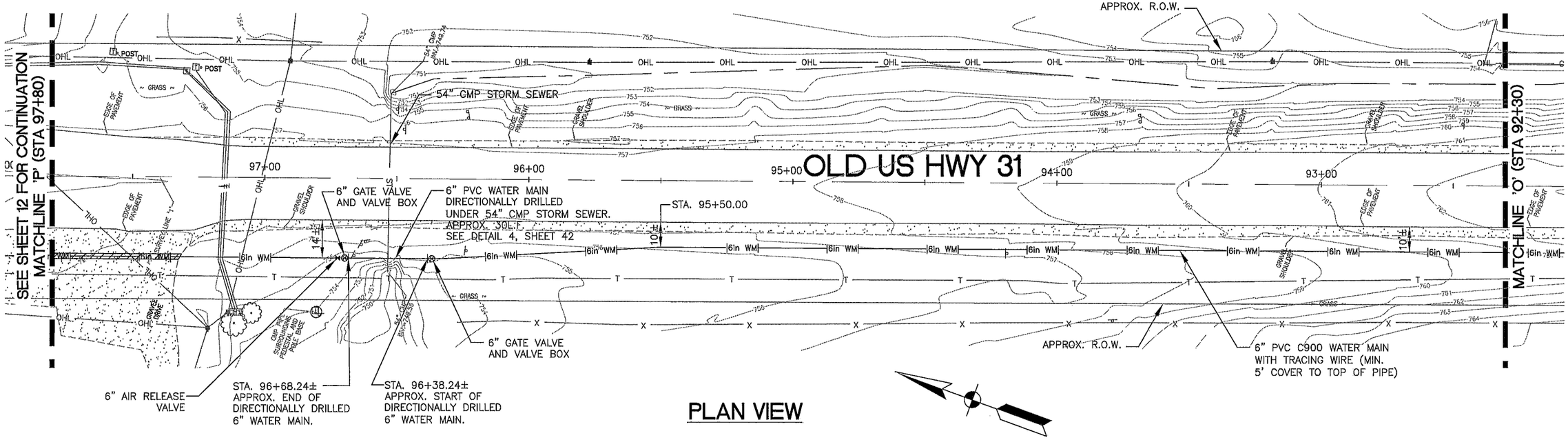
LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

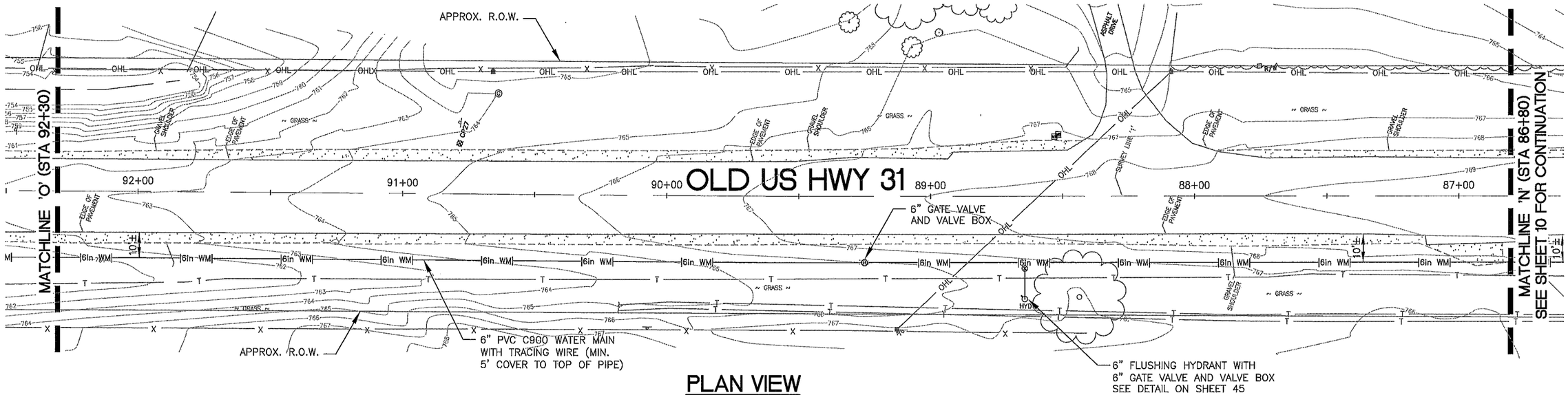
0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 75+80 TO STA 86+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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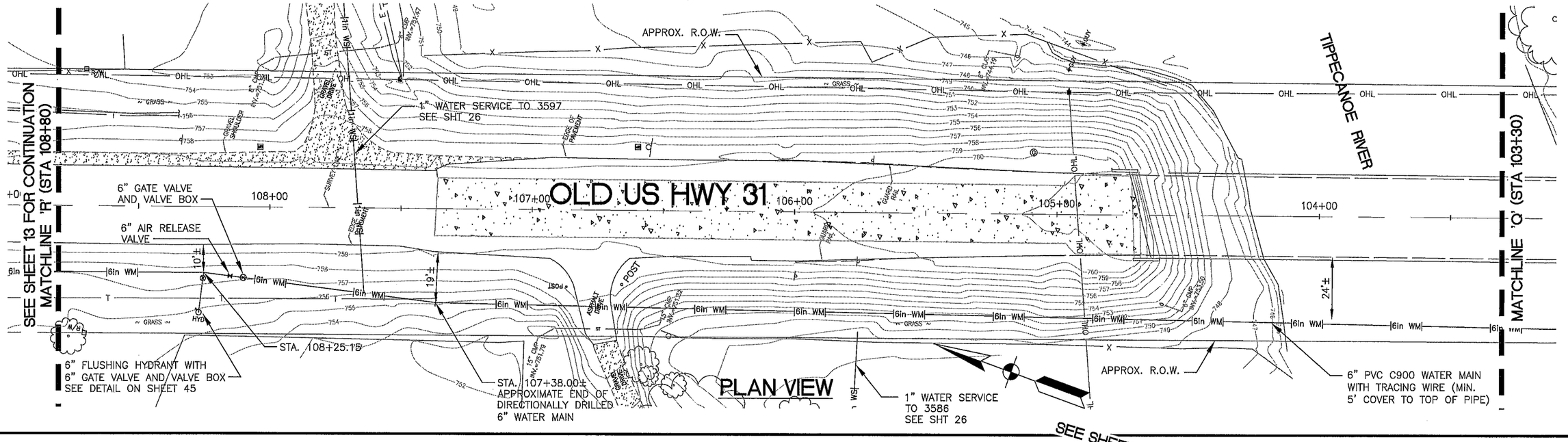
LEGEND

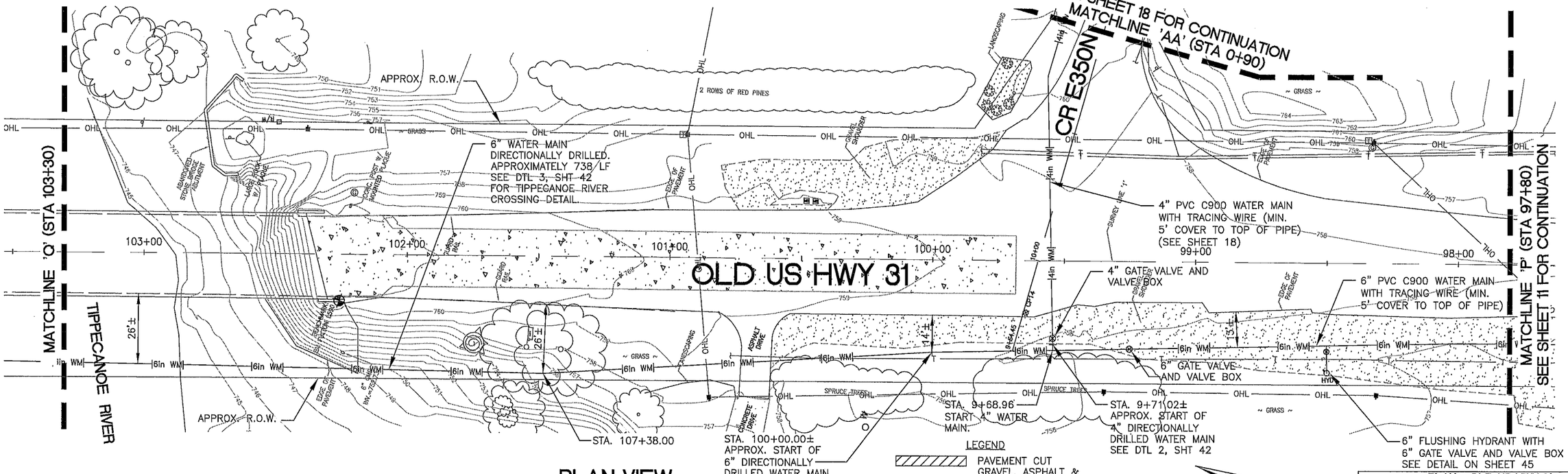
PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 86+80 TO STA 97+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY





PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
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DATE 06/14/10

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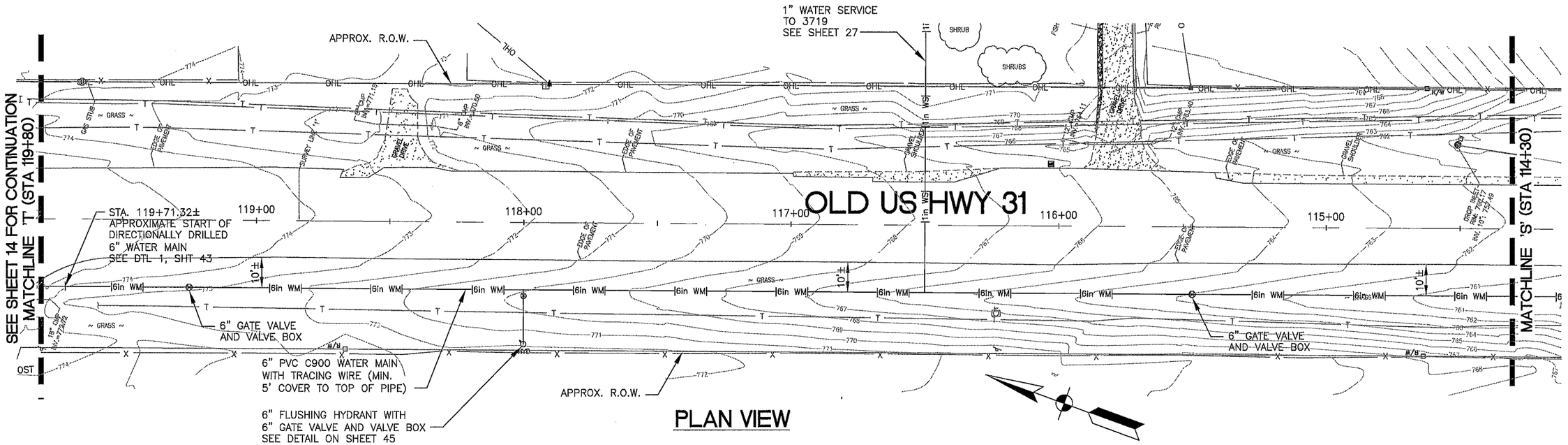
BENCHMARK

DOT BM FULTON L590
IN FULTON COUNTY, ROCHESTER QUAD., IN THE LAND GRANT AREA T.31 N., R. 3 E., 2ND PM; APPROXIMATELY 2 MILES NORTH OF ROCHESTER; AT THE OLD US 31 BRIDGE OVER THE TIPPECANOE RIVER; SET IN THE TOP OF THE SOUTHWEST RETAINING WALL OF THE BRIDGE, 1.3 FEET NORTHWEST OF THE NORTHWEST CORNER OF AN ALUMINUM "I" BEAM GUARD RAIL SUPPORT POST, 0.5 FEET EAST OF THE WEST FACE OF THE CONCRETE RETAINING WALL, LEVEL WITH THE ROAD; A STATE HIGHWAY COMMISSION OF INDIANA SURVEY BENCH MARK TABLET, STAMPED "FULTON L590". ELEVATION=761.122' (NAVD 88)

0 20 40

PLAN - OLD US HWY 31
(STA 97+80 TO STA 108+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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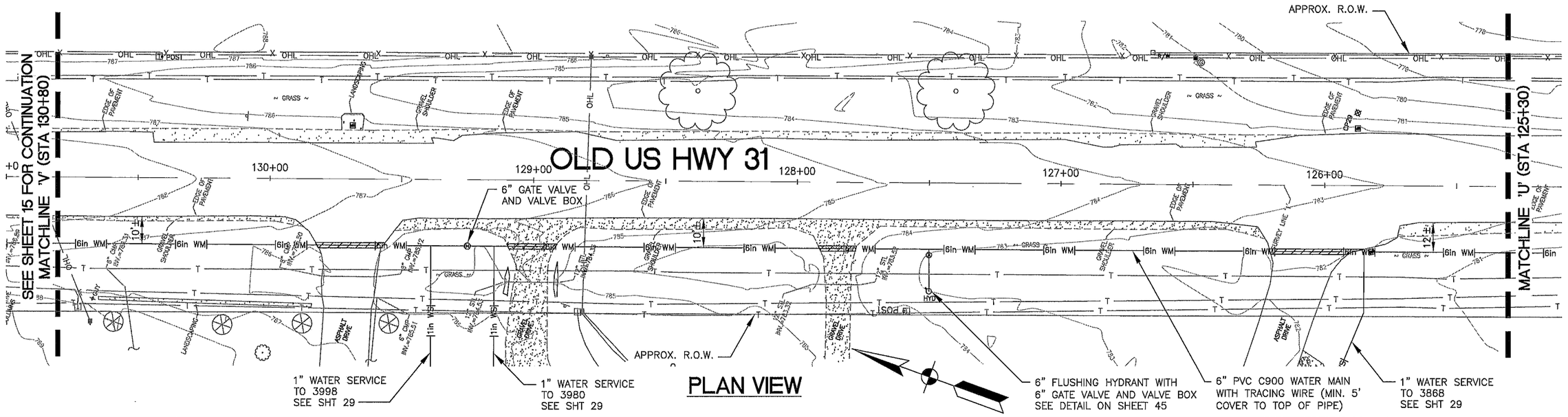
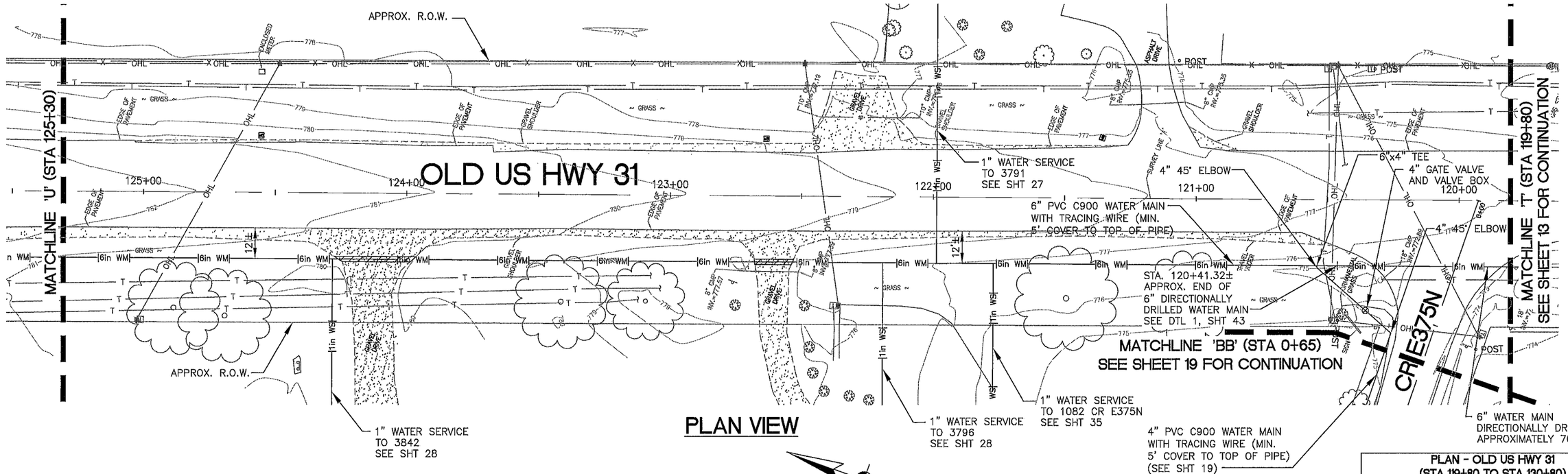
LEGEND
PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 108+80 TO STA 119+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY





REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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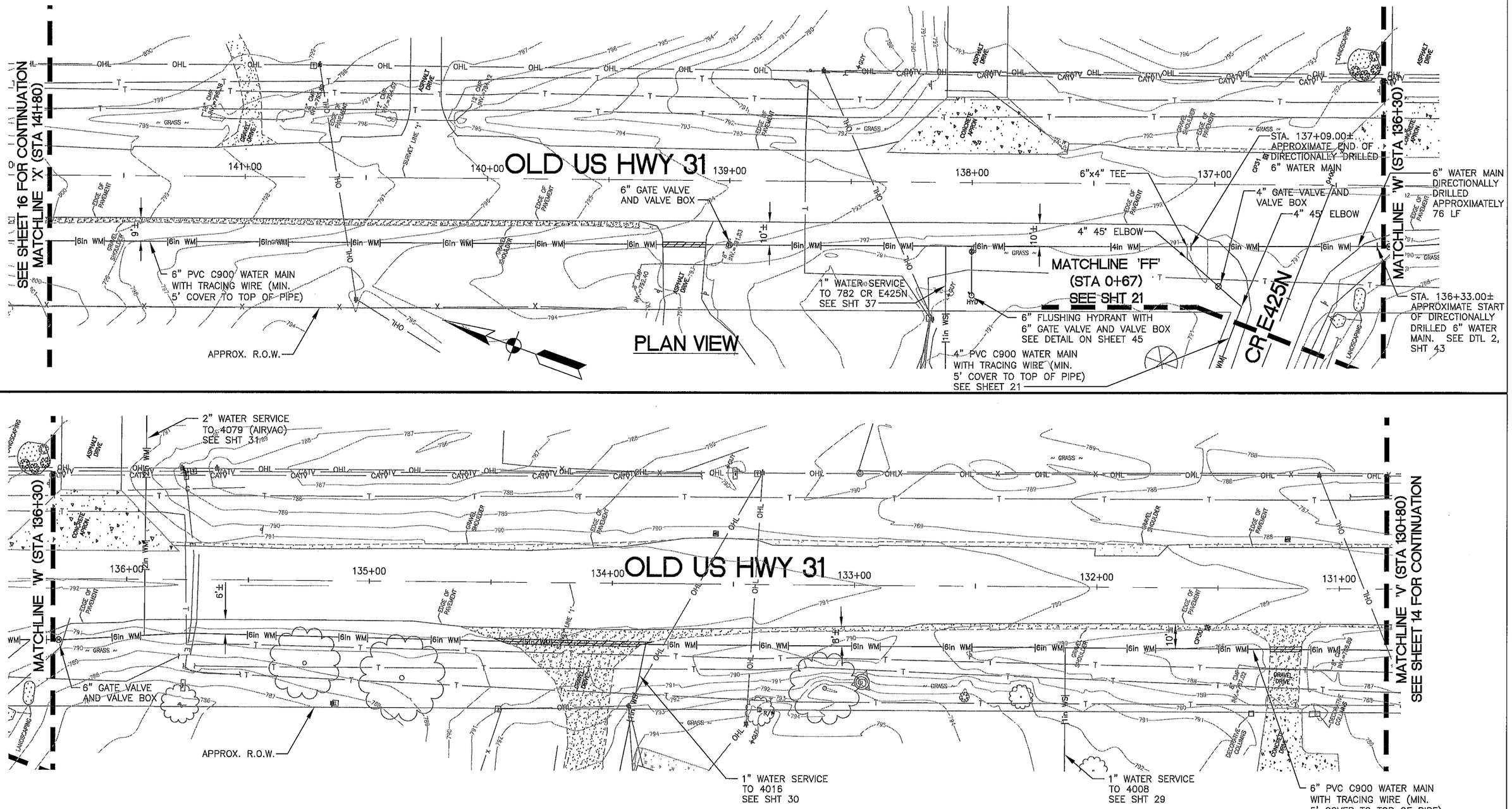
PH (309) 692-4422 FX (309) 692-9364

SCALE: 1"=20'

LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

PLAN - OLD US HWY 31
(STA 119+80 TO STA 130+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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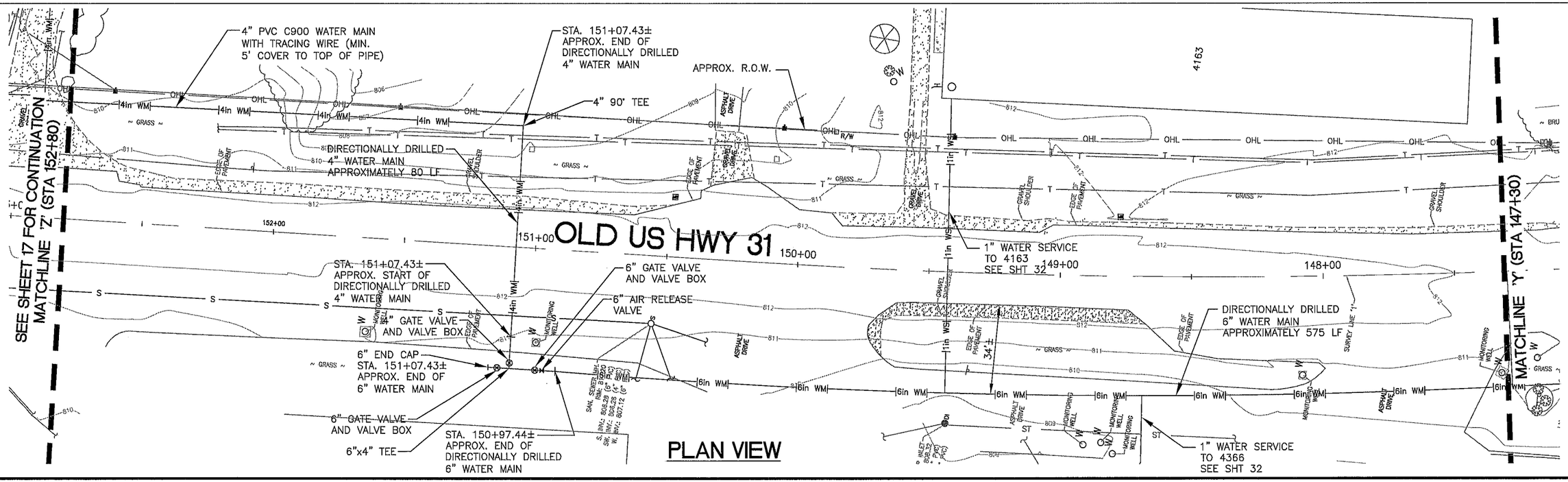
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 130+80 TO STA 141+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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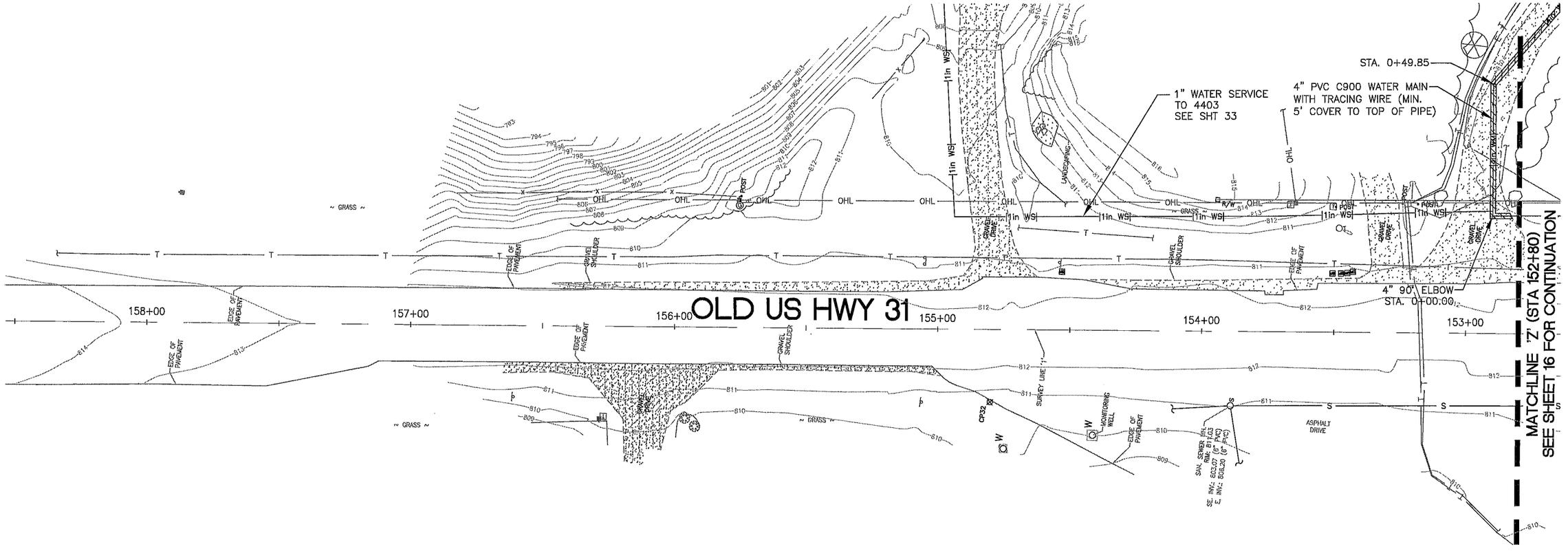
8901 NORTH INDUSTRIAL RD.
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

PLAN - OLD US HWY 31
(STA 141+80 TO STA 152+80)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

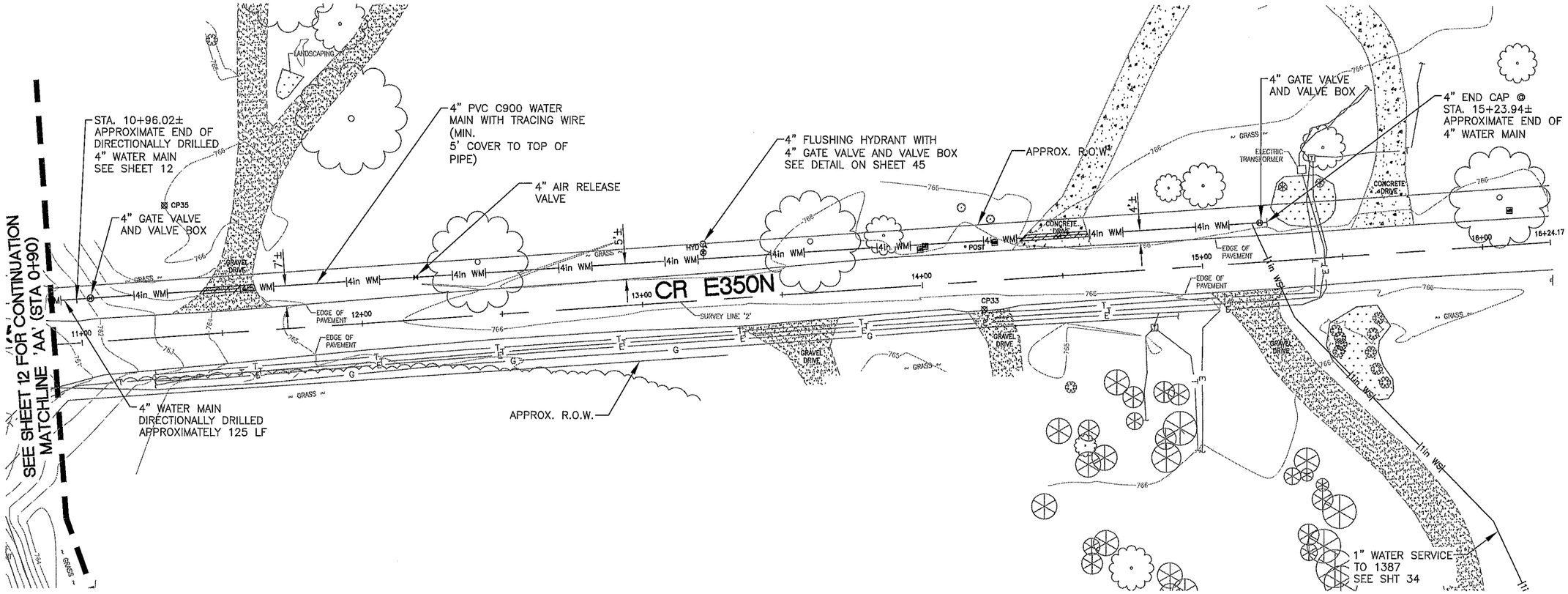
amec
8901 NORTH INDUSTRIAL RD.
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

PLAN - OLD US HWY 31
(STA 152+80 TO E.O.P.)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 08/14/10

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PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

LEGEND

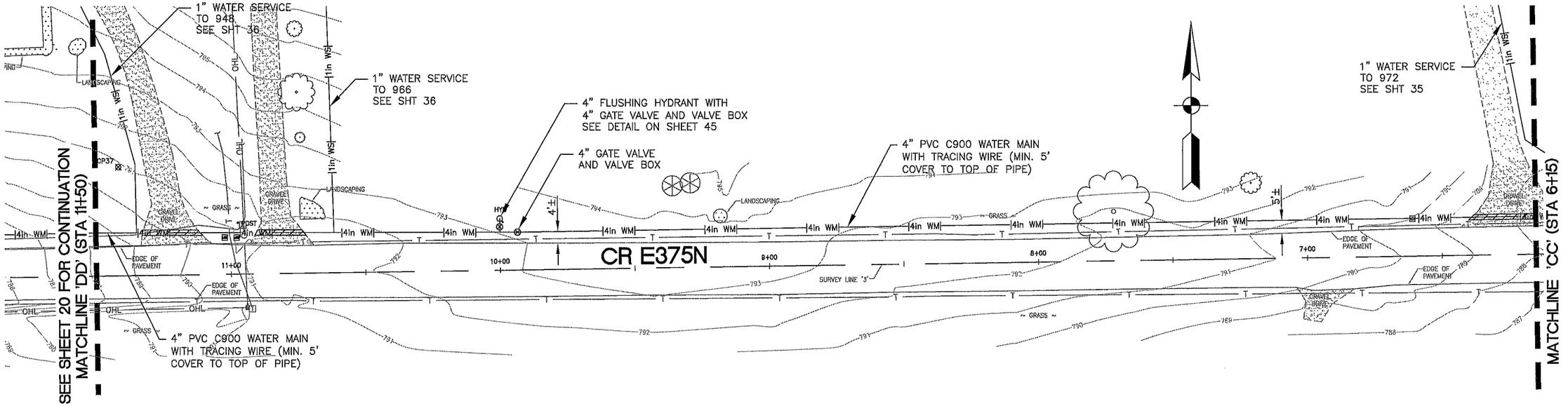
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

0 20 40

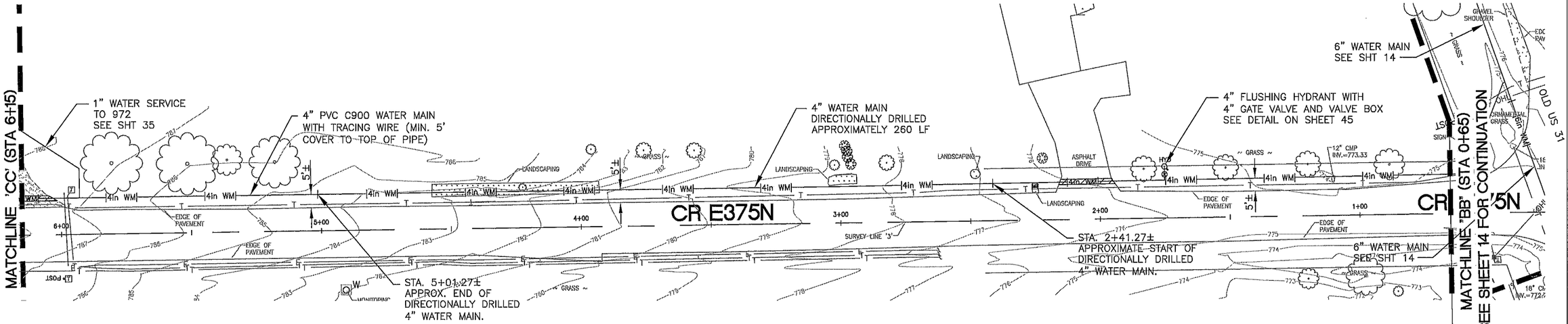
SCALE: 1"=20'

PLAN - CR E350N
(STA 0+90 TO E.O.P.)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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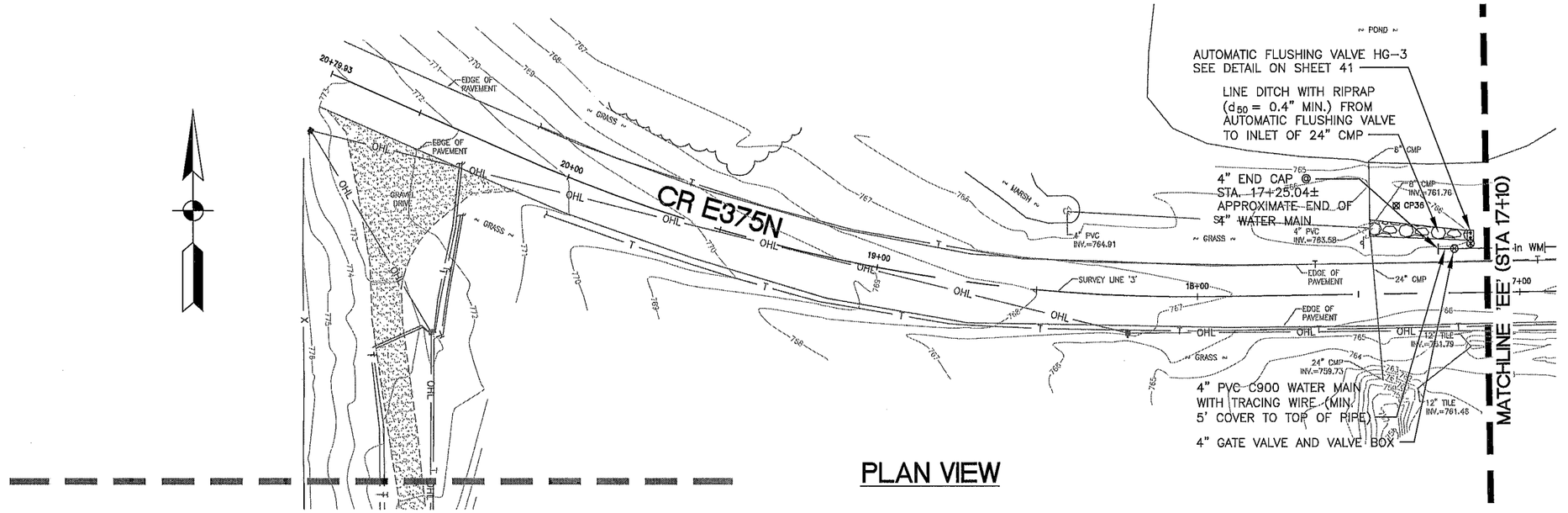
LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

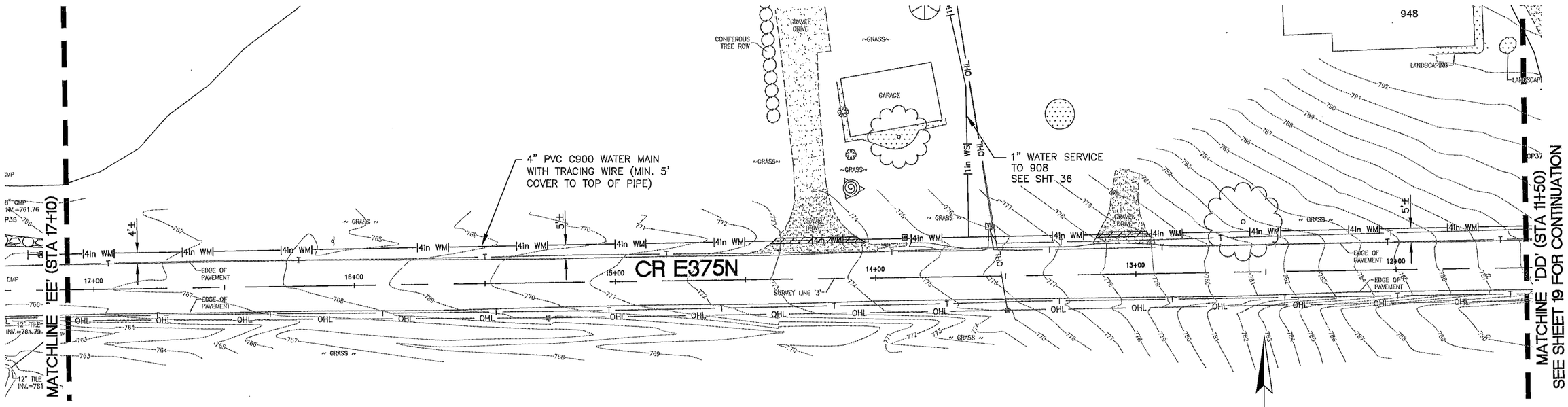
0 20 40
SCALE: 1"=20'

PLAN - CR E375N
(STA 0+65 TO STA 11+50)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW



PLAN VIEW

LEGEND

PAVEMENT CUT
GRAVEL, ASPHALT &
CONCRETE

0 20 40

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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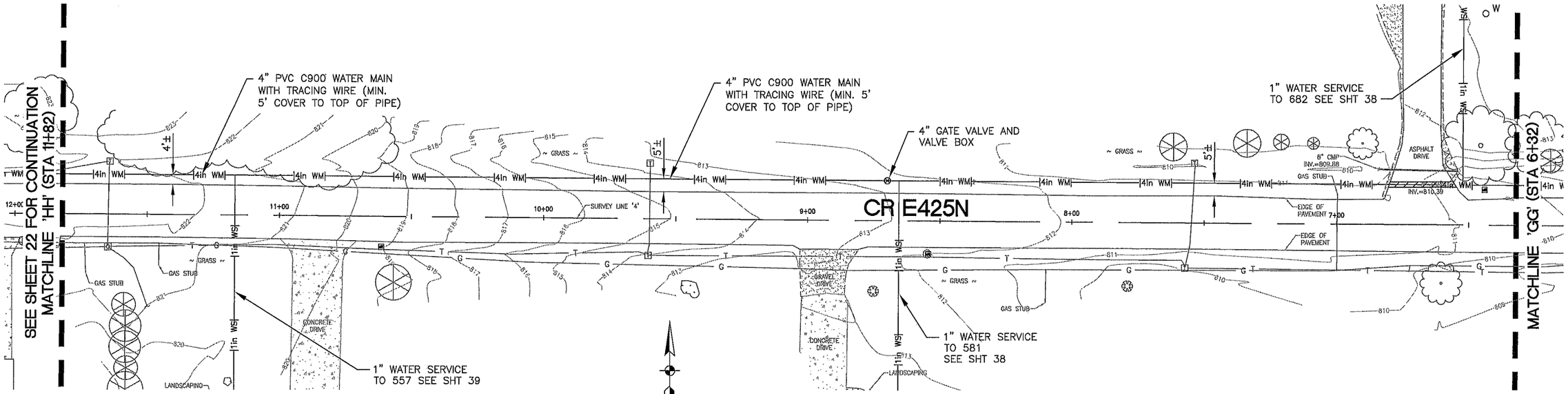
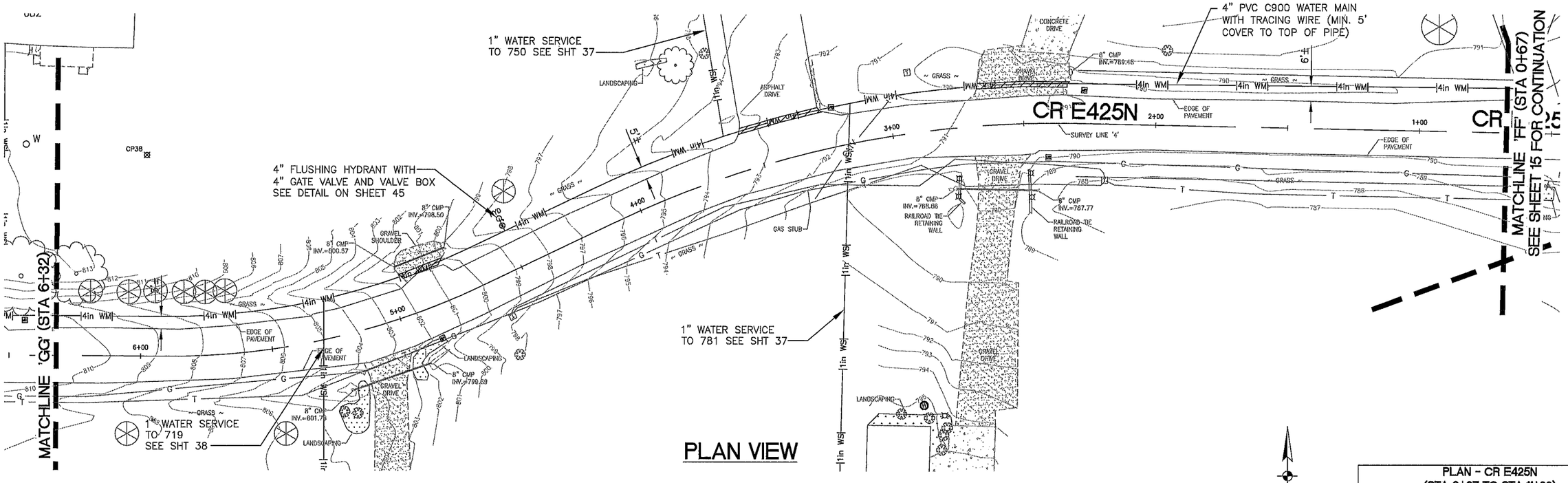
PLAN - CR E375N
(STA 11+50 TO E.O.P.)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY





REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
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1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JRA
CHECKED GMM
DATE 06/14/10

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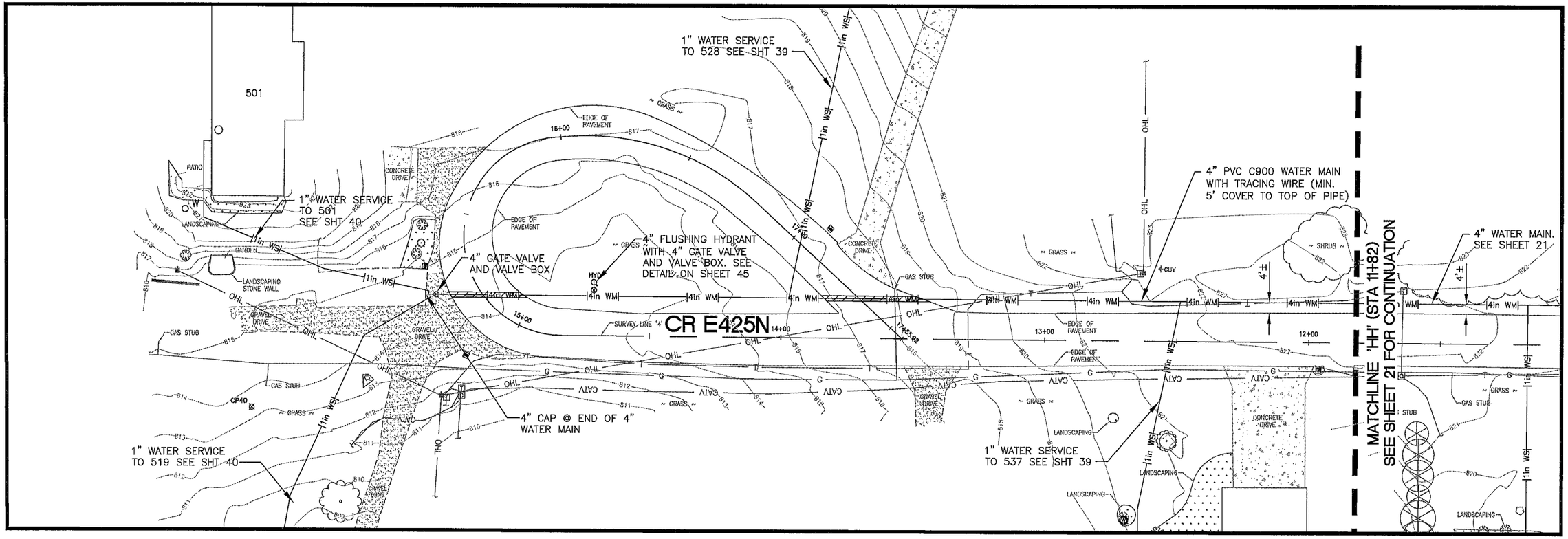
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

LEGEND
PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

SCALE: 1"=20'

PLAN - CR E425N
(STA 0+67 TO STA 11+82)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW

LEGEND

PAVEMENT CUT GRAVEL, ASPHALT & CONCRETE

0 20 40

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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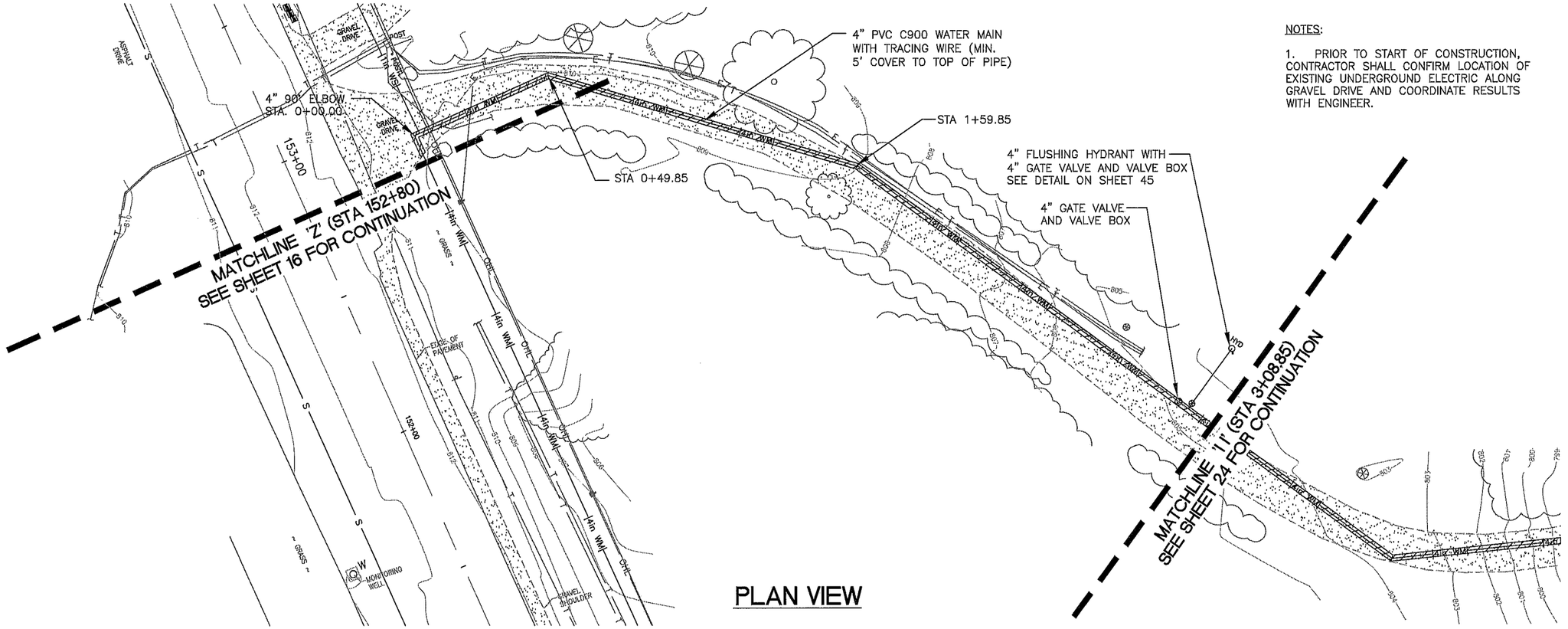
PLAN - CR E425N
(STA 11+82 TO E.O.P.)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



NOTES:

1. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL CONFIRM LOCATION OF EXISTING UNDERGROUND ELECTRIC ALONG GRAVEL DRIVE AND COORDINATE RESULTS WITH ENGINEER.

PLAN VIEW

LEGEND

PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

0 20 40
SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
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CHECKED GMM
DATE 06/14/10

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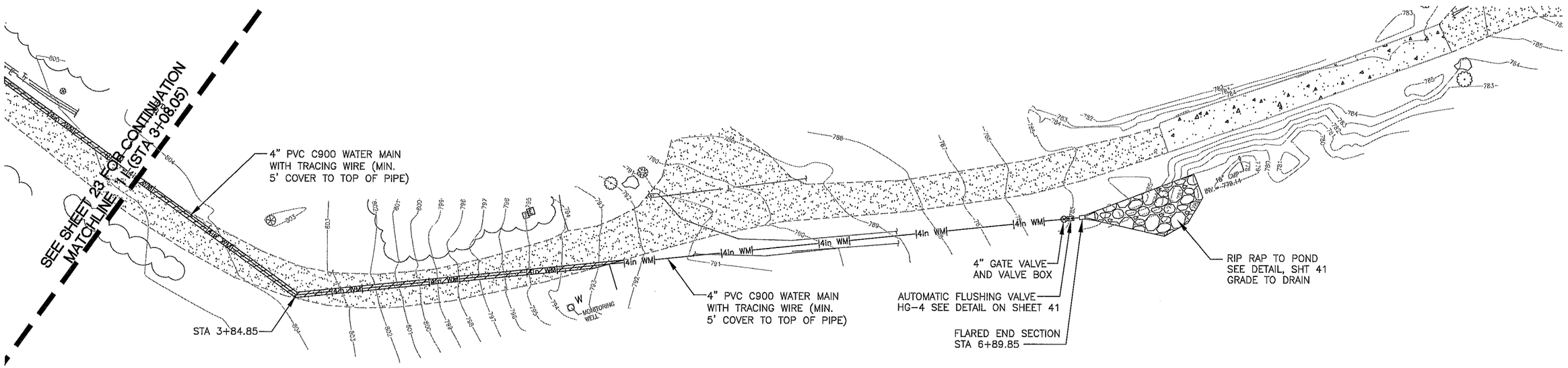
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

PLAN - 4" WATER MAIN
(STA 0+00 TO STA 3+08.85)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



PLAN VIEW

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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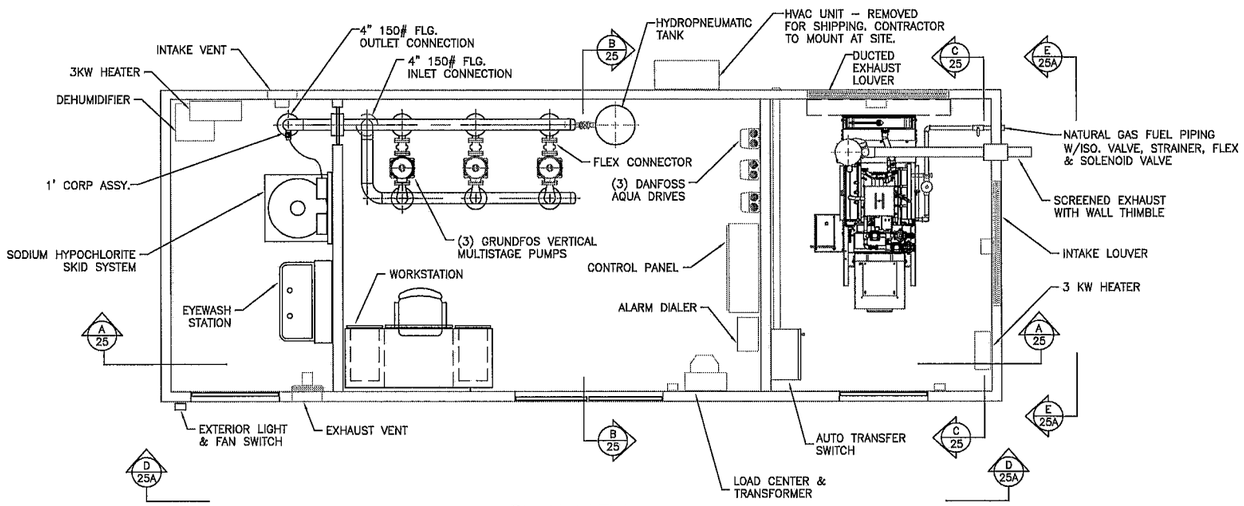
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

LEGEND
PAVEMENT CUT
GRAVEL, ASPHALT & CONCRETE

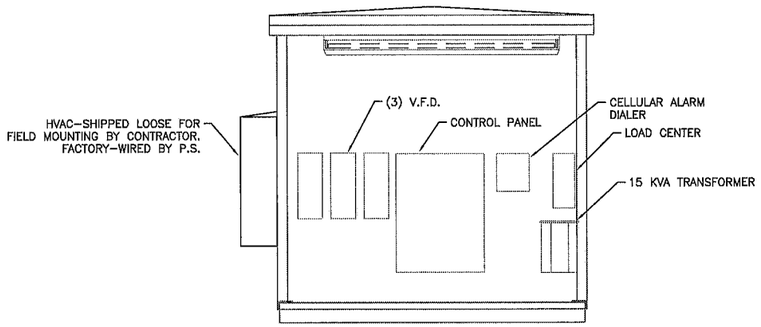
0 20 40
SCALE: 1"=20'

PLAN - 4" WATER MAIN
(STA 3+08.85 TO E.O.P.)

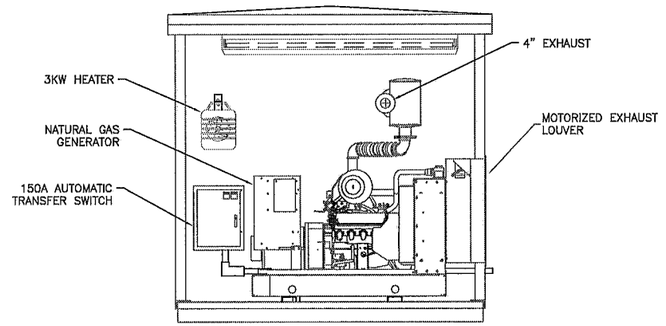
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



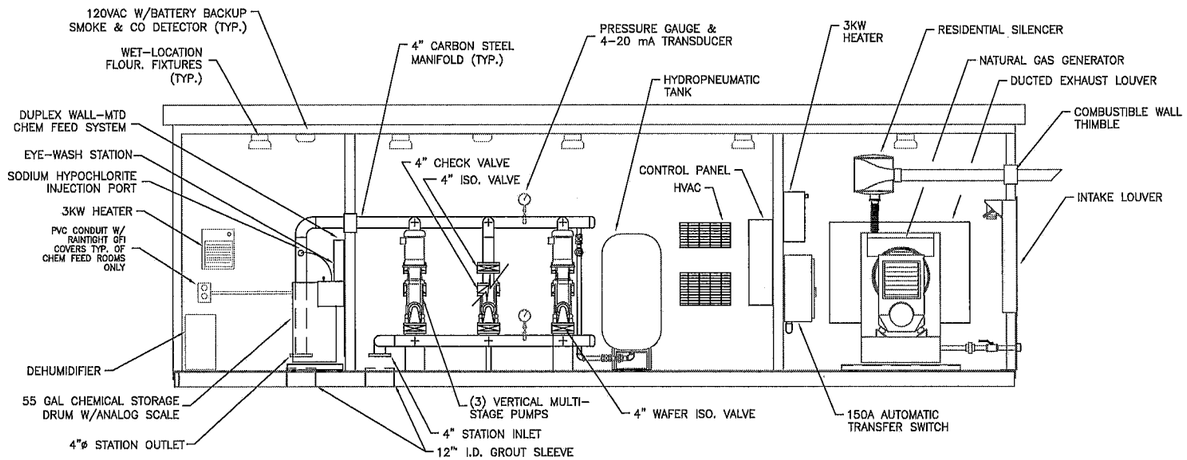
PLAN VIEW
NOT TO SCALE



SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE



SECTION A-A
NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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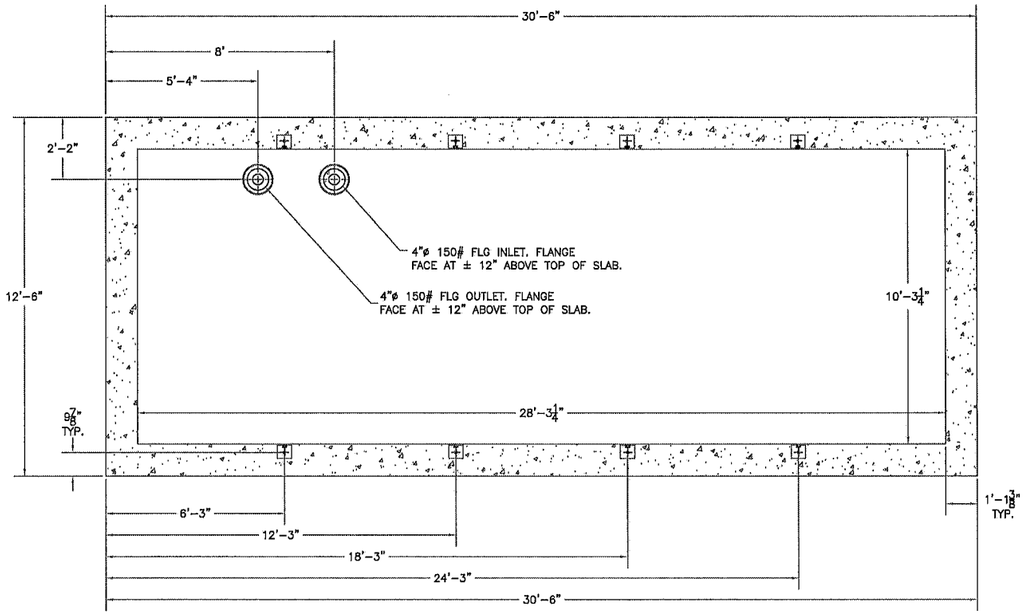
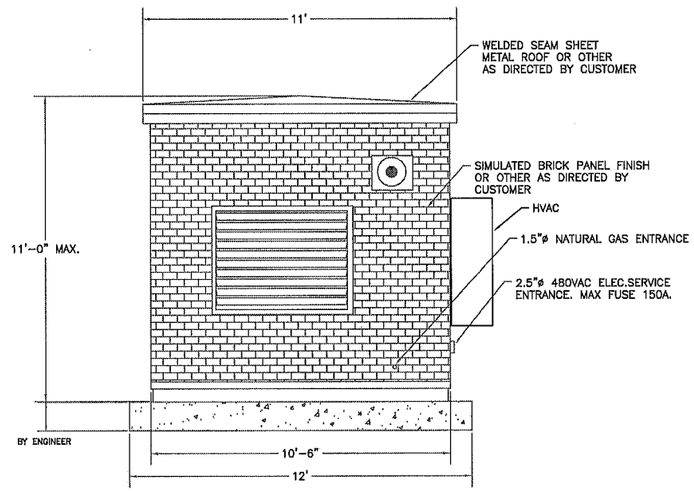
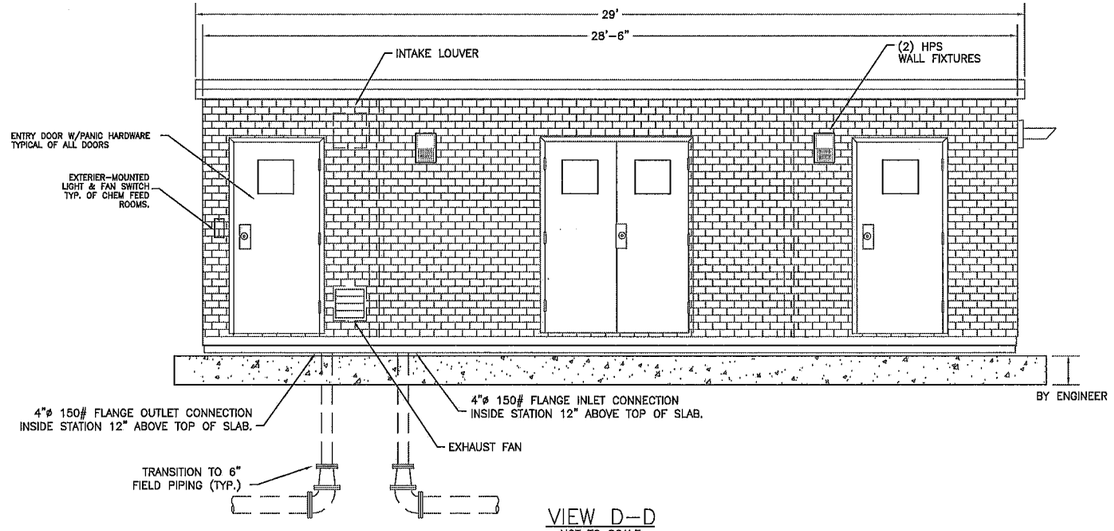
BOOSTER STATION DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

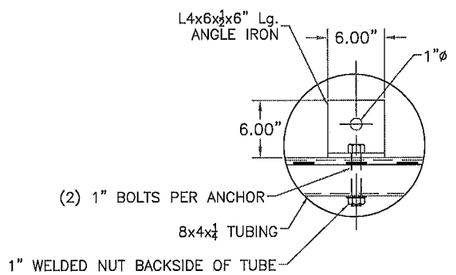




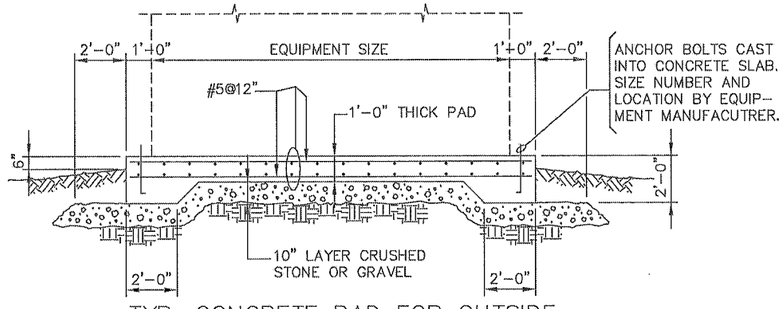
VIEW E-E
NOT TO SCALE



VIEW D-D
NOT TO SCALE



ANCHOR LUG DETAIL
NOT TO SCALE



TYP. CONCRETE PAD FOR OUTSIDE EQUIPMENT (U.O.N.)
NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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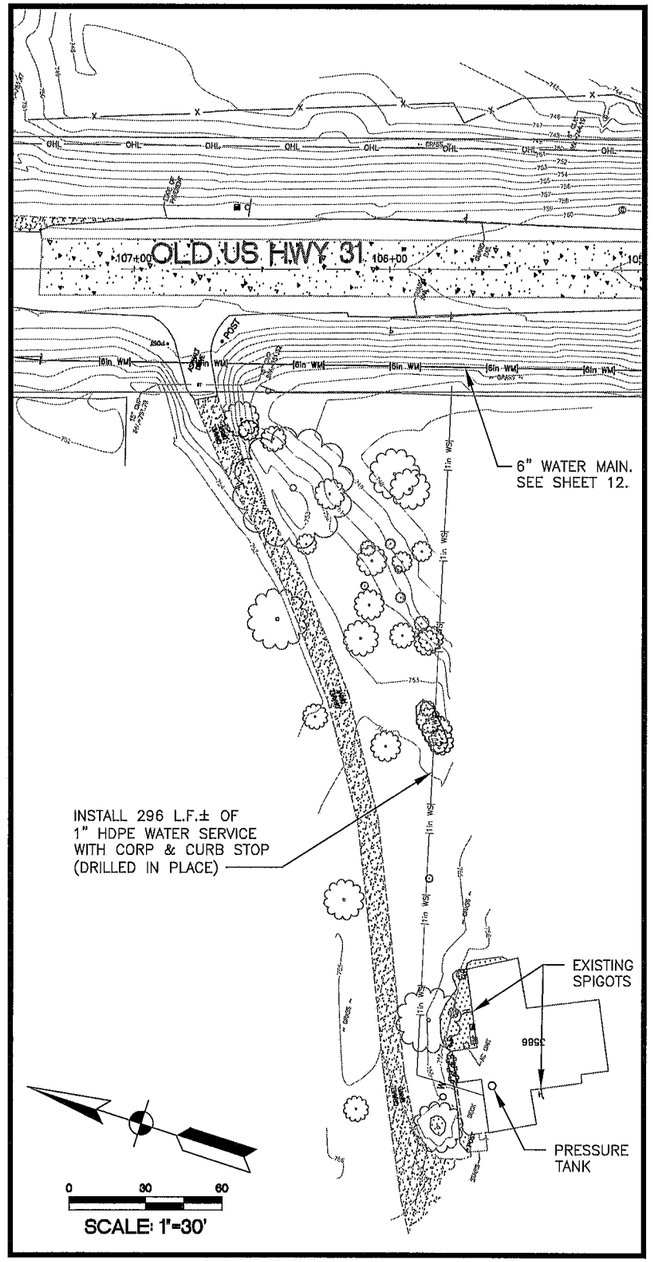
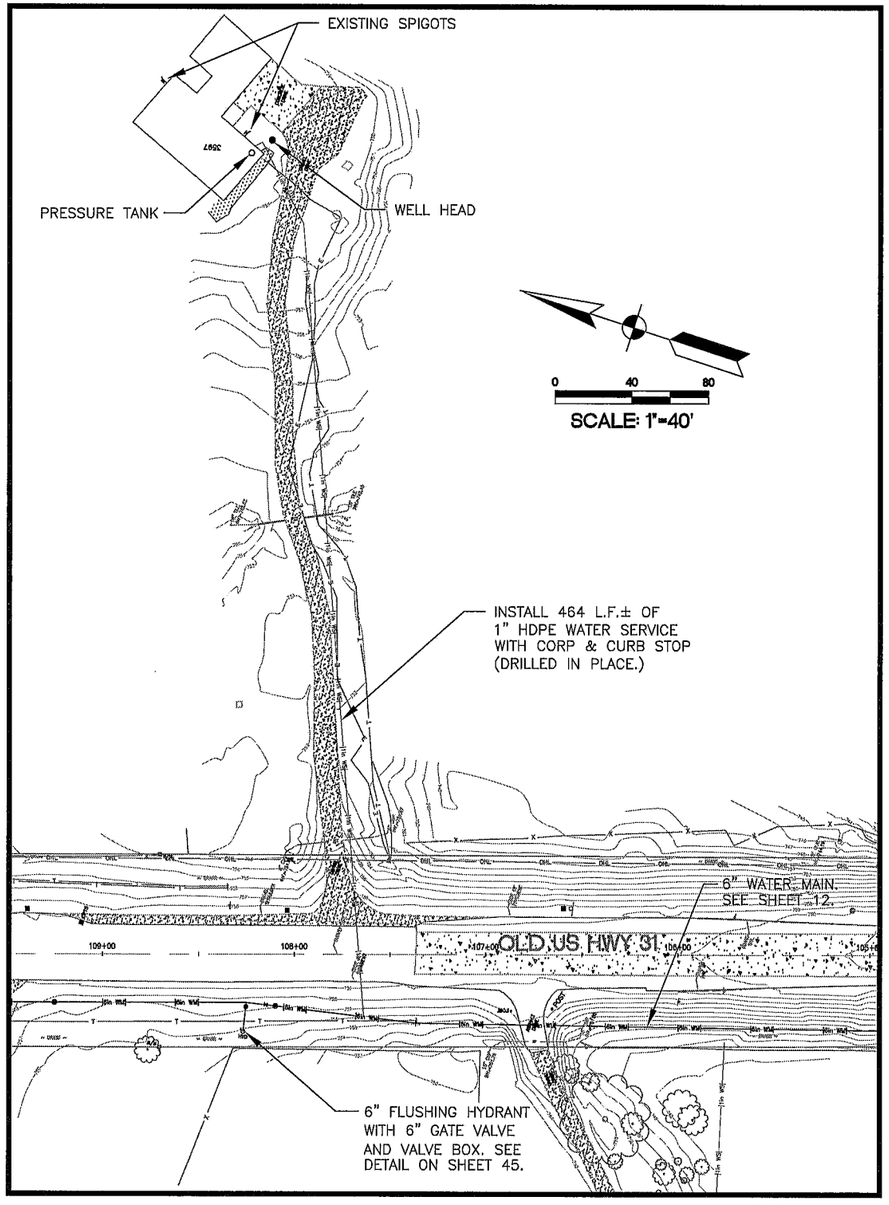
BOOSTER STATION DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



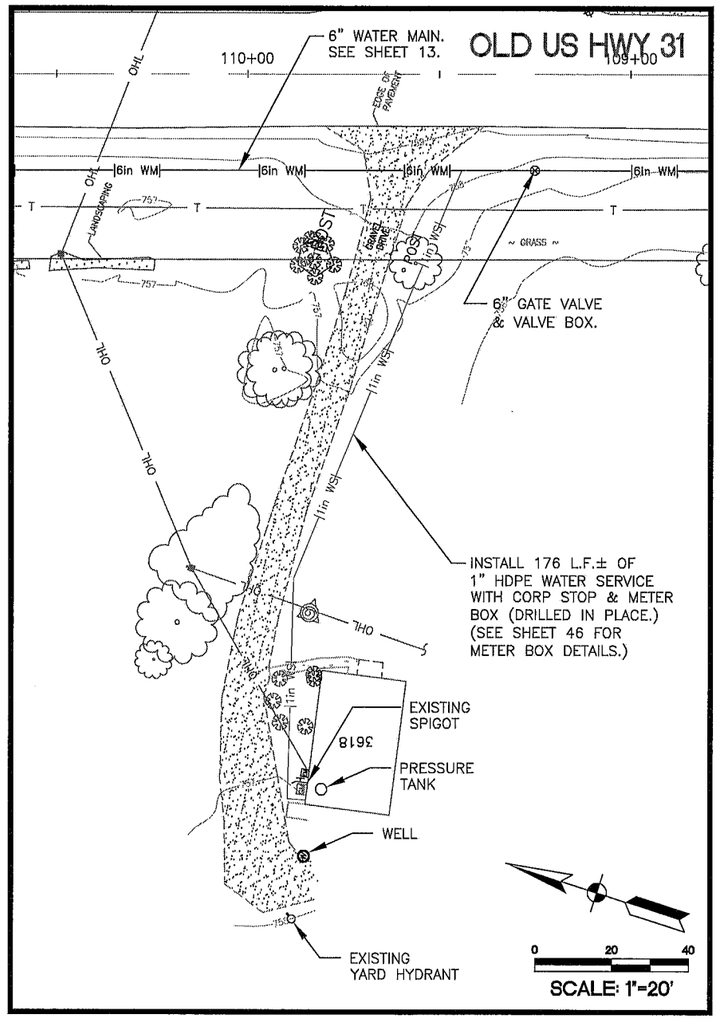
3586 OLD US HWY 31

SCALE: 1"=30'



3597 OLD US HWY 31

SCALE: 1"=40'



3618 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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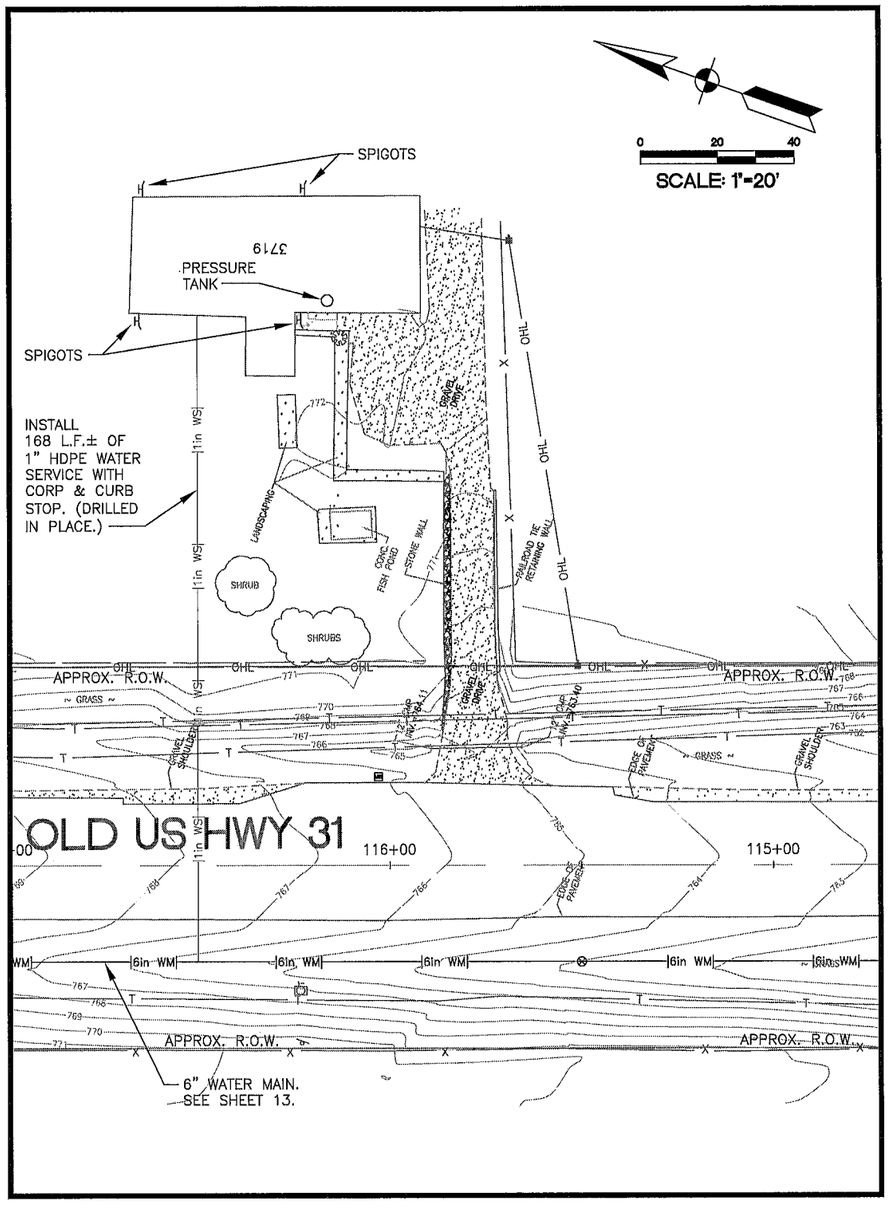
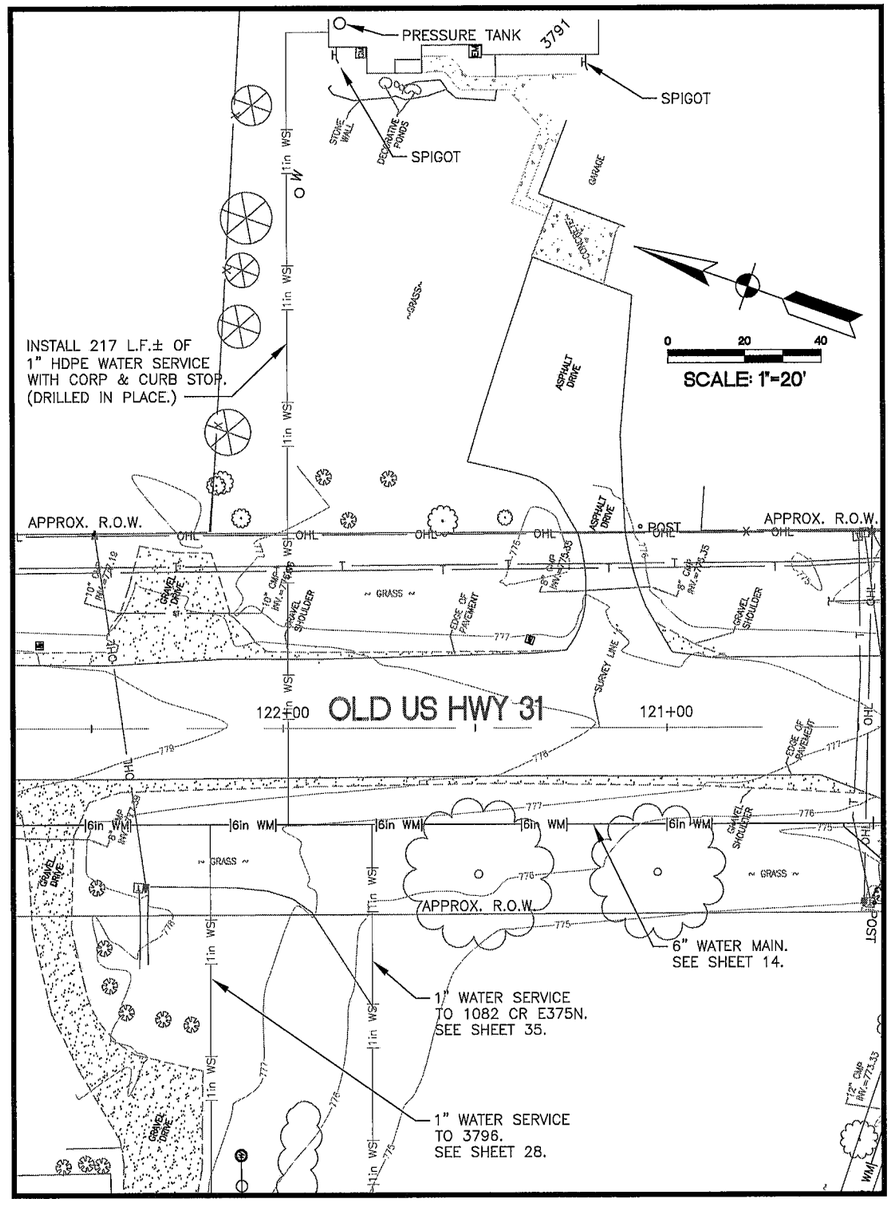
PLAN SHEET - WATER SERVICES
(3586, 3597 AND 3618 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



3719 OLD US HWY 31

SCALE: 1"=20'



3791 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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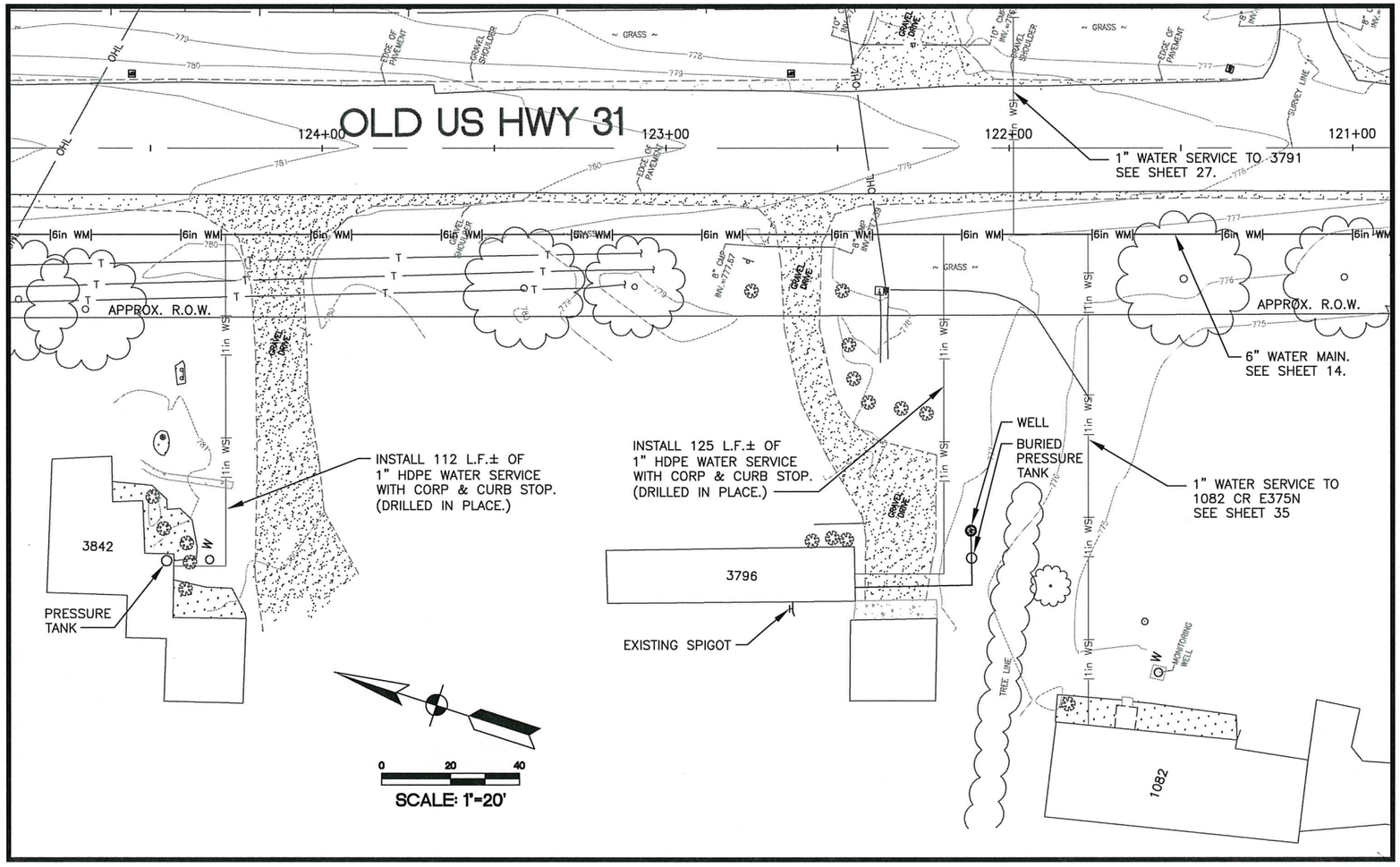
PLAN SHEET - WATER SERVICES
(3719 AND 3791 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



3796 AND 3842 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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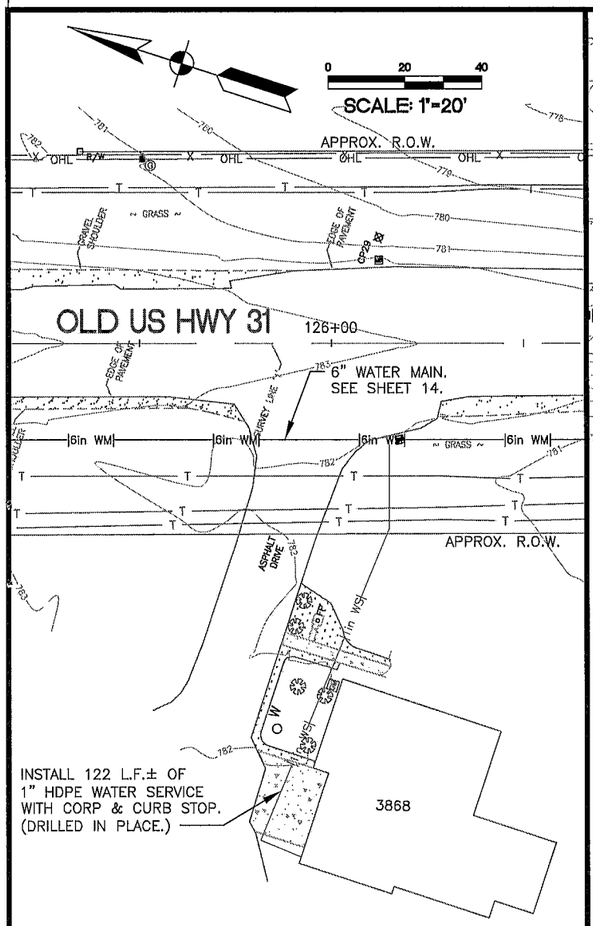
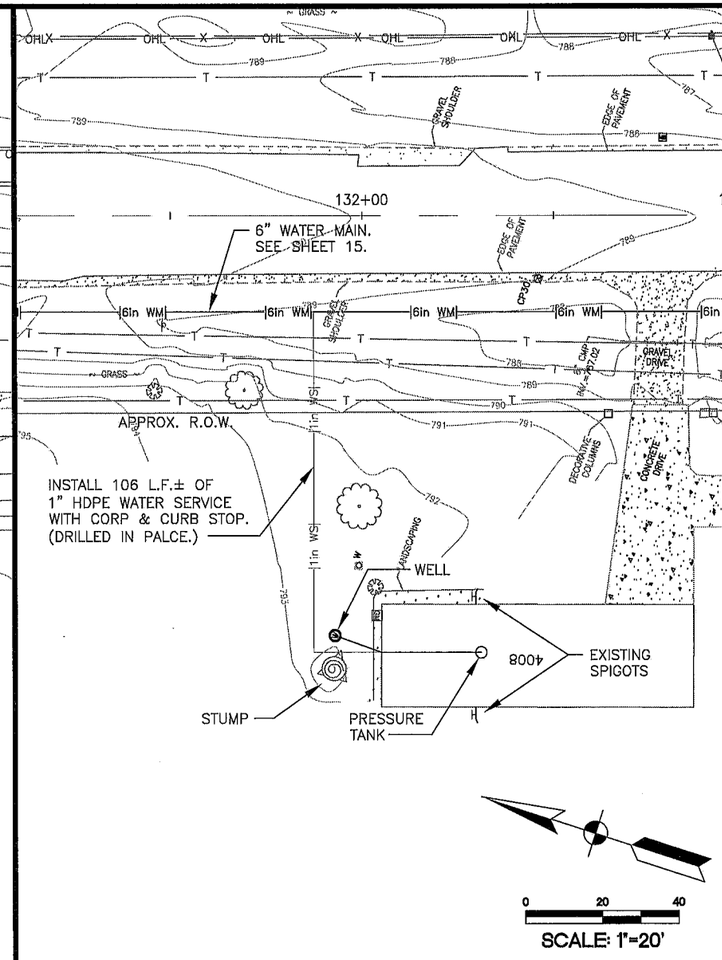
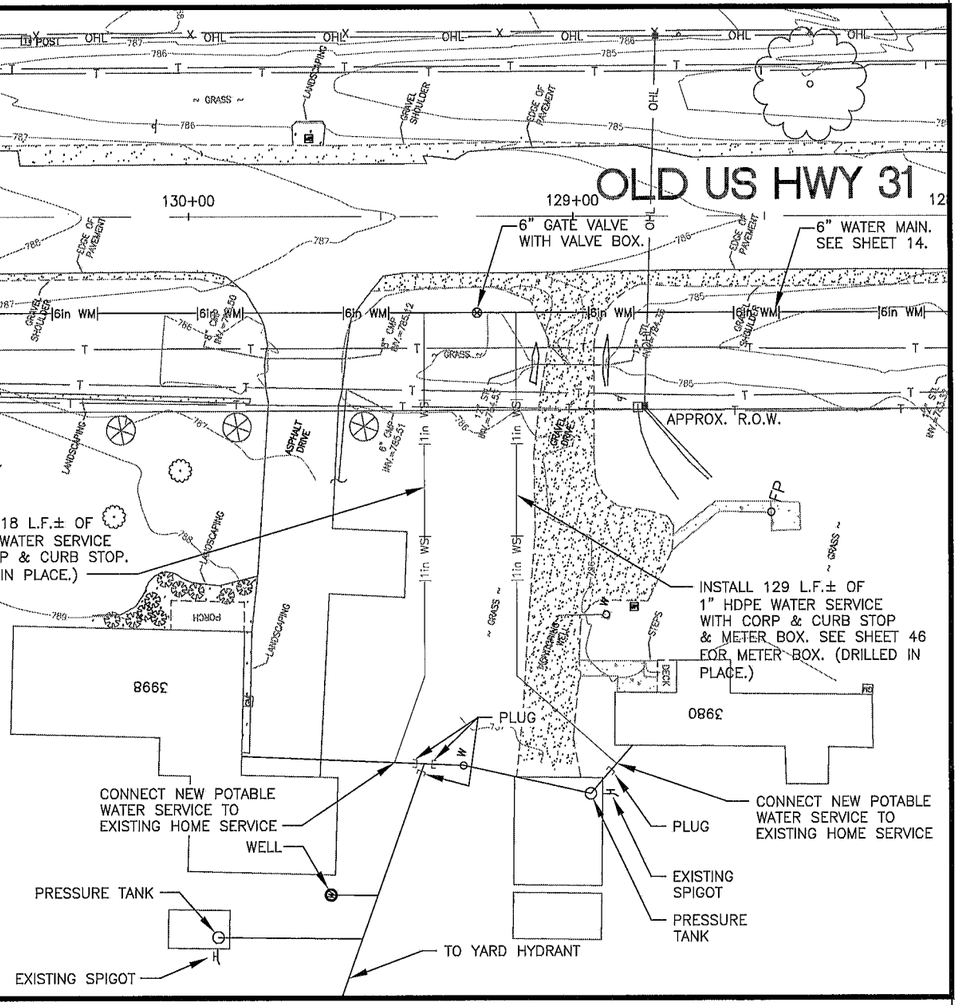
PLAN SHEET - WATER SERVICES
(3796 AND 3842 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY







3868 OLD US HWY 31

SCALE: 1"=20'

3980, 3998 AND 4008 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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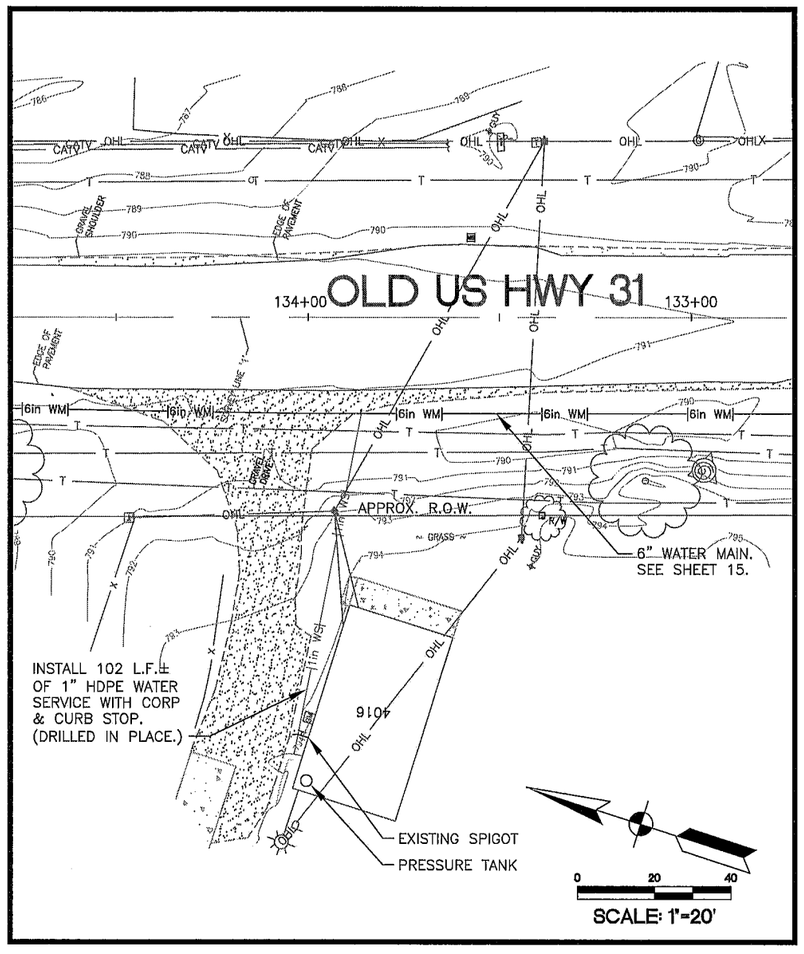
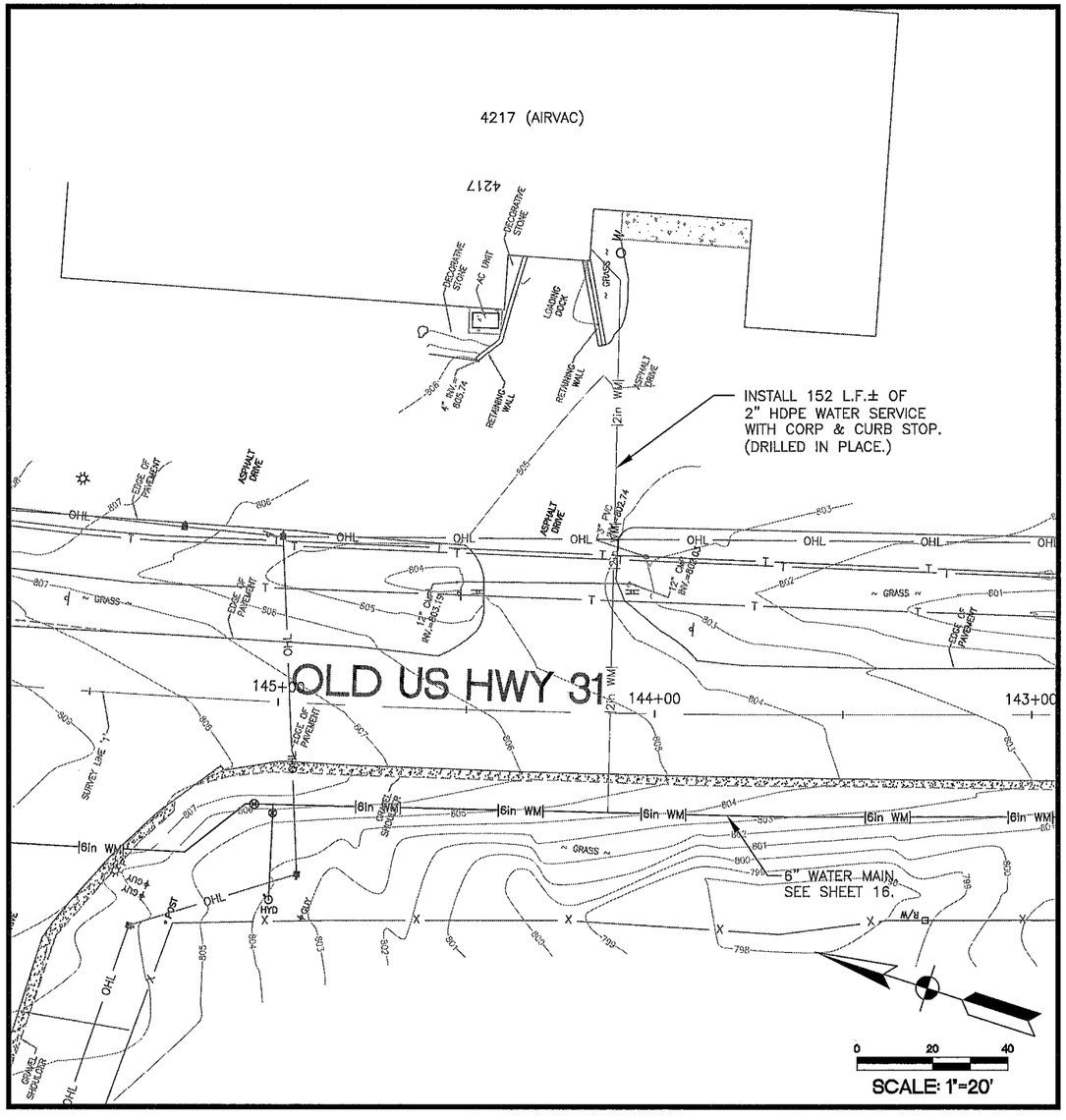
PLAN SHEET - WATER SERVICES
(3868, 3980, 3998 AND 4008 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



4016 OLD US HWY 31

SCALE: 1"=20'



4217 AIR VAC - OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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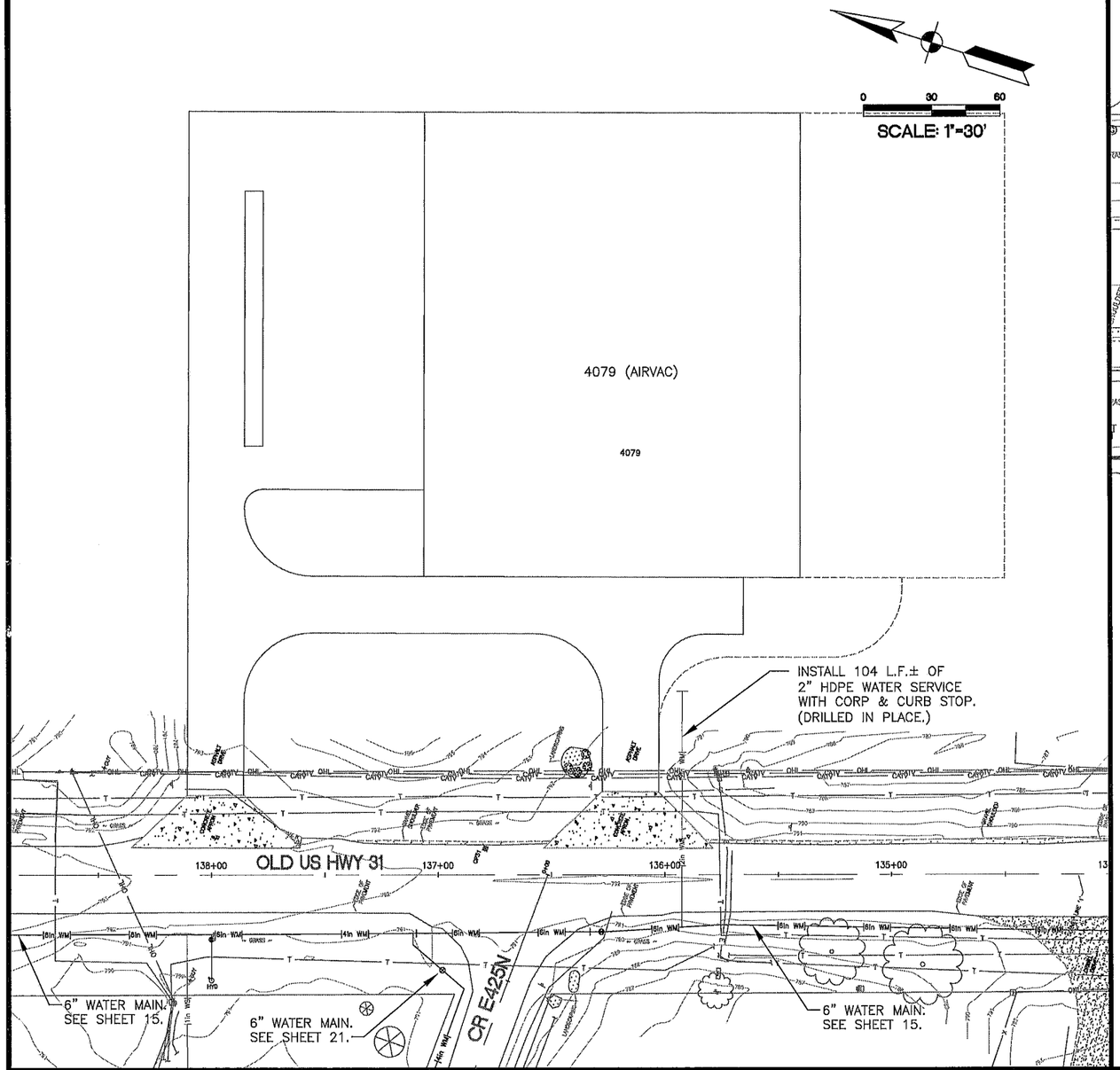
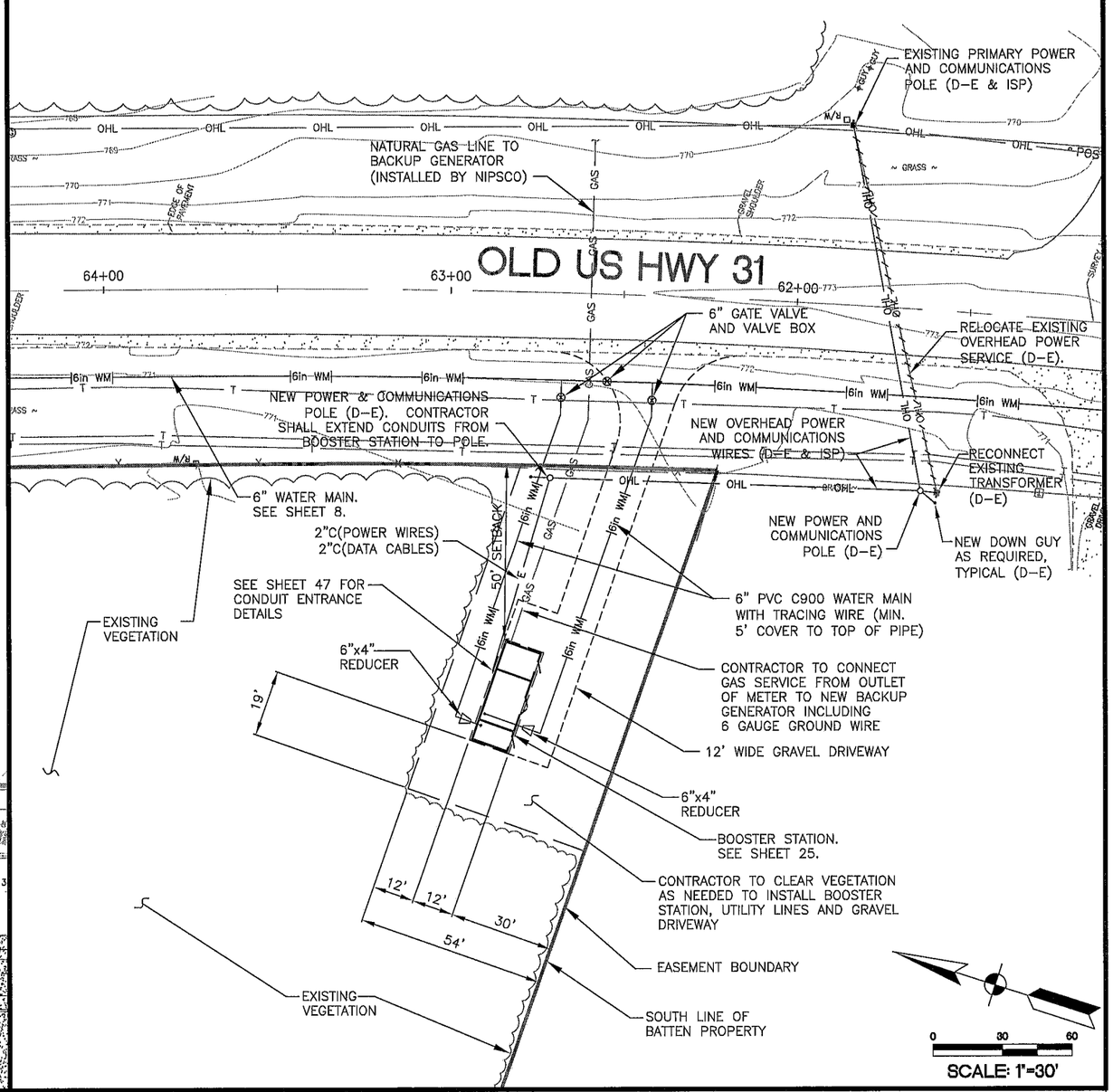
PLAN SHEET - WATER SERVICES
(4016 AND 4217 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



4079 AIRVAC - OLD US HWY 31

SCALE: 1"=30'



BOOSTER STATION SITE

SCALE: 1"=30'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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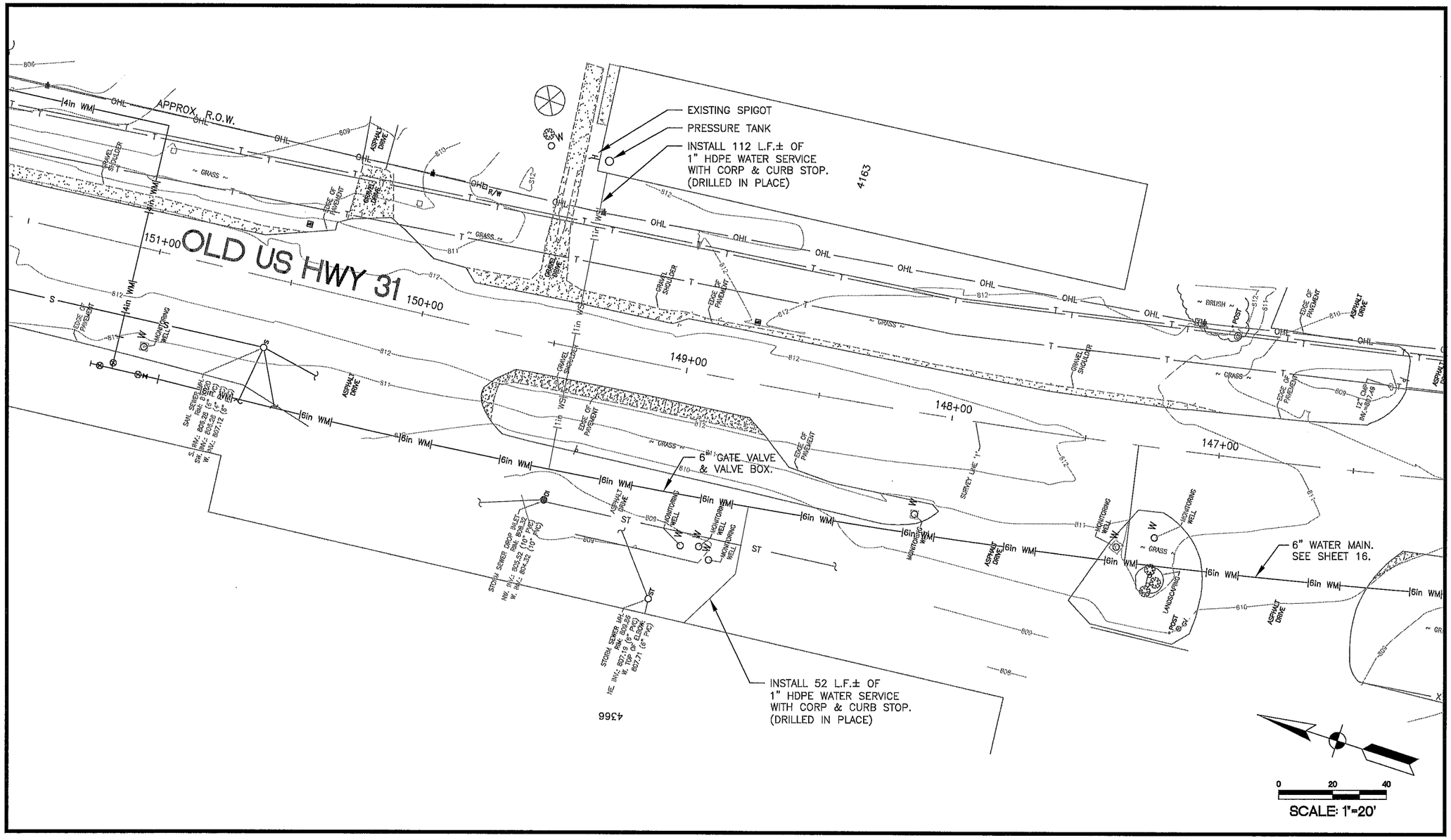
PLAN SHEET - WATER SERVICES
(4079 OLD US HWY 31 AND BOOSTER STATION SITE)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



4163, 4366 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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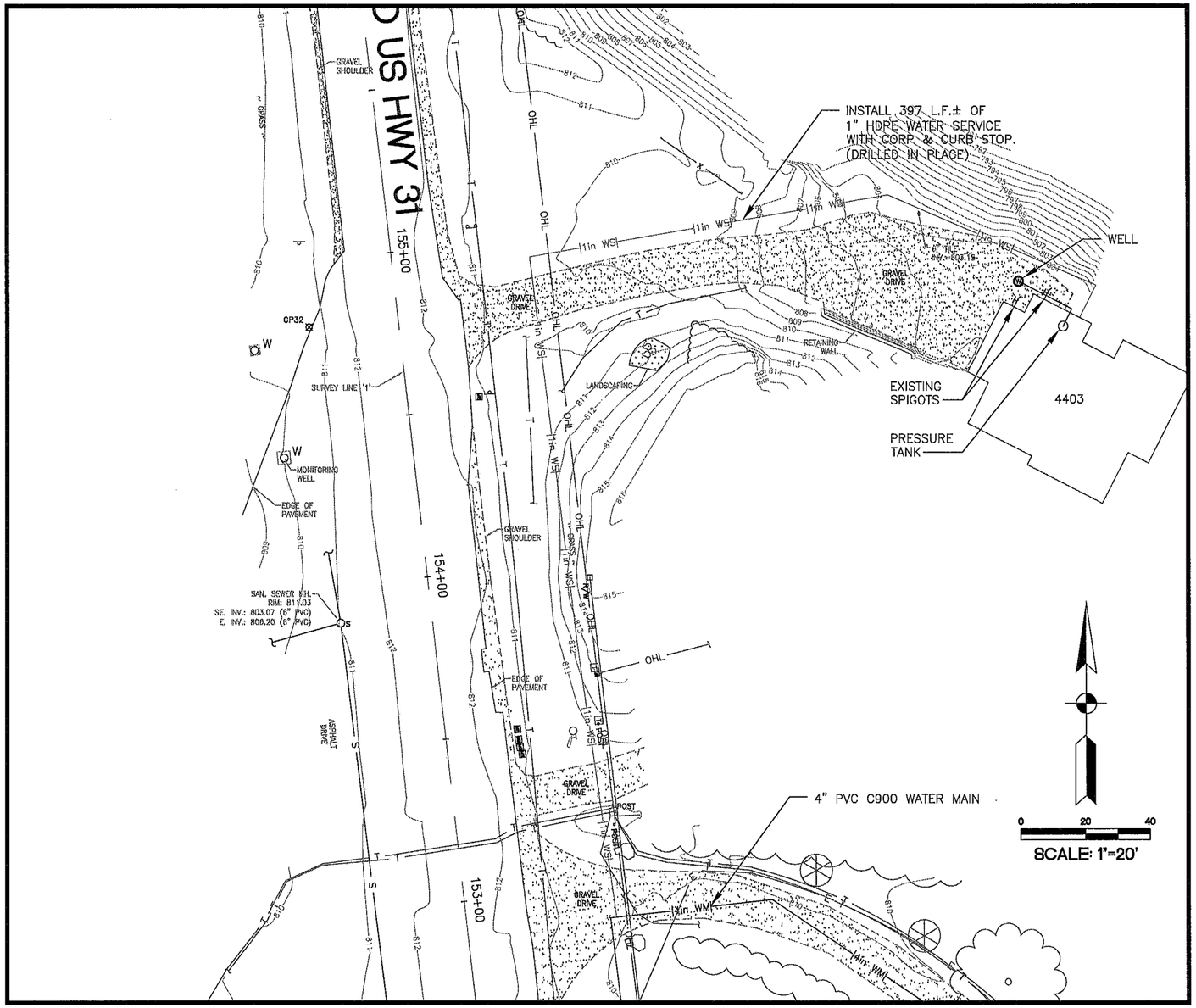
PLAN SHEET - WATER SERVICES
(4163 AND 4366 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



4403 OLD US HWY 31

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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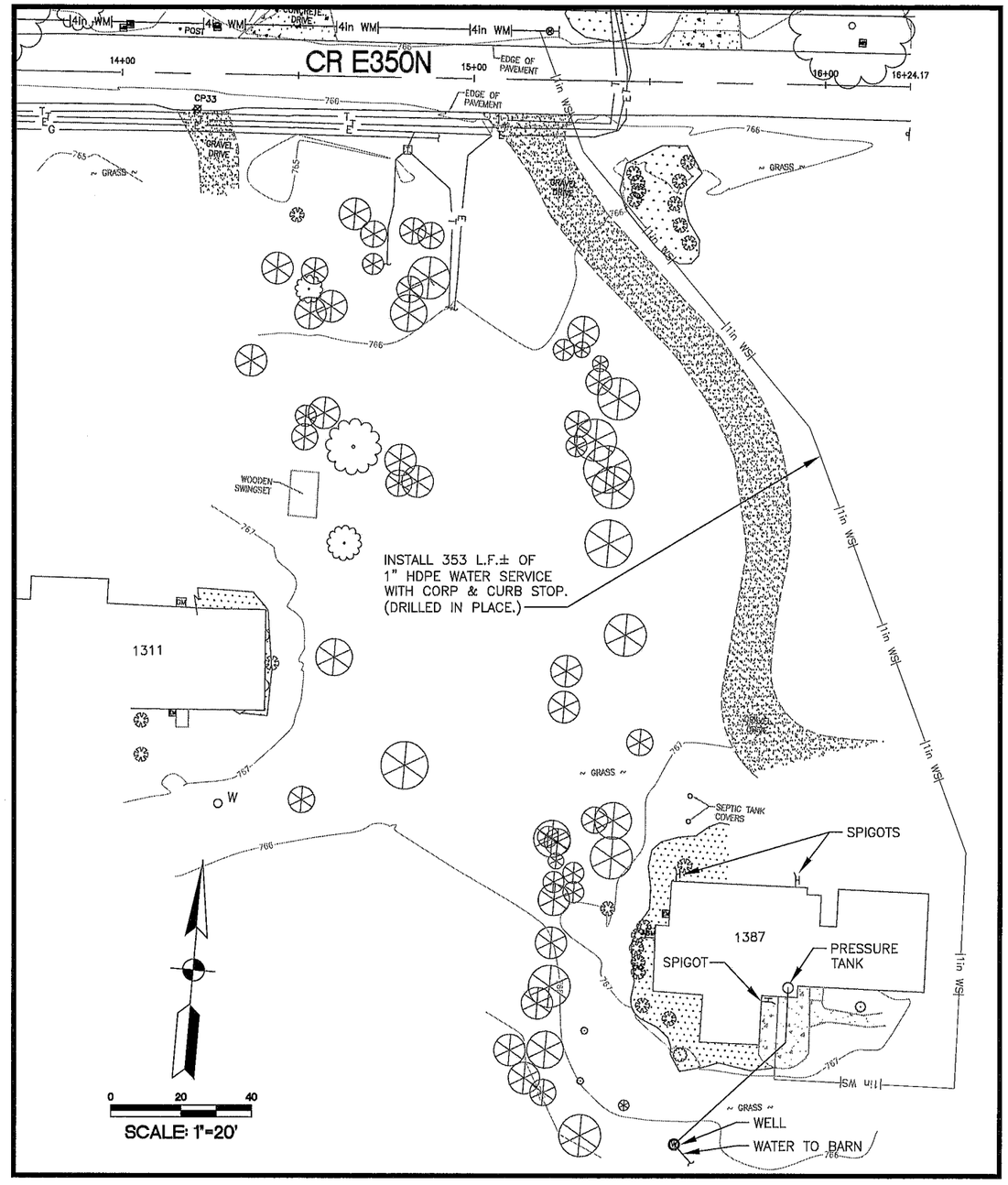
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

PLAN SHEET - WATER SERVICES
(4403 OLD US HWY 31)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



1387 CR E350N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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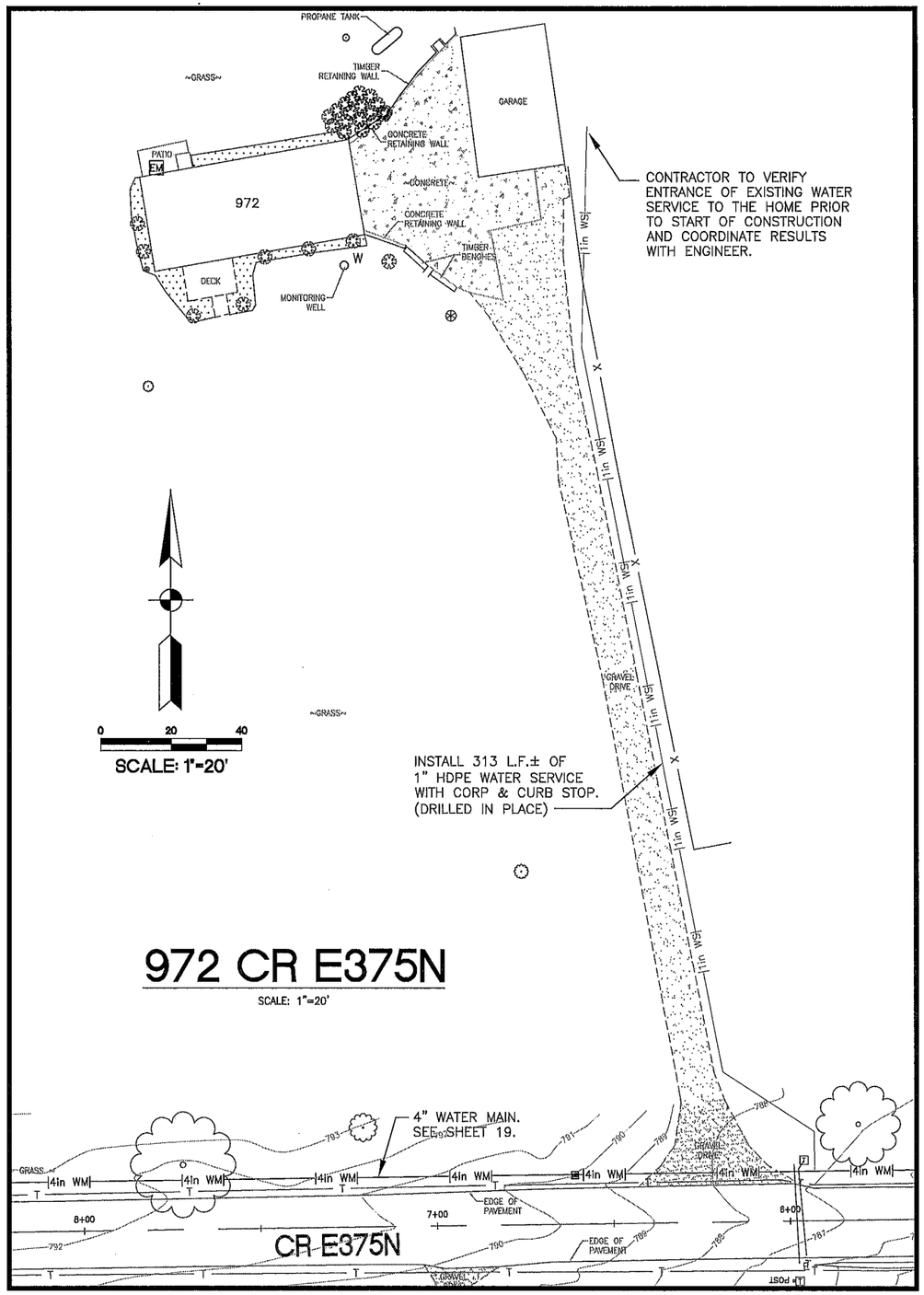
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

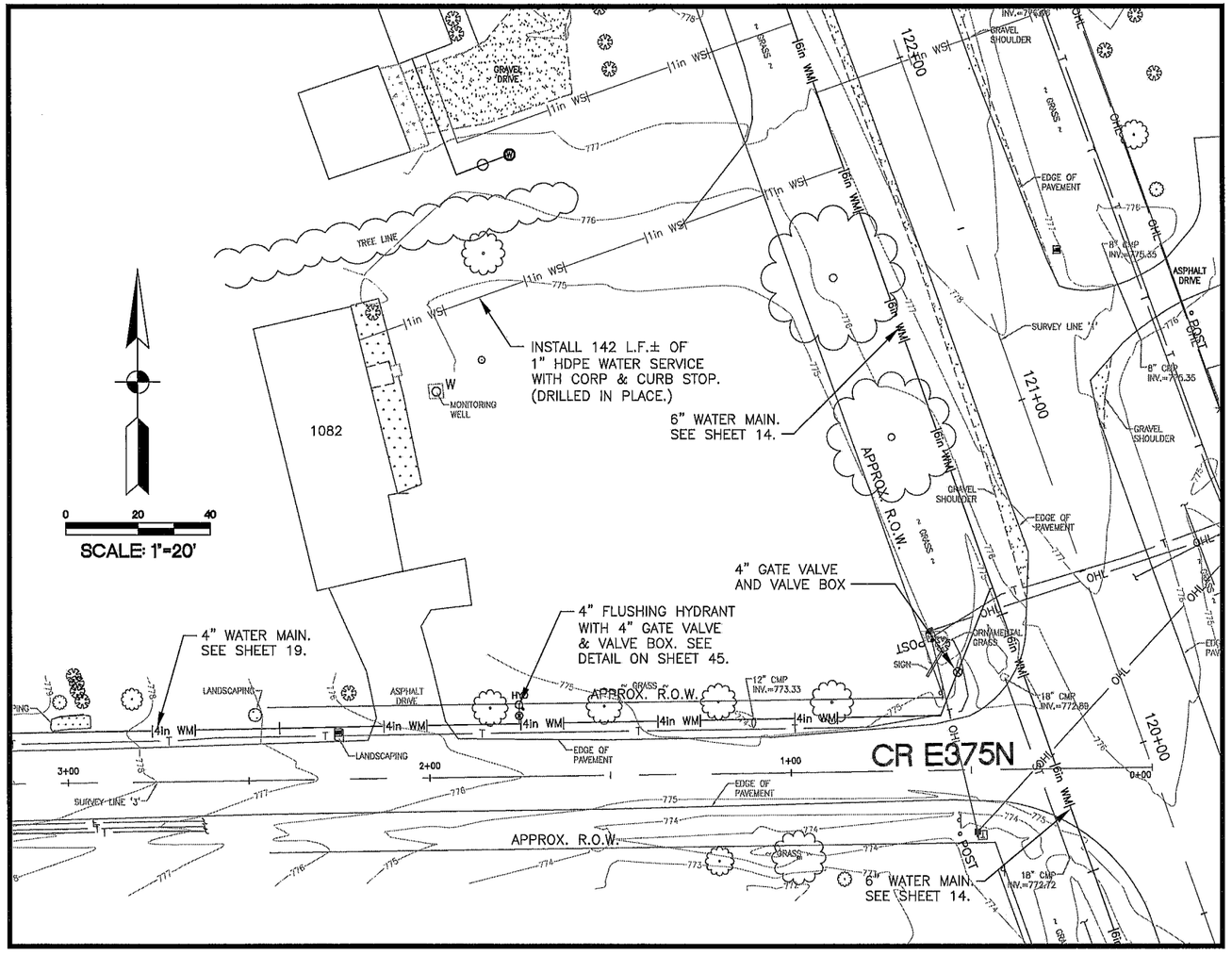
PLAN SHEET - WATER SERVICES
(1387 CR E350N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



972 CR E375N

SCALE: 1"=20'



1082 CR E375N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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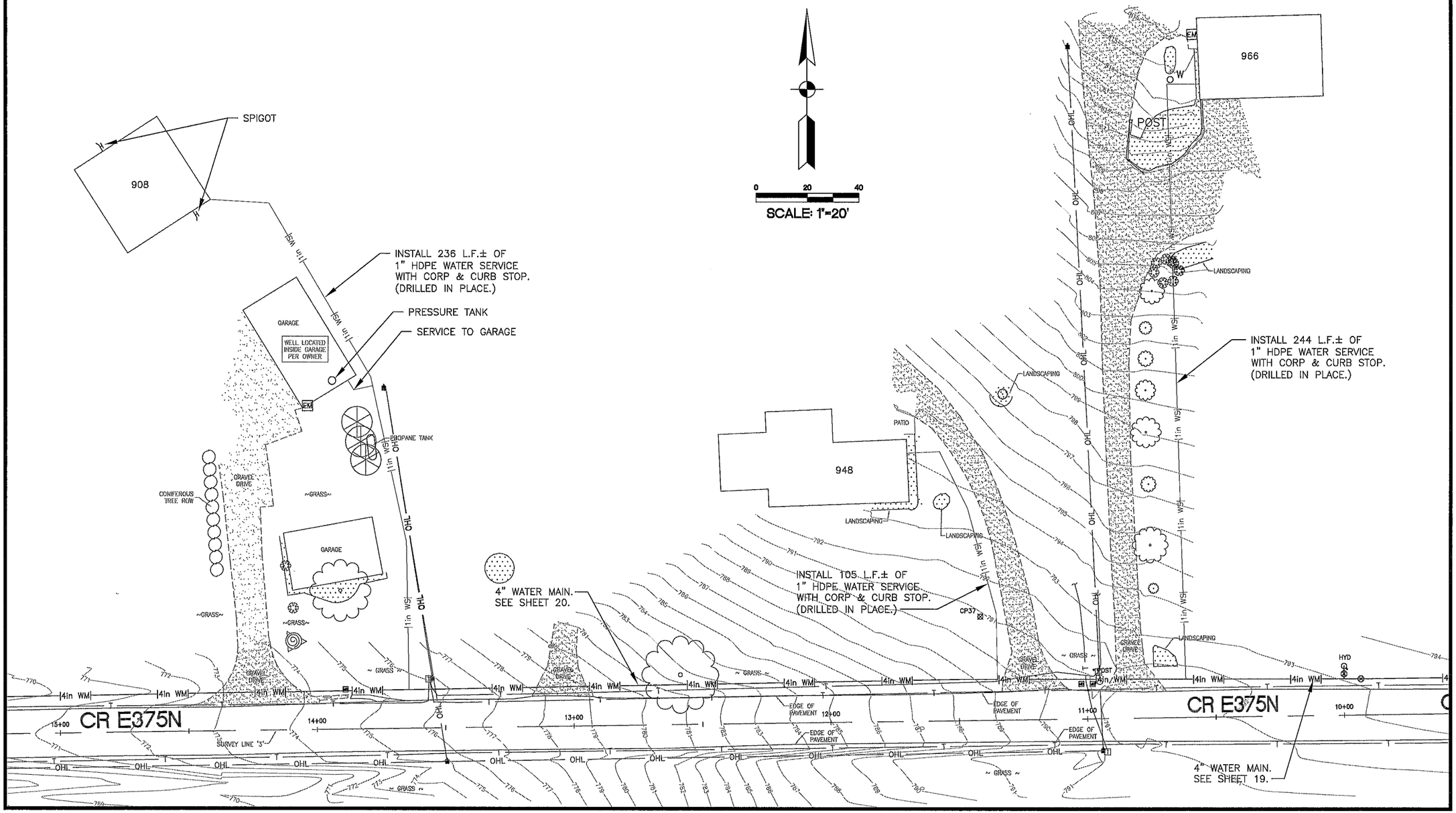
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

PLAN SHEET - WATER SERVICES
(972 AND 1082 CR E374N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



908, 948 AND 966 CR E375N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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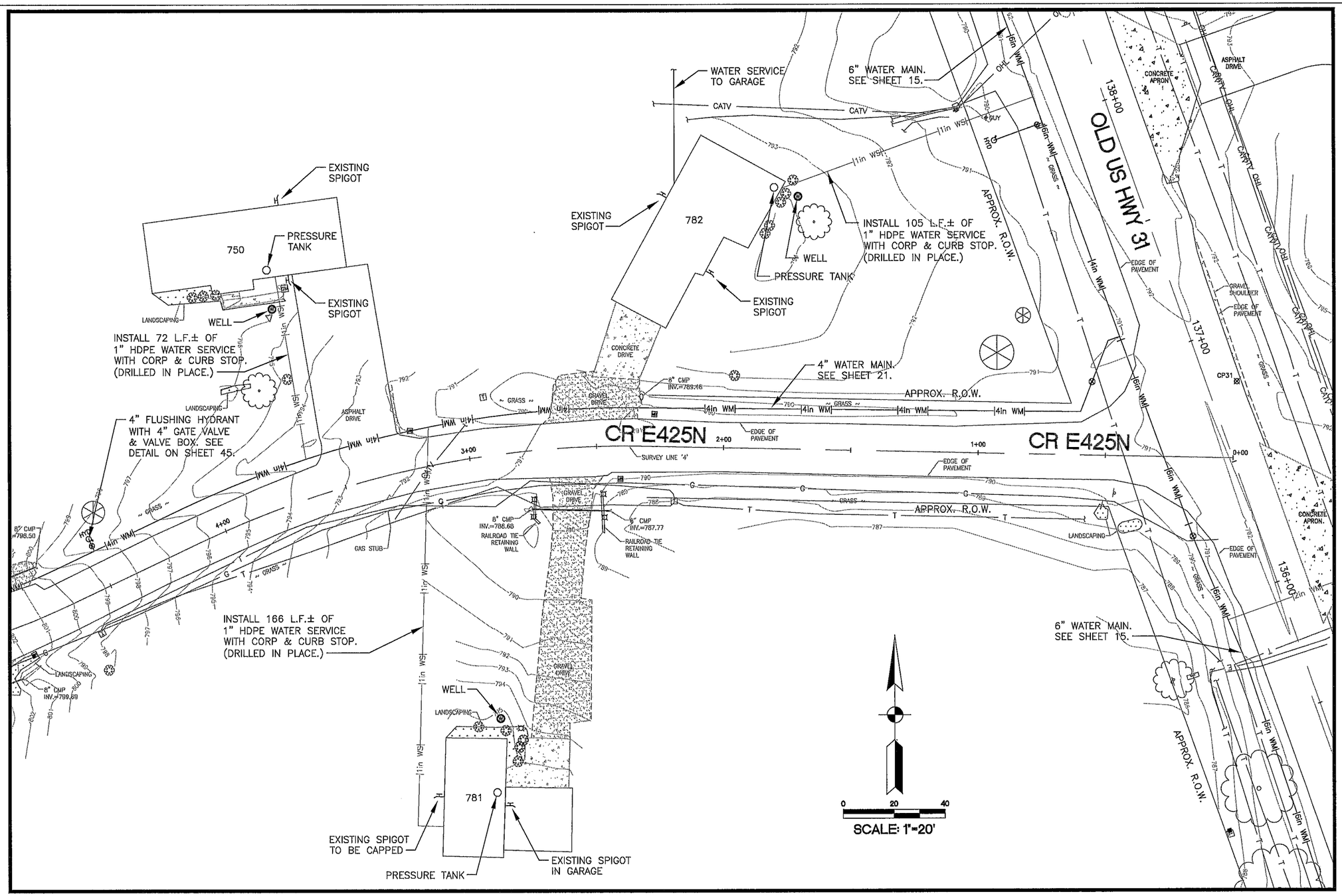
PLAN SHEET - WATER SERVICES
(908, 948 AND 966 CR E375N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



750, 781, AND 782 CR E425N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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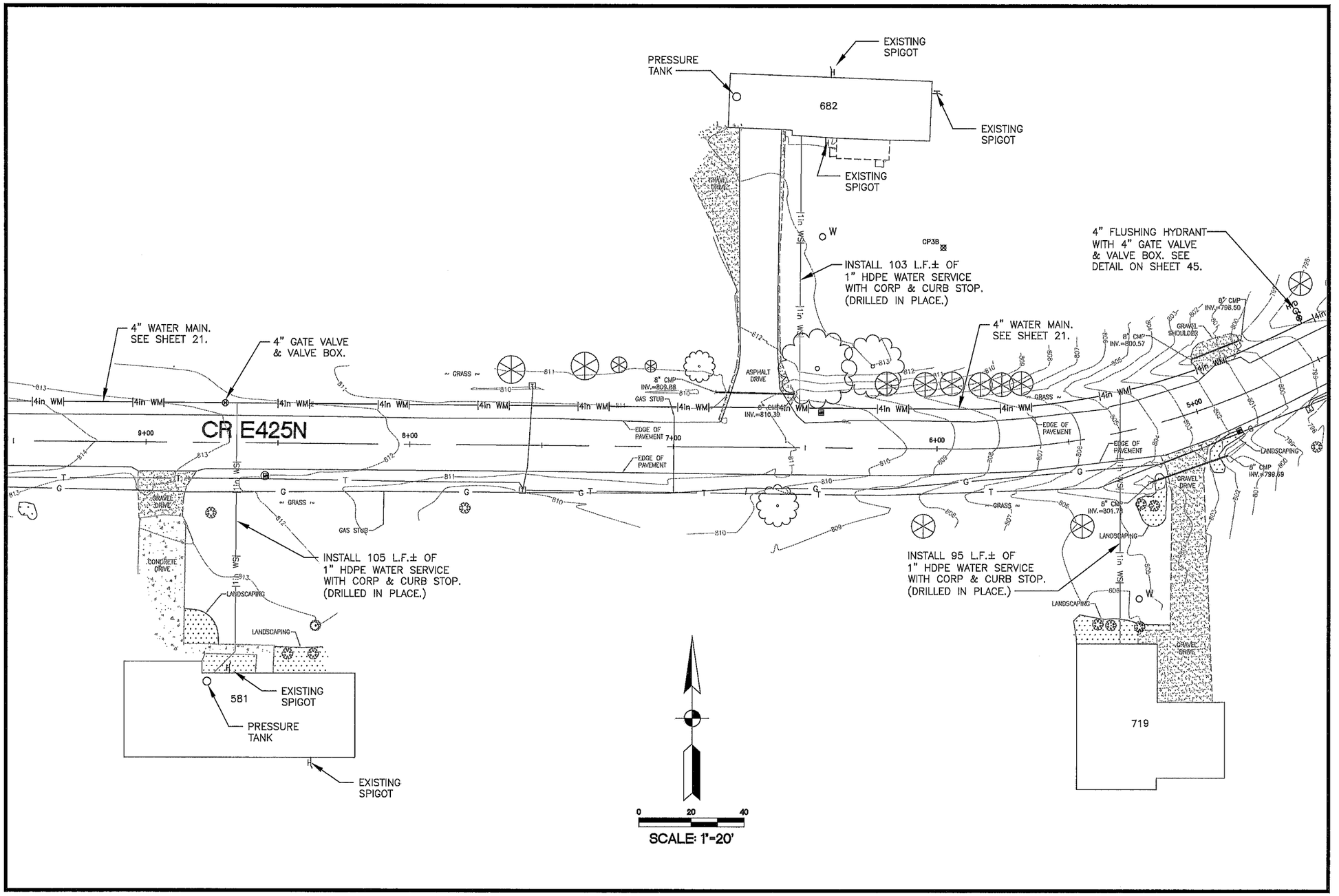
PLAN SHEET - WATER SERVICES (750, 781 AND 782 CR E425N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



581, 682 AND 719 CR E425N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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PEORIA, ILLINOIS 61615
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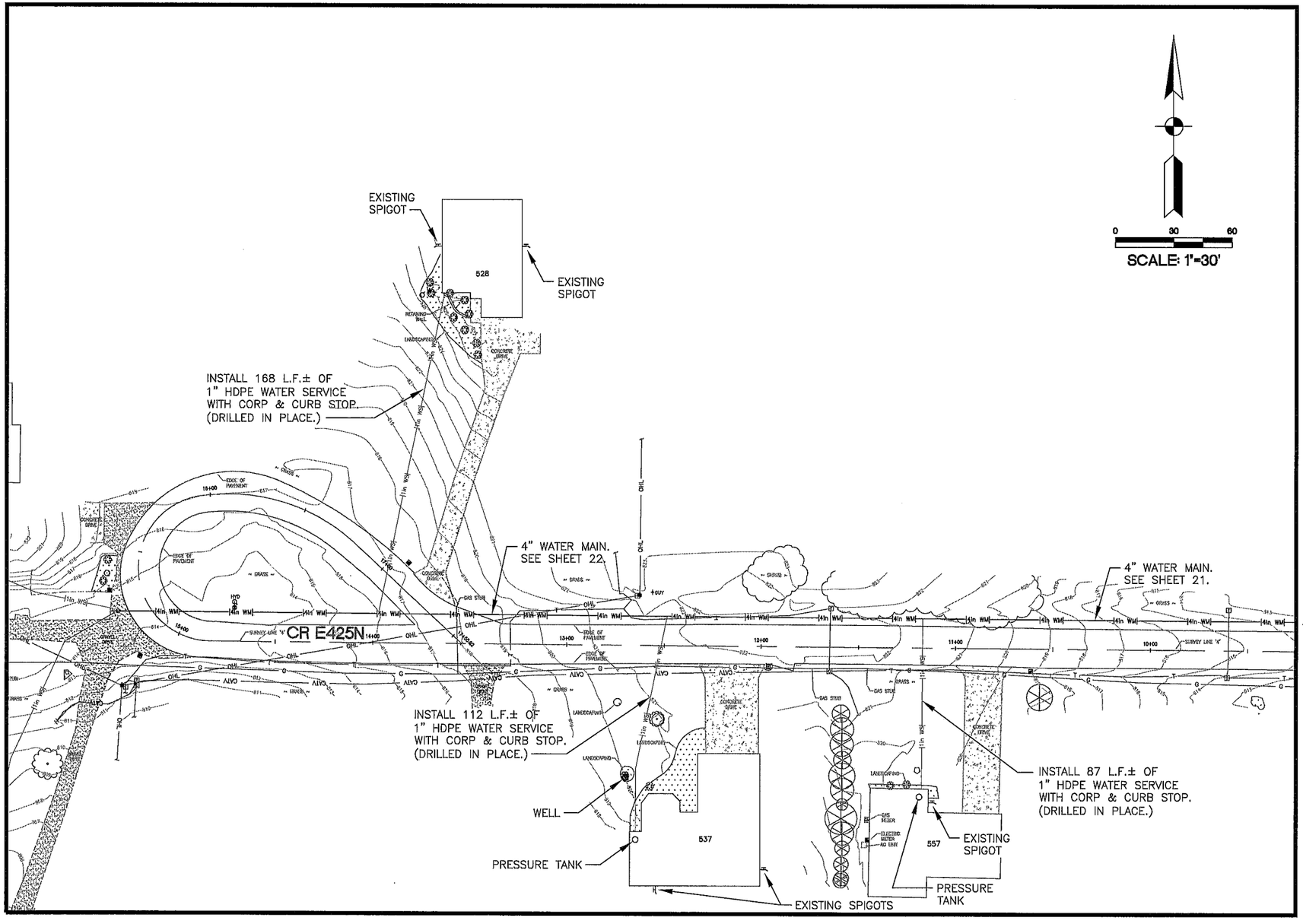
PLAN SHEET - WATER SERVICES
(581, 682 AND 719 CR E425N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



528, 537 AND 557 CR E425N

SCALE: 1"=30'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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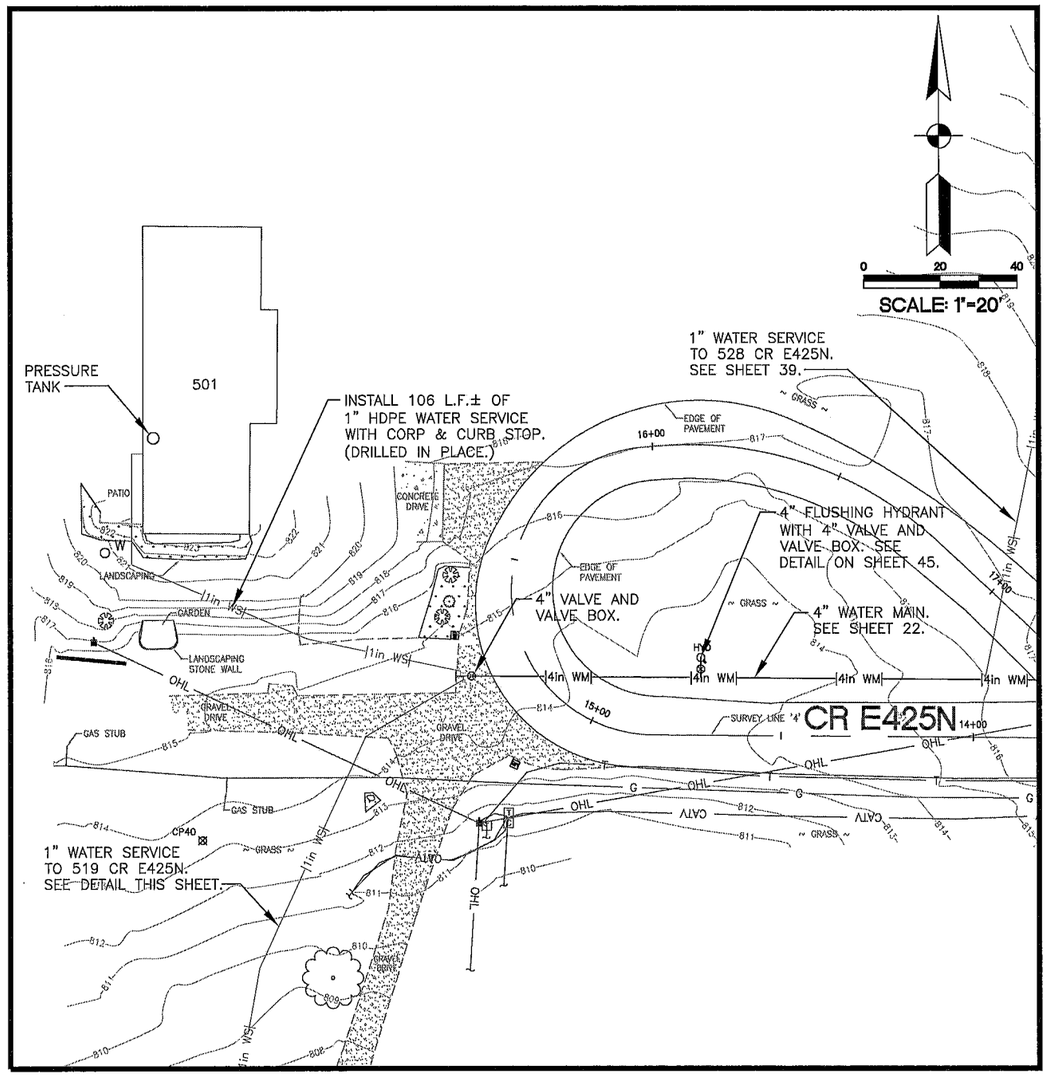
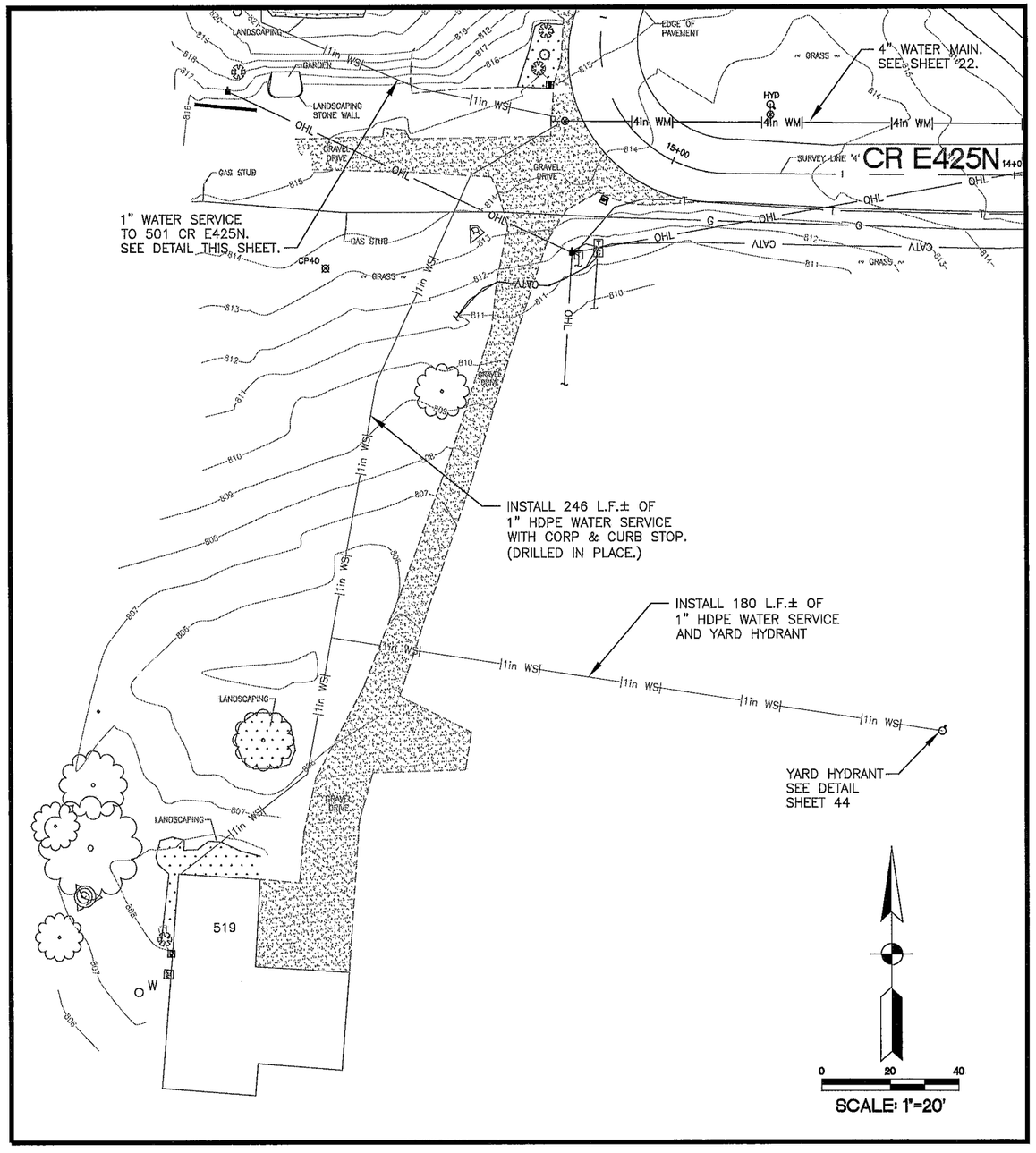
PLAN SHEET - WATER SERVICES
(528, 537 AND 557 CR E425N)

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



501 CR E425 N.

SCALE: 1"=20'



519 CR E425N

SCALE: 1"=20'

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
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DATE 08/14/10

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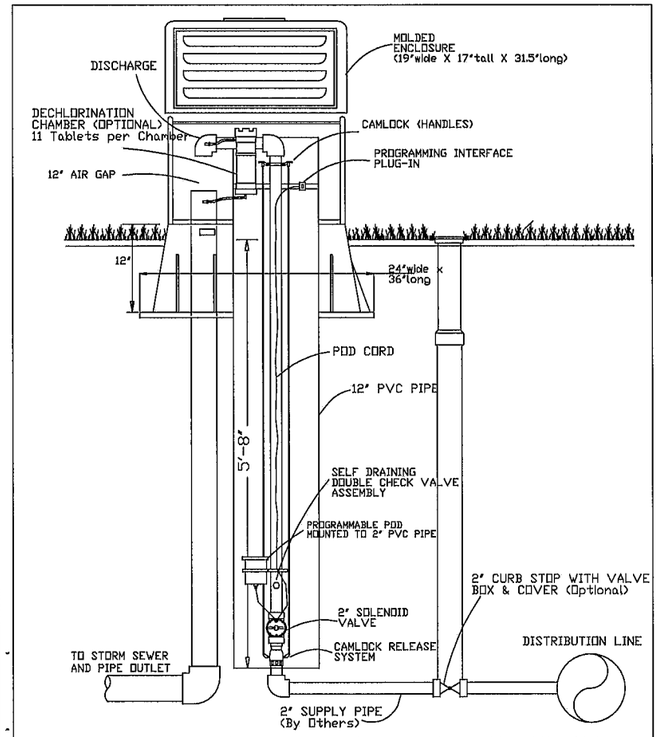
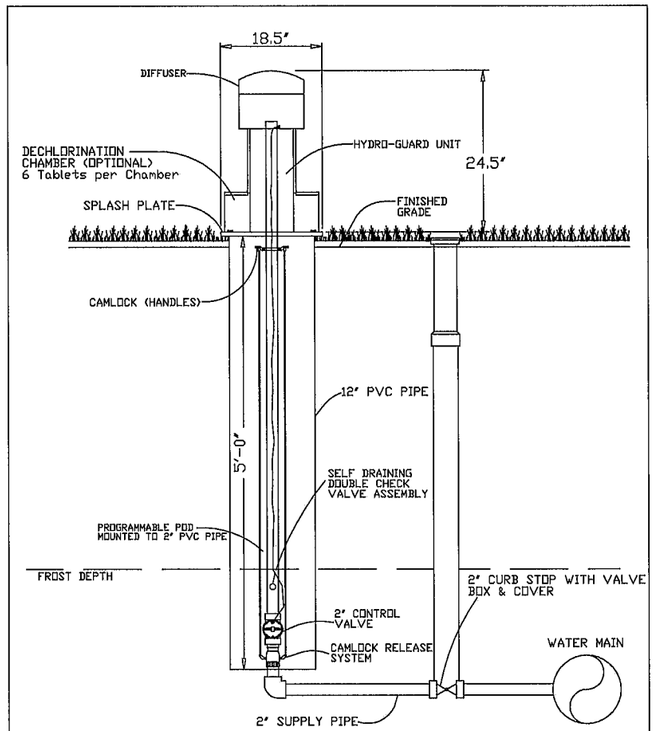
PLAN SHEET - WATER SERVICES
(501 AND 519 CR E425N)

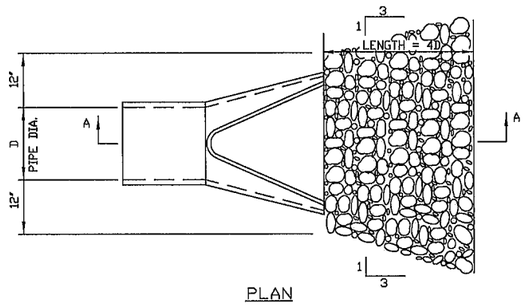
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



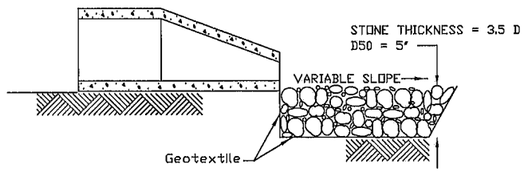
AUTOMATIC FLUSHING VALVE - TYPICAL INSTALL
HYDRO-GUARD® HG-4 OR APPROVED EQUAL



AUTOMATIC FLUSHING VALVE
HYDRO-GUARD® HG-3 OR APPROVED EQUAL

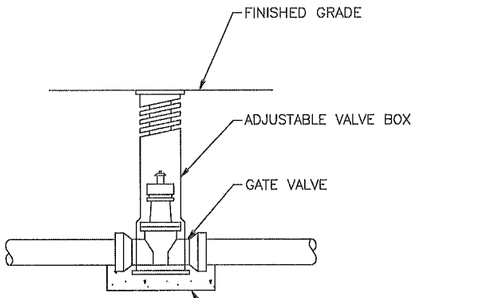


PLAN

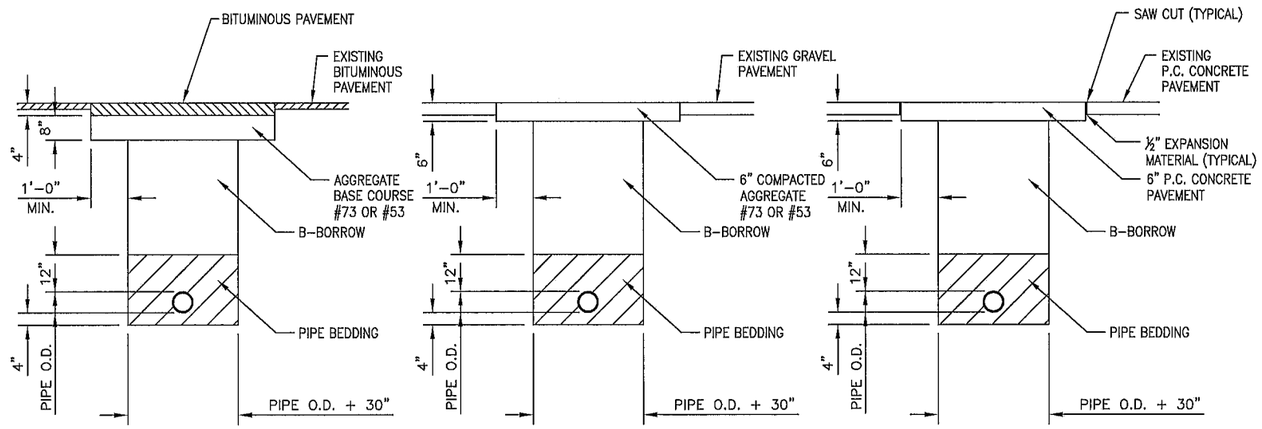


SECTION A-A

DETAIL - PIPE OUTLET TO FLAT AREA

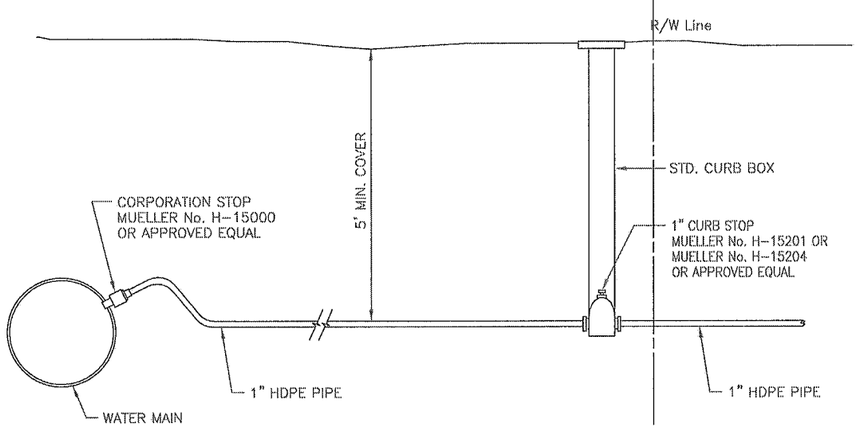


VALVE AND VALVE BOX SETTING DETAIL
NOT TO SCALE



BITUMINOUS DRIVEWAY GRAVEL DRIVEWAY CONCRETE DRIVEWAY

DETAIL - STANDARD PAVEMENT REMOVAL AND REPLACEMENT
NTS



DETAIL - WATER SERVICE CONNECTION
NTS

REVISIONS			
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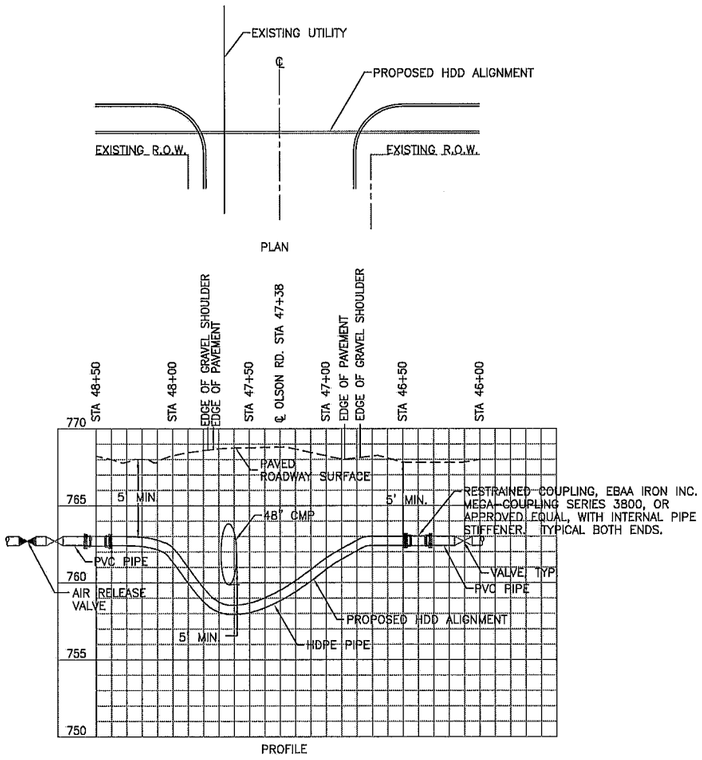
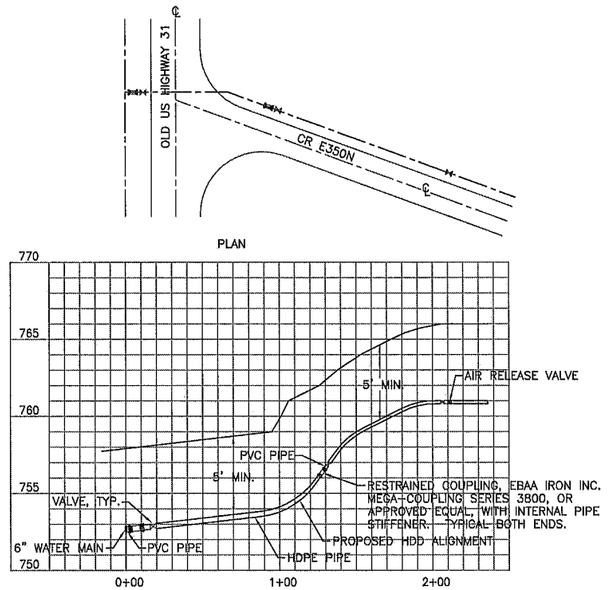
DETAILS

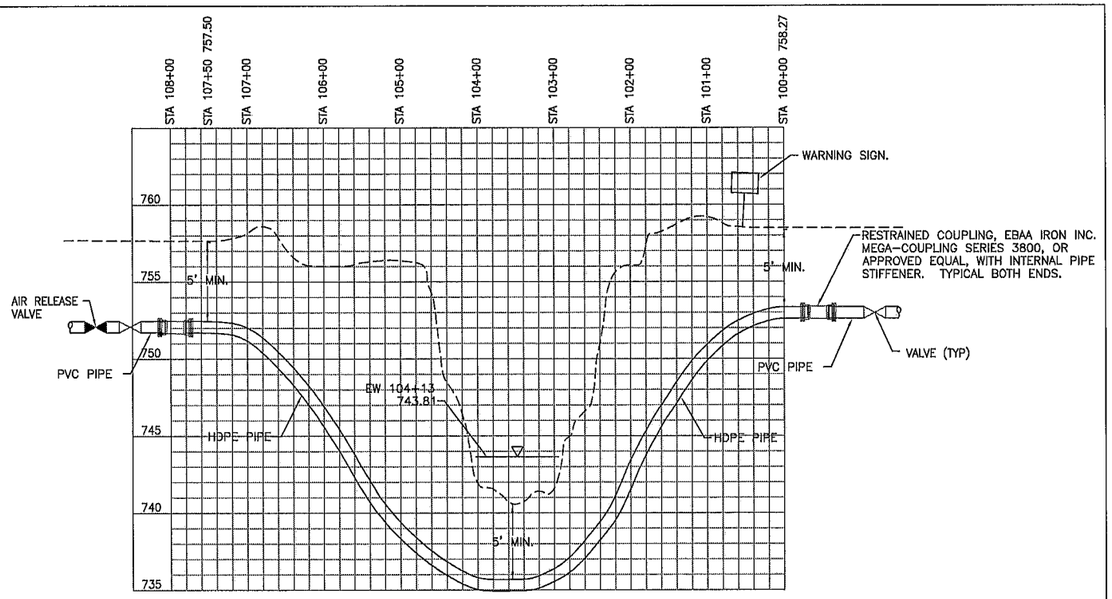
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



DETAIL 1 - HORIZONTAL DIRECTIONAL DRILL UNDER OLSON ROAD



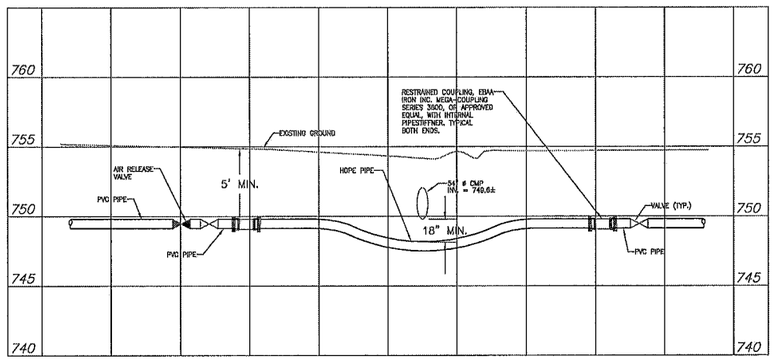
DETAIL 2 - HORIZONTAL DIRECTIONAL DRILL UNDER OLD US HIGHWAY 31 AT CR E350N



DETAIL 3 - TIPPECANOE RIVER CROSSING

HDD INSTALLATION NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFICATION OF AFFECTED AGENCIES AND COORDINATION WITH ALL UTILITIES PRIOR TO CONSTRUCTION.
2. ALL CONSTRUCTION MATERIALS, INCLUDING DRILLING FLUID, SHALL BE REMOVED FROM THE SITE PRIOR TO RESTORATION OF DISTURBED AREAS.
3. AIR RELEASE VALVE INSTALLED ON DOWNSTREAM SIDE OF HDD INSTALLATION.
4. PROVIDE VALVES AT BOTH ENDS OF HDD INSTALLATION.
5. AS PART OF THE HDD INSTALLATION CONTRACTOR SHALL INCLUDE 2 STRANDS OF TRACING WIRE.
6. FOR TIPPECANOE RIVER CROSSING WARNING SIGN SHALL BE PLACED ALONG BANK OF WATERWAY TO CLEARLY IDENTIFY WATERCOURSE CROSSING. SIGN SHALL INDICATE TYPE OF PIPELINE AND DEPTH OF PIPELINE BELOW BOTTOM OF WATER BODY.



DETAIL 4 - HORIZONTAL DIRECTIONAL DRILL AT STA. 96+52

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
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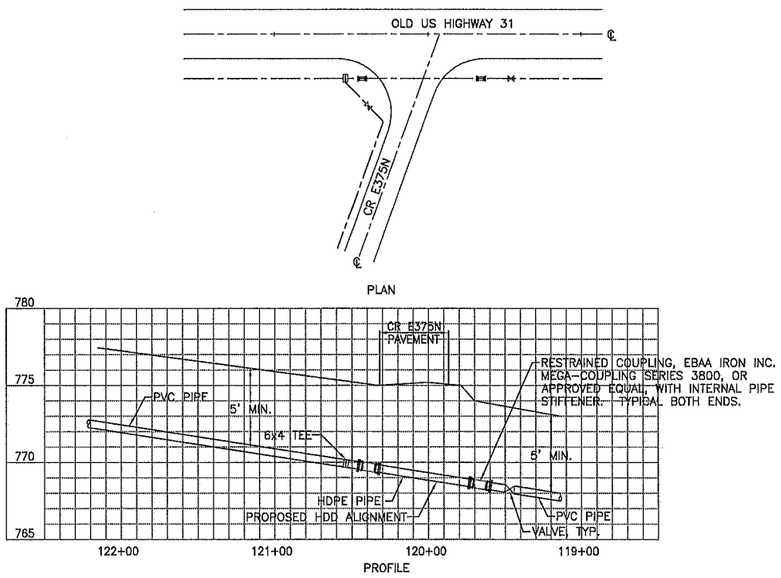
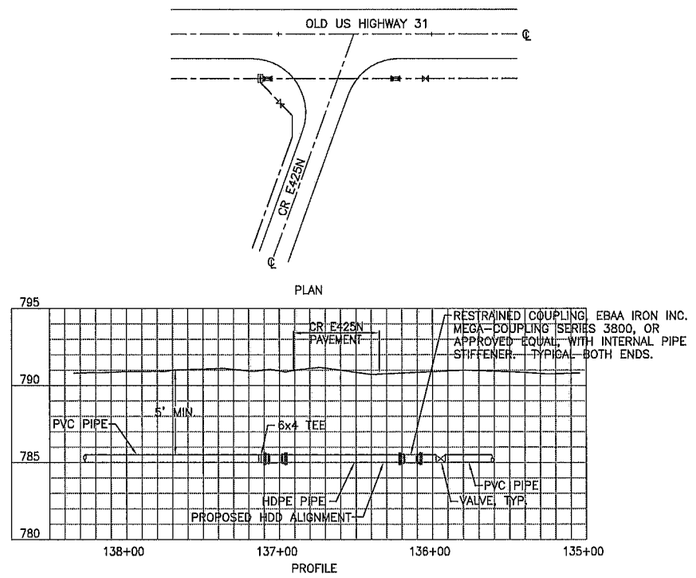
BORING DETAILS

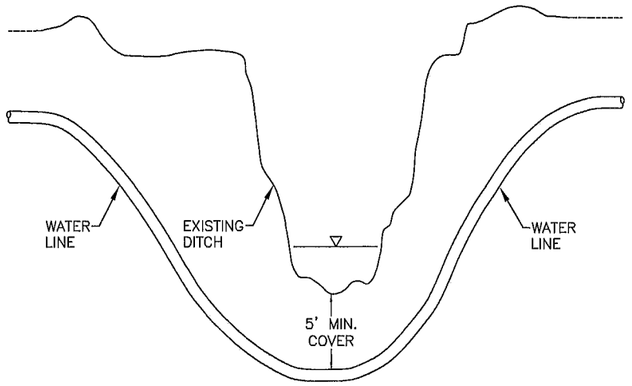
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



DETAIL 1 - HORIZONTAL DIRECTIONAL DRILL UNDER CR E375N

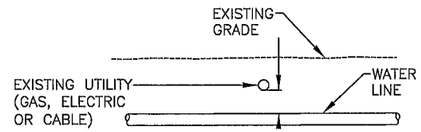


DETAIL 2 - HORIZONTAL DIRECTIONAL DRILL UNDER CR E425N



TYPICAL DITCH CROSSING COVER

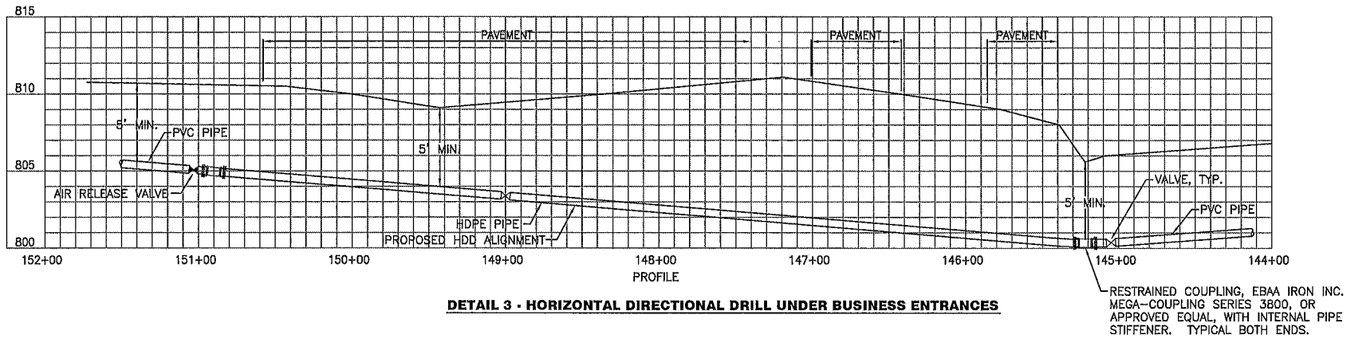
NOT TO SCALE



1'-6" MIN.
SEPARATION

TYPICAL UTILITY SEPARATION

(SEE SHEET 45 FOR WATER/SEWER SEPARATION DETAILS)
NOT TO SCALE



DETAIL 3 - HORIZONTAL DIRECTIONAL DRILL UNDER BUSINESS ENTRANCES

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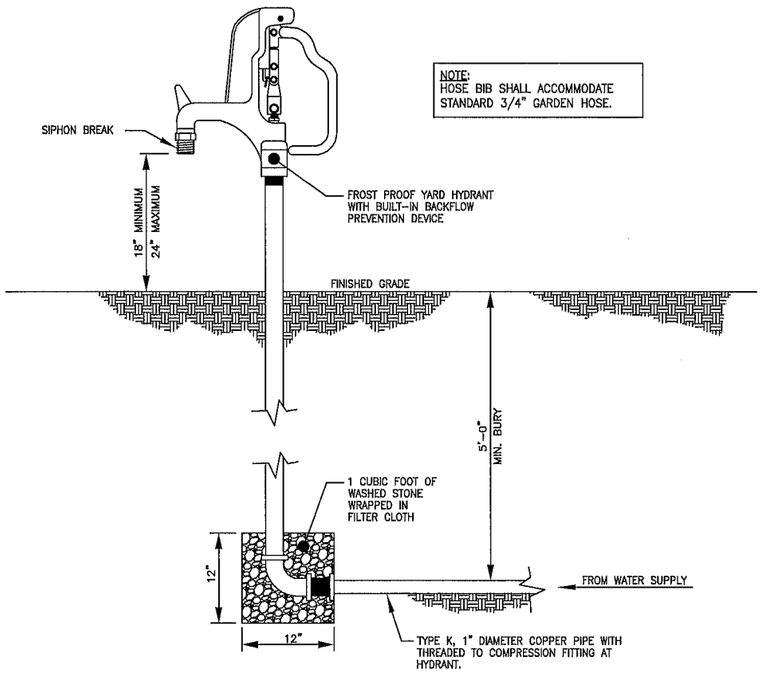
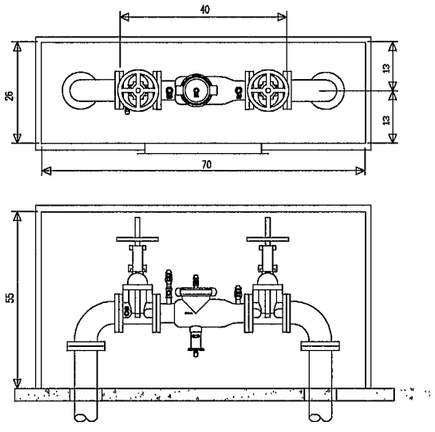
BORING DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY



DETAIL - STANDARD YARD HYDRANT (NON-FREEZE)

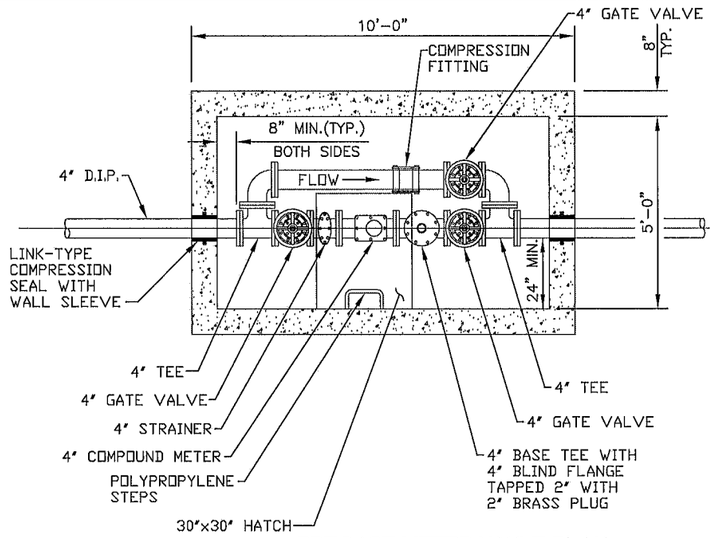


NOTES:

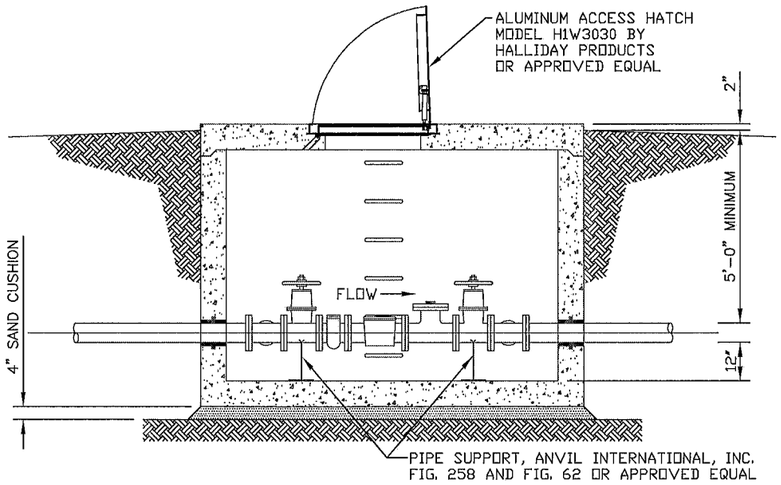
1. ALL DIMENSIONS ARE APPROXIMATED IN INCHES.
2. RECOMMENDED SLAB SIZE : 82"L x 38"W x 4" MINIMUM THICKNESS.
3. DETAIL IS BASED ON THE WB-E3 WATTS BOX ENCLOSURE AND THE SERIES 994 RPZA BACKFLOW PREVENTER MANUFACTURED BY WATTS WATER TECHNOLOGIES. LIKE PRODUCTS BY ALTERNATE MANUFACTURERS MAY BE USED WITH ENGINEER'S APPROVAL.

BACKFLOW PREVENTER WITH ENCLOSURE

NOT TO SCALE

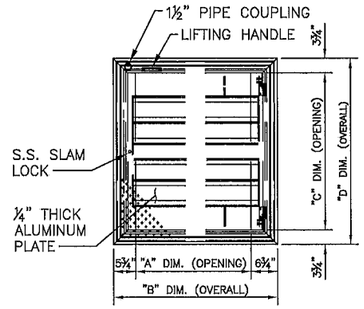


PRECAST METER VAULT PLAN



PRECAST METER VAULT ELEVATION

MODEL NO.	ACCESS HATCH DIMENSIONS				UNIT WT. LBS.
	"A" DIM.	"B" DIM.	"C" DIM.	"D" DIM.	
H1W3030	30"	42½"	30"	37½"	113 LBS

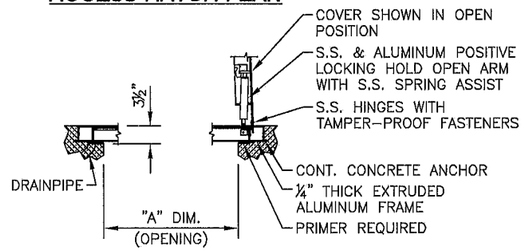


NOTES:

1) SUITABLE FOR USE IN OFF STREET LOCATION WHERE NOT SUBJECTED TO HIGH DENSITY TRAFFIC.

2) PROVIDE A FULL BED OF CLASS "A" CONCRETE (ACI 347-04) UNDER FRAME AND SUPPORT ANGLES.

ACCESS HATCH PLAN



ACCESS HATCH SECTION

ACCESS HATCH NOTES:

1. PROVIDE AN H1W SERIES (SINGLE LEAF) ACCESS FRAME AND COVER, AS MANUFACTURED BY HALLIDAY PRODUCTS, OR APPROVED EQUAL.
2. FRAME AND COVER SHALL HAVE A ¼" THICK, ONE-PIECE, MILL FINISH, EXTRUDED ALUMINUM CHANNEL FRAME, INCORPORATING A CONTINUOUS CONCRETE ANCHOR. A 1½" DRAINAGE COUPLING SHALL BE LOCATED IN THE FRONT LEFT CORNER OF THE CHANNEL FRAME. THE INSIDE OF THE FRAME SHALL HEVE A DOOR-SUPPORT LEDGE ON TWO (2) SIDES.
3. BOTH FRAME AND LEDGE SHALL BE SUPPORTED BY A FULL BED OF CLASS "A" CONCRETE.
4. THE DOOR PANEL SHALL BE ¼" ALUMINUM DIAMOND PLATE, REINFORCED TO WITHSTAND A LIVE LOAD OF THE H-20 DESIGNATION.
5. DOOR SHALL OPEN TO 90-DEGREES AND AUTOMATICALLY LOCK WITH A STAINLESS STEEL HOLD OPEN ARM WITH ALUMINUM RELEASE HANDLE.
6. FOR EASE OF OPERATION, DOOR SHALL INCORPORATE ENCLOSED STAINLESS STEEL COMPRESSION SPRING ASSISTS. DOOR SHALL CLOSE FLUSH WITH THE FRAME.
7. HINGES AND ALL FASTENING HARDWARE SHALL BE STAINLESS STEEL.
8. UNIT SHALL LOCK WITH STAINLESS STEEL SLAM LOCK WITH REMOVABLE KEY AND HAVE A NON-CORROSIVE HANDLE.
9. UNIT SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND/OR WORKMANSHIP FOR A PERIOD OF 10 YEARS.

CONCRETE STRUCTURE NOTES:

1. PRECAST CONCRETE METER VAULT SHALL BE DESIGNED FOR THE FOLLOWING CONDITIONS STATED BELOW (1.1 through 1.5). SUBMIT CALCULATIONS TO ENGINEER FOR REVIEW. ALL CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE WHERE THE CONSTRUCTION IS TO TAKE PLACE.
   1.1 STRUCTURE FILLED TO TOP WITH NO EXTERNAL SOIL PRESSURE.
   1.2 STRUCTURE EMPTY WITH SOIL BACKFILL TO FINISH GRADE. ASSUME SOIL DRY DENSITY AT 95 LBS./C.F. ASSUME SOIL SATURATED TO FINISHED GRADE.
   1.3 STRUCTURE SHALL NOT FLOAT WITH SATURATED SOIL TO FINISHED GRADE. ASSUME SOIL LOAD ON CONCRETE LIP AT 32 LBS/C.F. A SAFETY FACTOR OF 1.5 SHALL BE PROVIDED IN THE FLOTATION CALCULATIONS.
   1.4 SOIL BEARING PRESSURE OF 2,500 PSI.
   1.5 EFFECTS OF ALL VERTICAL LOADS ANTICIPATED ON THE FINISHED STRUCTURE SHALL BE INCLUDED IN THE ANALYSIS AND DESIGN. LOADING FROM PIPING AND EQUIPMENT, HOIST, SUPERSTRUCTURES, SNOW, H-20 LIVE LOAD AND ACTUAL DEPTH OF SOIL COVER SHALL BE INCLUDED.
2. PRECAST VAULT STEPS SHALL BE MADE OF POLYPROPYLENE ENCASED STEEL AS MANUFACTURED BY M.A. INDUSTRIES AND SHALL CONFORM TO ASTM C478.
3. THE EXTERIOR OF ALL PRECAST PRODUCTS SHALL BE COATED WITH TWO COATS OF BITUMASTIC PAINT. 16 TO 20 MIL DFT, TO FINISHED GRADE USE PROMASTIC 900 COAL TAR WATERPROOFING MANUFACTURED BY PROGUARD COATING, INC.
4. ALL ALUIMINUM IN CONTACT WITH CONCRETE SHALL BE PAINTED WITH 2 COATS OF COAL TAR EPOXY OR ISOLATED FROM THE CONCRETE WITH 1/8" THICK NEOPRENE PADDING. ALL STEEL THRUST RESTRAINT ANGLES SHALL BE WIRE BRUSHED AND PAINTED WITH TWO COATS OF COAL TAR EPOXY.
5. ALL PIPE COUPLINGS IN CONTACT WITH SOIL SHALL BE WIRE BRUSHED AND PAINTED WITH 2 COATS OF COAL TAR EPOXY.
6. ALL CONCRETE ANCHORS AND HARDWARE SHALL BE STAINLESS STEEL.
7. PROVIDE COMMON KEYED LOCKS FOR ALL HATCHES, PANELS, DOORS AND QUICK DISCONNECT CAPS ASSOCIATED WITH THIS PROJECT.
8. ALL CONCRETE STRUCTURES SHALL BE CONSTRUCTED WATERTIGHT. ALL STRUCTURES SHALL BE WATERTIGHT AND SHALL BE TESTED FOR WATER TIGHTNESS BY FILLING PRECAST STRUCTURE WITH WATER PRIOR TO BACKFILLING. AN ACCEPTABLE LEAKAGE IS DEFINED AS LOSS OF LESS THAN 1/2" IN 24 HOURS AND NO VISABLE LEAKS. REPAIR OF LEAKS IS REQUIRED USING METHODS APPROVED BY AMERICAN WATER.
9. DUAL SEAL II GASKETS DISTRIBUTED BY DUAL SEAL CORP. SHALL MEET ASTM C923 REQUIREMENTS.
10. JOINTS IN STRUCTURE SHALL BE SEALED WITH BITUMEN CONSEAL CS-102-B JOINT SEALANT MATERIAL MANUFACTURED BY CONCRETE SEALANTS, INC. AND MEET FEDERAL SPECIFICATION SS-S-00210 (210-A).
11. CONCRETE STRUCTURES SHALL MEET THE REQUIREMENTS OF ASTM C478. DESIGN SHALL FOLLOW ACI 318-95 USING LOAD FACTOR DESIGN.
12. CONCRETE: fc = 4,000 PSI AT 28 DAYS. TYPE III CEMENT. A1 ENTRAINMENT 7% ± 2%. ASTM C33 NO. 57 OR NO. 67 COARSE AGGREGATE.
13. REINFORCEMENT: WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. BAR REFORCEMENT SHALL BE GRADE 60, CONFORMING TO ASTM A615.
14. VERTICAL BAR REINFORCEMENT REQUIRED BETWEEN BASE SLAB AND FIRST VERTICAL SECTION OF STRUCTURE.

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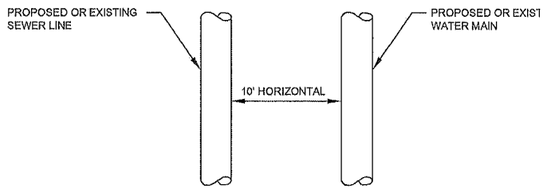
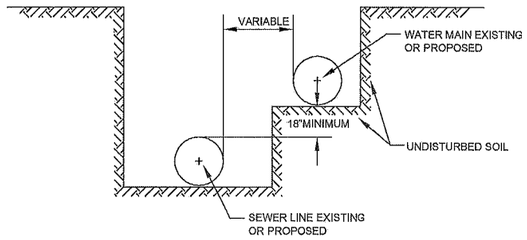
DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

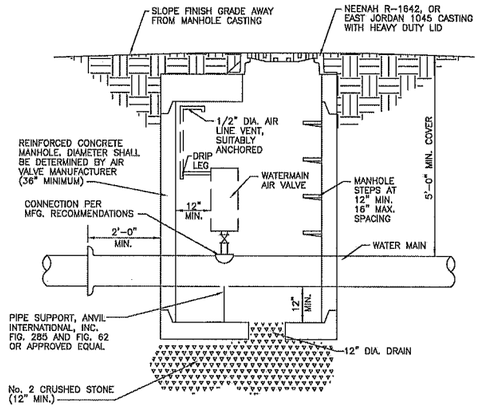
NOTE:
WHEN PROPOSED SEWER (OR WATER) IS LOCATED 10 FEET OR MORE FROM EXISTING WATER (OR SEWER), NO SPECIAL CONSTRUCTION REQUIRED. SEE SECTION 41-2.01B (1) OF THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS, CURRENT EDITION.



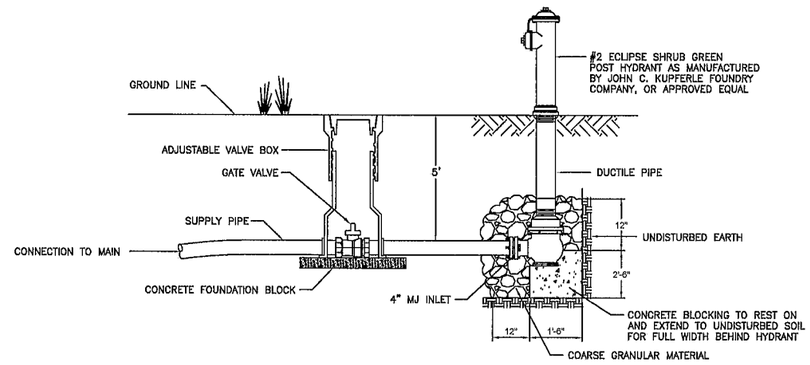
NOTE:
WHEN PROPOSED SEWER (OR WATER) IS LOCATED LESS THAN 10 FEET FROM EXISTING WATER (OR SEWER), DETAILS BELOW SHALL APPLY. SEE SECTION 41-2.01B (2) OF THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS, CURRENT EDITION.



WATER AND SEWER HORIZONTAL SEPARATION REQUIREMENTS
NOT TO SCALE



DETAIL - AIR RELEASE VALVE STRUCTURE
NTS



FLUSHING HYDRANT SETTING DETAIL
NTS

TABLE I				
INSIDE DIAMETER OF CONDUIT IN INCHES ("D")	MAXIMUM TRENCH WIDTH IN FEET FOR PAYMENT	PAYMENT QUANTITIES PER FOOT OF CONDUIT		
		BEDDING C.Y./FOOT WHERE ELIGIBLE FOR PAYMENT	B-BORROW BACKFILL C.Y./FOOT PER FOOT OF DEPTH WHERE ELIGIBLE FOR PAYMENT	PERMANENT PAVEMENT REMOVAL AND REPLACEMENT S.Y./FOOT
4 – 6"	0.0+30"	0.24	0.13	0.62
8"	0.0+30"	0.29	0.14	0.64
10"	0.0+30"	0.31	0.15	0.66
12"	0.0+30"	0.34	0.15	0.69

PAYMENT QUANTITIES PER FOOT OF CONDUIT
NOT TO SCALE

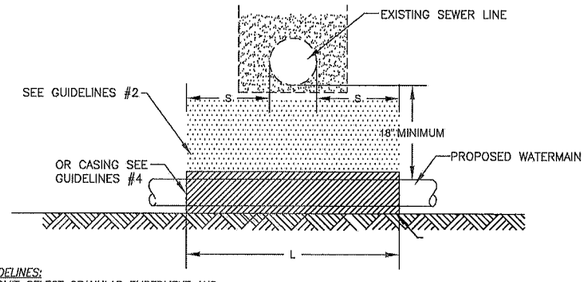
NOTES:
1. PIPE BEDDING TO 12" ABOVE THE TOP OF THE PIPE SHALL BE REQUIRED ON ALL PIPE BEDDING INCLUDING COMPACTION, SHALL BE CONSIDERED INCIDENTAL TO THE PRICE PER LINEAL FOOT OF INSTALLED WATER MAIN OR SEWER. FLEXIBLE THERMOPLASTIC OR CORRUGATED METAL PIPE.

2. B-BORROW SHALL CONSIST OF BACKFILLING FROM 1 FOOT OVER THE TOP OF THE PIPE TO THE NATURAL OR FINISHED SURFACE LINE LESS C.Y. PAVEMENT STRUCTURE. IF SELECT GRANULAR MATERIAL IS REQUIRED FOR BACKFILL, IT WILL BE MEASURED FOR PAYMENT ON A CUBIC YARD BASIS IN ACCORDANCE WITH THE PAYMENT QUANTITY PER FOOT OF CONDUIT TABLE. (SEE DETAIL THIS SHEET).

3. EXCAVATED MATERIAL MAY BE SUITABLE FOR BACKFILL. EXCAVATED MATERIAL, INCLUDING COMPACTION, USED FOR BACKFILL SHALL BE CONSIDERED INCIDENTAL TO THE PRICE PER LINEAL FOOT OF INSTALLED WATER MAIN.

4. COMPACTION IN ACCORDANCE WITH SECTION 02221 OF THE SPECIFICATIONS SHALL BE REQUIRED FOR PIPE BEDDING & B-BORROW BACKFILL FOR ALL CONDUITS LOCATED UNDER OR WITHIN 2 FEET OF EXISTING OR FUTURE PAVED AREAS. PAVED AREAS INCLUDE STREETS, CURBS, GUTTERS, SHOULDERS AND SIDEWALKS.

5. IN ALL OTHER AREAS, COMPACTION SHALL BE REQUIRED FOR PIPE BEDDING. FINAL BACKFILL SHALL CONSIST OF UNCONSOLIDATED BACKFILL AND WILL NOT REQUIRE COMPACTION.



GUIDELINES:
1. OMIT SELECT GRANULAR EMBEDMENT AND GRANULAR BACKFILL TO ONE (1) FOOT OVER TOP OF WATERMAIN AND USE SELECT EXCAVATED MATERIAL (CLASS IV) AND COMPACT THE LENGTH OF "L" FEET.

2. IF SELECT GRANULAR BACKFILL EXISTS: REMOVE WITHIN WIDTH OF EXISTING SEWER LINE TRENCH AND REPLACE WITH SELECT EXCAVATED MATERIAL (CLASS IV) AND COMPACT.

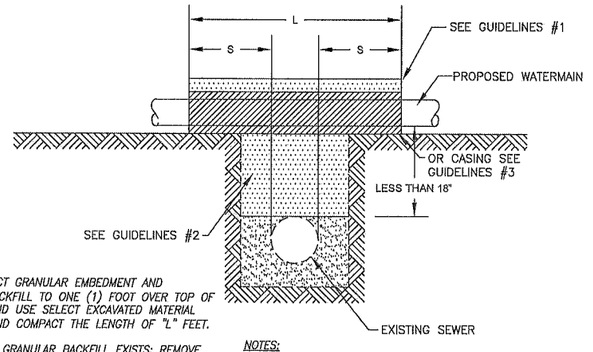
3. PROVIDE ADEQUATE SUPPORT FOR EXISTING SEWER LINE TO PREVENT DAMAGE DUE TO SETTLEMENT.

4. USE "L" FEET OF WATER MAIN MATERIAL FOR CASING OF PROPOSED WATER MAIN AND SEAL ENDS OF CASING.

NOTES:
1. "S" THE LENGTH NECESSARY TO PROVIDE 10 FEET OF SEPARATION AS MEASURED PERPENDICULAR TO EXISTING SEWER LINE.

2. HORIZONTAL AND VERTICAL SEPARATION OF WATER AND SEWER MAINS SHALL BE IN ACCORDANCE WITH SECTION 370.350 OF THE ILLINOIS RECOMMENDED STANDARDS FOR SEWAGE WORKS OR SECTION 41-2.01 OF THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS, CURRENT EDITION.

PROPOSED WATER MAIN BELOW EXISTING SEWER LINE WITH LESS THAN 18" VERTICAL SEPARATION
NOT TO SCALE



GUIDELINES:
1. OMIT SELECT GRANULAR EMBEDMENT AND GRANULAR BACKFILL TO ONE (1) FOOT OVER TOP OF WATERMAIN AND USE SELECT EXCAVATED MATERIAL (CLASS IV) AND COMPACT THE LENGTH OF "L" FEET.

2. IF SELECT GRANULAR BACKFILL EXISTS: REMOVE WITHIN WIDTH OF EXISTING SEWER LINE TRENCH AND REPLACE WITH SELECT EXCAVATED MATERIAL (CLASS IV) AND COMPACT.

3. USE "L" FEET OF WATER MAIN MATERIAL FOR CASING OF PROPOSED WATERMAIN AND SEAL ENDS OF CASING.

4. POINT LOADS SHALL NOT BE ALLOWED BETWEEN WATERMAIN CASING AND SEWER.

NOTES:
1. "S" THE LENGTH NECESSARY TO PROVIDE 10 FEET OF SEPARATION AS MEASURED PERPENDICULAR TO EXISTING SEWER LINE.

2. HORIZONTAL AND VERTICAL SEPARATION OF WATER AND SEWER MAINS SHALL BE IN ACCORDANCE WITH SECTION 370.350 OF THE ILLINOIS RECOMMENDED STANDARDS FOR SEWAGE WORKS OR SECTION 41-2.01 OF THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS, CURRENT EDITION.

PROPOSED WATER MAIN ABOVE EXISTING SEWER LINE WITH LESS THAN 18" VERTICAL SEPARATION
NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

amec
8901 NORTH INDUSTRIAL RD.
PEORIA, ILLINOIS 61615
PH (309) 692-4422 FX (309) 692-9364

STANDARD DETAILS AND PAYMENT QUANTITIES

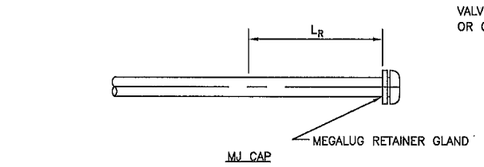
SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

NOTES:

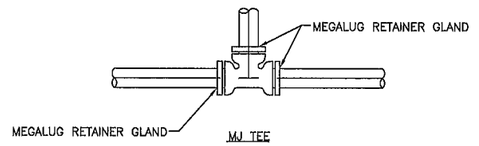
1. THRUST RESTRAINT SHALL BE PROVIDED AT ALL FITTINGS AND VALVES. THE THRUST RESTRAINT SYSTEM SHALL BE A COMBINATION OF MEGALUG RETAINER GLANDS AND BELL RESTRAINTS (AS MANUFACTURED BY EBAA IRON, OR APPROVED EQUAL), AS SHOWN ON THIS SHEET.
2. L_R IS THE PIPE LENGTH THAT SHALL BE RESTRAINED BEFORE AND AFTER THE VALVE OR FITTING, AS SHOWN IN THE ADJACENT DRAWINGS. A BELL RESTRAINT SHALL BE INSTALLED WITH ANY JOINTS LOCATED WITHIN THE REQUIRED RESTRAINT LENGTH FROM THE VALVE OR FITTING. THIS APPLIES ONLY IF THE MEGALUG RESTRAINT SYSTEM IS UTILIZED. THE REQUIRED VALUES OF L_R ARE LISTED IN THE TABLE ON THIS SHEET.
3. ALL MEGALUGS AND BELL RESTRAINTS SHALL BE BITUMINOUS COATED TO PROTECT AGAINST CORROSION.
4. WHEN TWO BENDS ARE INSTALLED WITHIN THE RESTRAINED LENGTH OF ONE ANOTHER, THE RESTRAINED LENGTH MUST BE CALCULATED FOR THE COMBINATION OF THE TWO BENDS, NOT EACH BEND INDIVIDUALLY.
5. WHEN A VALVE OR FITTING IS ADJACENT TO A CONNECTION BETWEEN NEW AND EXISTING PIPE, THE EXISTING PIPE SHALL BE REPLACED FOR AT LEAST THE LENGTH L_R BEYOND THE FITTING OR VALVE AND BELL RESTRAINTS WILL BE INSTALLED AT ANY JOINTS ALONG THIS LENGTH.

DESIGN PARAMETERS FOR THIS SHEET

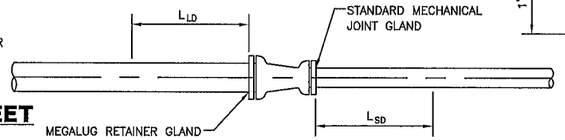
DESIGN PRESSURE = 100 PSI
PIPE MATERIAL = PVC
MINIMUM DEPTH OF COVER (TO TOP OF PIPE) = 4'
GRANULAR CRADLE MATERIAL UNIFIED SOIL CLASSIFICATION = GP
ACCEPTABLE GRANULAR CRADLE MATERIALS = CA-6, CA-7
FACTOR OF SAFETY = 2.0



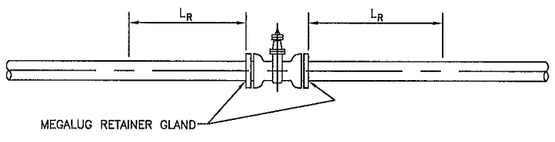
MJ CAP



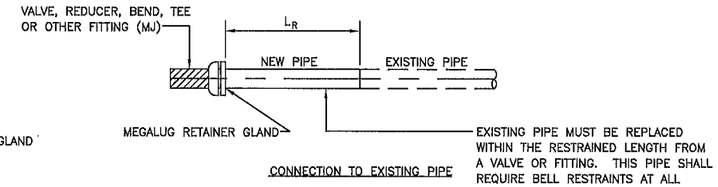
MJ TEE



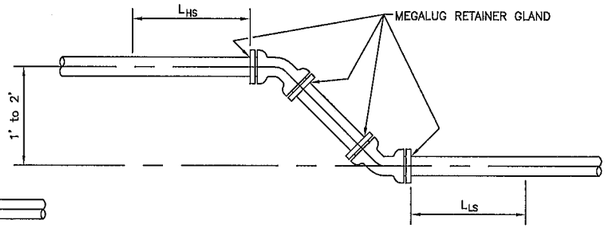
MJ REDUCER



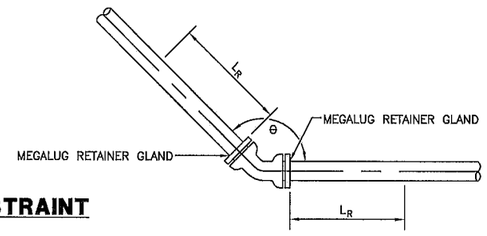
MJ VALVE



CONNECTION TO EXISTING PIPE



VERTICAL OFFSET USING 45° ELBOWS

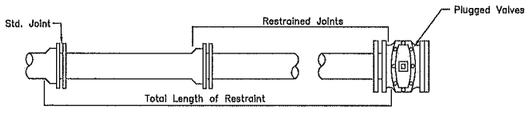


MJ BEND

THRUST RESTRAINT

NOT TO SCALE

REQUIRED COMPONENTS OF MEGALUG THRUST RESTRAINT SYSTEMS FOR VARIOUS FITTINGS



DEAD ENDS OF MAINS

NOTE:

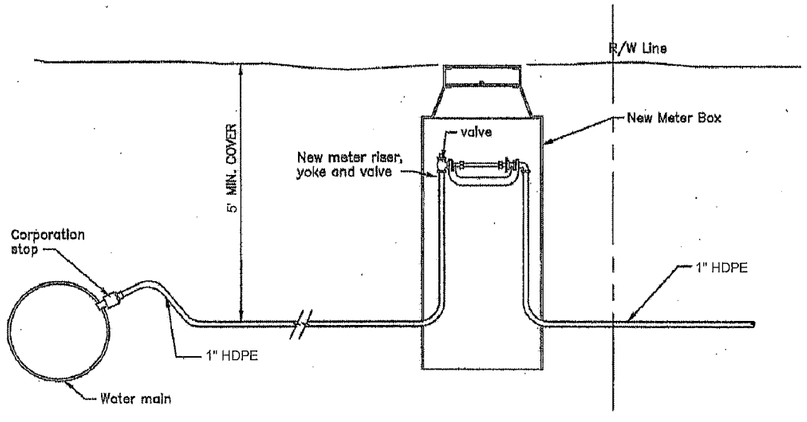
Length of Restraint same as for 90° Bends & Dead ends. See Constr. Std. "Length and Method of Restraint"

REQUIRED LENGTH (FEET) OF PIPE RESTRAINT FOR PVC

FITTING	PIPE DIA.	L_R
VALVE	4"	25
	6"	36
	8"	47
	10"	56
	12"	67
22.5° BEND	4"	3
	6"	2
	8"	3
	10"	4
	12"	5
45° BEND	4"	4
	6"	5
	8"	7
	10"	8
	12"	10
90°	4"	9
	6"	13
	8"	17
	10"	20
	12"	24
CAP	4"	28
	6"	39
	8"	51
	10"	61
	12"	73
VERT. OFFSET	4"	11-4
	6"	16-5
	8"	21-7
	10"	25-8
	12"	30-10
45° ELBOWS	4"	11-4
	6"	16-5
	8"	21-7
	10"	25-8
	12"	30-10

REQUIRED LENGTH (FEET) OF PIPE RESTRAINT FOR PVC

FITTING	PIPE DIA.	L_{HS}	L_{LS}
VERT. OFFSET (1'-2') WITH 45° ELBOWS	4" & 6"	16	5
	8"	21	7
	10"	25	8
	12"	30	10
REDUCER	PIPE DIA.	L_{LD}	L_{SD}
	6" x 4"	18	27
	8" x 4"	34	64
	8" x 6"	20	26
	10" x 4"	46	110
	10" x 6"	35	57
	10" x 8"	19	24
	12" x 4"	58	166
	12" x 6"	48	95
	12" x 8"	35	53
	12" x 10"	20	23



WATER SERVICE CONNECTION DETAIL
PROPOSED METER SETTING
WHERE INDOOR INSTALLATION IS NOT POSSIBLE

NTS

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

DESIGNED EJC
DRAWN KSB, JLA, JBA
CHECKED GMM
DATE 06/14/10

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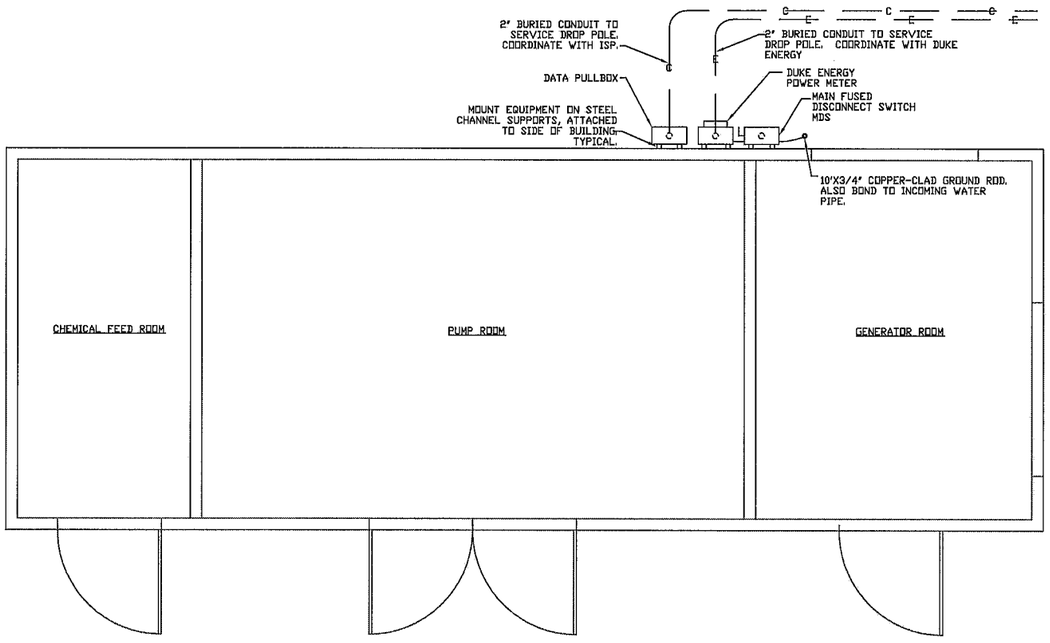
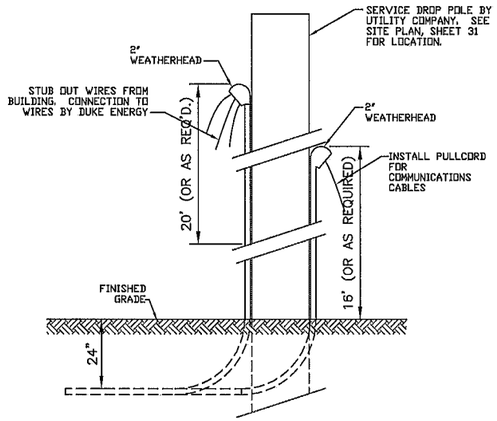
STANDARD DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
OLD US HIGHWAY 31
WATER MAIN EXTENSION
ROCHESTER, INDIANA
FULTON COUNTY

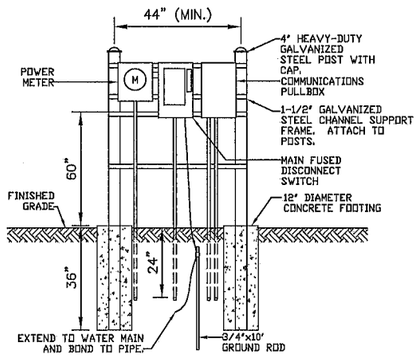


BOOSTER STATION FLOOR PLAN
NOT TO SCALE

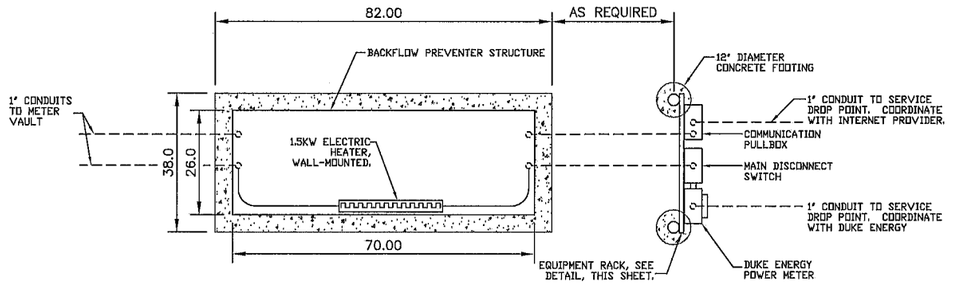


SERVICE DROP POLE DETAIL
NOT TO SCALE

COORDINATE WITH DUKE ENERGY AND ISP PROVIDER FOR SERVICE AND INSTALLATION.



EQUIPMENT RACK DETAIL
NOT TO SCALE



BACKFLOW PREVENTER FLOOR PLAN
NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	APPROVED
0		30% DESIGN	GMM
1	6/2010	75% DESIGN	GMM
2	11/2011	DRAFT FINAL	GMM

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ELECTRICAL DETAILS

SOUTH RICHLAND CONSERVANCY DISTRICT
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